

**UNITED STATES INTERNATIONAL TRADE COMMISSION**

**Washington, D.C.**

**In the Matter of**

**CERTAIN NANOLAMINATE ALLOY  
COATED METAL PARTS AND  
PRODUCTS CONTAINING THE SAME**

**Inv. No. 337-TA-1431**

**CORRECTED INITIAL DETERMINATION ON VIOLATION OF SECTION 337**

**Administrative Law Judge MaryJoan McNamara**

(May 6, 2026)

The Initial Determination on violation (“ID”) in this Investigation issued on April 30, 2026. (Doc. ID No. 880847 (Apr. 30, 2026).). This corrected ID, which is substantively and textually identical to the ID, adds one footnote on page 84.

**SELECTED SUMMARY FINDINGS**

Pursuant to the Notice of Investigation (“NOI”), 90 Fed. Reg. 7704, dated January 22, 2025, this is the Initial Determination (“ID”) of the Investigation in the Matter of Certain Nanolaminate Alloy Coated Metal Parts and Products Containing the Same, United States International Trade Commission Investigation No. 337-TA-1431. *See* 19 C.F.R. § 210.42(a).

It is a finding of the ID that Complainant Modumetal, Inc. (“Complainant” or “Modumetal”) has not proven by a preponderance of evidence that Respondents Parker Hannifin Corporation (“Parker Hannifin”), Lu Chu Shin Yee Works Co., Ltd. (“LCSYW”), Jiangsu DVP Hi Pressure Technology Co., Ltd. (“Jiangsu”), Maxort Philippines Inc. (“Maxort”), Paloma Turning Co. Pvt. Ltd. (“Paloma”), Shanghai Overseas Enterprises Co., Ltd. (“SOE”), Shaoxing Xuantong Fluid Connectors Manufacturing Co., Ltd. (“Shaoxing”), and Zhejiang Fitting Machinery Co., Ltd. (“Zhejiang”) (collectively, “Respondents,” and together with Modumetal, “the Parties”) have violated subsection (b) of Section 337 of the Tariff Act of 1930, in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain metal parts coated with Parker’s ToughShield® Plus coating as well as bundles containing one or more parts with ToughShield® Plus coating.

It is a finding of the ID that Respondents have not infringed Asserted Claims 1, 2, 3, 5, 7 of U.S. Patent No. 10,253,419 (“the ’419 patent”).

It is a finding of the ID that Respondents have not infringed Asserted Claims 1, 2, 3, and 5 of U.S. Patent No. 11,242,613 (“the ’613 patent”).

It is also a finding of the ID that Respondents have not proven that Asserted Claims 1, 2, 3, 5, 7 of the ’419 patent are invalid.

It is also a finding of the ID that Respondents have not proven that Asserted Claims 1, 2,

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3, and 5 of the '613 patent are invalid.

It is a finding of the ID that one or more of Modumetal's domestic industry products has not satisfied the technical industry prong of the domestic industry requirement for the '419 patent or the '613 patent. It is also a finding of this ID that Modumetal has not satisfied the economic prong of the domestic industry requirement under Sections 337(a)(3)(A) and (B).

Accordingly, the ID does not recommend issuance of a remedy. However, if the Commission finds a violation of Section 337, then the ID recommends: (1) issuance of a Limited Exclusion Order ("LEO") with a standard certification provision; (2) a carveout for non-infringing redesign products; and (3) quarterly domestic industry reporting requirements for Modumetal. The issuance of a Cease and Desist Order ("CDO") has not been recommended. There is a recommendation that no bond be entered during the Presidential Review Period ("PRP").

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**ABBREVIATIONS**

The following shorthand references to the Parties, to related U.S. agencies, and to related proceedings are used in this Initial Determination:

|                                 |                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Complainant or Modumetal</b> | Complainant Modumetal, Inc.                                                                                                                                                                                                                                                                                                 |
| <b>Parker Hannifin</b>          | Respondent Parker Hannifin Corporation                                                                                                                                                                                                                                                                                      |
| <b>Respondents</b>              | Respondents Parker Hannifin Corporation, Lu Chu Shin Yee Works Co., Ltd., Jiangsu DVP Hi Pressure Technology Co., Ltd., Maxort Philippines Inc., Paloma Turning Co. Pvt. Ltd., Shanghai Overseas Enterprises Co., Ltd., Shaoxing Xuanton Fluid Connectors Manufacturing Co., Ltd., and Zhejiang Fitting Machinery Co., Ltd. |
| <b>CBP</b>                      | U.S. Customs and Border Protection                                                                                                                                                                                                                                                                                          |
| <b>PTO</b>                      | U.S. Patent and Trademark Office                                                                                                                                                                                                                                                                                            |

The following abbreviations for pleadings, exhibits, briefs, transcripts, and Orders are used in this Initial Determination:

|               |                                                                                                                                                       |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Compl.</b> | Complaint                                                                                                                                             |
| <b>Resp.</b>  | Verified Response of Parker Hannifin Corporation to the Notice of Investigation and Complaint Under Section 337 of the Tariff Act of 1930, as Amended |
| <b>CX</b>     | Complainant's exhibit                                                                                                                                 |
| <b>CDX</b>    | Complainant's demonstrative exhibit                                                                                                                   |
| <b>CPX</b>    | Complainant's physical exhibit                                                                                                                        |
| <b>CPBr.</b>  | Complainant's Pre-Hearing Brief                                                                                                                       |
| <b>CBr.</b>   | Complainant's Initial Post-Hearing Brief                                                                                                              |
| <b>CRBr.</b>  | Complainant's Reply Post-Hearing Brief                                                                                                                |
| <b>CPSt.</b>  | Complainant's Pre-Hearing Statement                                                                                                                   |
| <b>CMBr.</b>  | Complainant's <i>Markman</i> Brief                                                                                                                    |

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|                             |                                                                         |
|-----------------------------|-------------------------------------------------------------------------|
| <b>CRMBr.</b>               | Complainant’s Responsive <i>Markman</i> Brief                           |
| <b>JX</b>                   | Joint exhibit                                                           |
| <b>RX</b>                   | Respondents’ exhibit                                                    |
| <b>RDX</b>                  | Respondents’ demonstrative exhibit                                      |
| <b>RPX</b>                  | Respondents’ physical exhibit                                           |
| <b>RPBr.</b>                | Respondents’ Pre-Hearing Brief                                          |
| <b>RBr.</b>                 | Respondents’ Initial Post-Hearing Brief                                 |
| <b>RRBr.</b>                | Respondents’ Reply Post-Hearing Brief                                   |
| <b>RPSt.</b>                | Respondents’ Pre-Hearing Statement                                      |
| <b>RMBr.</b>                | Respondents’ <i>Markman</i> Brief                                       |
| <b>RRMBr.</b>               | Respondents’ Responsive <i>Markman</i> Brief                            |
| <b>Tr.</b>                  | Evidentiary hearing transcript                                          |
| <b>Dep. Tr.</b>             | Deposition transcript                                                   |
| <b>Joint CC Chart</b>       | Joint Claim Construction Chart (EDIS Doc. ID No. 848151 (Apr. 8, 2025)) |
| <b><i>Markman</i> Order</b> | Order No. 30 (Sept. 26, 2025)                                           |

The following shorthand references to certain products and patents at issue are used in this Initial Determination:

|                                        |                                                                                                                              |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>’419 patent</b>                     | U.S. Patent No. 10,253,419                                                                                                   |
| <b>’613 patent</b>                     | U.S. Patent No. 11,242,613                                                                                                   |
| <b>Asserted Patents</b>                | ’419 patent and ’613 patent                                                                                                  |
| <b>Asserted Claims</b>                 | Claims 1, 2, 3, 5, and 7 the ’419 patent and claims 1, 2, 3, and 5 of the ’613 patent                                        |
| <b>Representative Accused Products</b> | The ToughShield® Plus Seal-Lok O-Ring Face Seal Tube nut fittings (10BL-S); the ToughShield® Plus Ferulok Flareless fittings |

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(16-12FBU-S); the ToughShield® Plus Elbow Fitting Seal Lok (8 C5OLO-S); and the Triple Lok Tube Nut 4 BTX-S, i.e., the Barrel-Plated Replacement Product

**DI Products**

All metal parts coated by Modumetal with its proprietary NanoGalv® laminate coating in the United States, including the DI Fastener

**DI Fastener**

NanoGalv® L5040.5/8.2H.N part

## **I. INITIAL DETERMINATION ON VIOLATION OF SECTION 337**

### **A. Technology Comment**

The technology at issue in this Investigation generally relates to “metallic coatings for corrosion protection.” (Tr. (Dr. Robert Kelly) at 388:2–3).<sup>1</sup> According to Modumetal, “corrosion of metals occurs naturally by electrochemical reactions between a metal object and the environment. Corrosion reduces the structural integrity of the metal and can result in mechanical failures that are sudden, catastrophic, and costly.” (CBr. at 6 (citing Tr. (Dennis

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<sup>1</sup> Modumetal identified Dr. Robert Kelly as its expert “related to the formation and characterization of zinc/nickel alloy layers.” (CPSt. at 3.). Modumetal called Dr. Kelly to testify about: “1. [t]he basis for Dr. Kelly’s opinion that the Accused Products (including certain of the Replacement Products) infringe the Asserted Patents. 2. The basis for Dr. Kelly’s opinion that the Domestic Industry Products practice the Asserted Patents. 3. The testing and characterization methods used to analyze the Accused Products (including certain of the Replacement Products) and the Domestic Industry Products.” (*Id.* at 2–3.).

Dr. Kelly holds a bachelor’s degree in materials science and biomedical engineering, a Master of Science and Engineering in materials science and engineering, and a Ph.D. in materials science and engineering, all from the Johns Hopkins University in Baltimore. (Tr. (Kelly) at 383:25–385:7; CDX-0001.0003.). After completing his Ph.D., Dr. Kelly spent two years as a visiting scholar at the University of Manchester Institute of Science and Technology, and then in July 1990 Dr. Kelly joined the University of Virginia as an associate professor. (Tr. (Kelly) at 385:8–385:18; CDX-0001.0004.). At the time of the Hearing, Dr. Kelly was still with the University of Virginia as an endowed chair. (*Id.*). Dr. Kelly has received numerous honors and awards, including receiving a Fulbright Scholarship during his time at the University of Manchester, the A.B. Campbell Award, the Uhlig Award from NACE (National Association of Corrosion Engineers) which is for a young educator, was elevated to “Fellow” of the NACE in 2007, was elevated to “Fellow” of the Electrochemical Society, in 2016 received an Uhlig Award of the Corrosion Division of the Electrochemical Society for career achievement, and in 2021 was awarded the W.R. Whitney Award of NACE International for career achievement. (Tr. (Kelly) at 385:23–386:16; CDX-0001.0005–.0006.). Dr. Kelly has authored more than 165 publications, presentations, and lectures, holds one (1) patent, has another patent pending, and has three (3) archival journal papers on corrosion performance of zinc-nickel coatings on steel. (Tr. (Kelly) at 386:17–24; CDX-0001.0007.). Dr. Kelly also has performed technical consulting in the areas of alloy selection, corrosion testing, corrosion monitoring, corrosion instrumentation development, and failure analysis. (Tr. (Kelly) at 386:25–387:14; CDX-0001.0008.). Modumetal offered Dr. Kelly as an expert “in the field of electrochemistry and corrosion resistance” for the purpose of providing testimony on “infringement and domestic industry.” (Tr. (Modumetal) at 391:7–12.). Respondents stated that they did not object. (Tr. (Respondents) at 391:13–15.). Therefore, Dr. Kelly was “accepted as an expert witness on the subject matter for which he has been called to testify and for the topics on which he has been called to testify, without objection.” (Tr. (ALJ) at 391:18–20.).

Creech) at 238:9–11)).<sup>2</sup>

As Modumetal described (and the Parties appear to agree), the most common and basic form of corrosion is general or uniform corrosion, where the entire exposed surface of a metallic structure undergoes a reaction. (CPBr. at 6 (citing RX-0036C at ¶ 47).). The corrosion rate, or how fast a material corrodes, will depend upon multiple factors such as its composition, microstructure, and exposure environment. (*Id.*). As the Parties appear to agree, despite the development of various anti-corrosion approaches to protect metals and prevent corrosion, the problem of metal corrosion in various industries from oil and gas to automobiles remains a significant economic problem worldwide. (*Id.*). Accordingly, as noted, different coatings can be applied to a substrate—or base material—to prevent or minimize corrosion. (*Id.* (citing RX-0036C at ¶ 48).). Coatings may include metals, alloys, paints, or other inert materials. (*Id.*; *see also* JX-0001 at Abstract; JX-0002 at Abstract.).

The Asserted Patents explain the application of corrosion-protective coatings through electrodeposition, a well-known and common method for forming a protective metallic coating on substrates. (JX-0001 at 1:22–26 (“Electrodeposition has been successfully used to deposit nanolaminated coatings on metal and alloy components for a variety of engineering applications. Electrodeposition is recognized as a low-cost method for forming a dense coating on any

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<sup>2</sup> When he testified during the Hearing, Mr. Dennis Creech was the Executive Chairman of Modumetal and a member of the Board of Directors. (CPSt. at 1.). Modumetal identified Mr. Creech as a fact witness to testify about the creation of Modumetal; the development of NanoGalv®; Modumetal’s business model, markets and technology/product licenses; the preparation, filing, and prosecution of the Asserted Patents; the Parker Hannifin/Modumetal Collaboration Agreement; the types of business records Modumetal keeps in the ordinary course of business and an explanation of those business records; the types of investments Modumetal performs in the United States related to the Domestic Industry Products; Modumetal’s domestic industry and facts supporting Modumetal’s domestic industry; the representativeness of the NanoGalv® Fastener of all NanoGalv® Domestic Industry Articles; and the Parker Hannifin Accused Products. (*Id.*).

conductive substrate.”); JX-0002 at 1:23–27.). Electrodeposition is the process of depositing a metal or alloy onto a substrate using an electric current in a solution containing ions of that metal or alloy. (See RX-0037C at ¶ 36.). The two (2) methods of electrodeposition used by the Parties in this Investigation are rack-plating and barrel-plating. (See CPBr. at 7 (citing RX-0037C at ¶ 86); *see also* Section V.).

Using the process of electrodeposition, multiple layers of protective coatings can be applied to the same substrate. (See JX-0001 at 1:26–28; JX-0002 at 1:27–29.). The Asserted Patents discuss “time varying electrodeposition parameters such as current density, bath composition, pH, mixing rate, and/or temperature” to produce “multi-laminate materials” wherein “the individual laminates may vary in the composition of the metal.” (JX-0001 at 1:26–33; JX-0002 at 1:27–34.).

According to Modumetal, and as reflected in the ’419 patent, some anti-corrosion methods suppress corrosion by applying a layer that is less corrosion resistant than the underlying metal substrate material. (JX-0001.0005 at 1:38–54; *see also* CBr. at 5–6.). As also reflected in the Asserted Patents, if a metal part is coated with a material that is less resistant to corrosion than the part itself, it acts as a “sacrificial layer” that is preferentially corroded rather than the underlying part. (*Id.*). However, corrosion protection only lasts as long as the sacrificial layer remains intact, which can vary depending upon the environmental conditions. (*Id.*).

Another anti-corrosion approach involves depositing a barrier coating that is *more* resistant to corrosion than the underlying metal part. (*Id.*, JX-0001.0005 at 1:55–2:7). In this approach, if the barrier coating becomes compromised, the part may corrode even faster than without a coating, due to an undesirable role-reversal where the underlying metal part becomes a “sacrificial layer” for the barrier layer. (*Id.*; *see also* CBr. at 6–7.).

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Almost 200 years ago, it was discovered that immersing a substrate or metal piece, such as steel, in a molten solution of zinc results in a protective zinc coating—a process referred to as “galvanization.” (Tr. (Dr. Gerald Frankel)<sup>3</sup> at 883:5–11.). A zinc coating protects an underlying steel substrate in two (2) ways. First, the zinc coating acts as a barrier between the substrate and the environment, thus preventing corrosion. (*Id.* at 883:12–16.). Second, if a zinc barrier is compromised by, for example, a scratch, thus exposing the substrate to the environment, the substrate undergoes corrosion more slowly because of the “galvanic coupling of the zinc coating and the iron substrate.” (*Id.* at 883:17–884:15.). This second type of protection is called “sacrificial protection.” (*Id.*).

The galvanization process is important in, for example, automobile manufacturing. (*Id.*). For a car made today in the United States, if the outside is scratched deeply to expose the underlying steel panel, there is no visible corrosion “for a long time, because that corrosion is prevented by the galvanizing on that steel panel.” (*Id.*). Because of galvanization, car makers are able to provide ten (10) year warranties against corrosion. (*Id.*).

Starting about 60 years ago, protective coatings that could be used industrially on a

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<sup>3</sup> When he testified during the Hearing, Dr. Gerald Frankel was a Professor Emeritus at Ohio State University. (Tr. (Frankel) at 875:24-25.). Dr. Frankel testified that he retired from Ohio State University one month before the Hearing. (*Id.* at 875:20-23.). He stated that he taught at Ohio State University for 30 years. (*Id.* at 876:1-2.). Dr. Frankel stated that during his employment at Ohio State University, he “started as an associate professor and became a full professor, and then I held the title of Distinguished Professor of Engineering for about the last ten years of my time there.” (*Id.* at 876:5-8.). He was also Director of the Fontana Corrosion Center at Ohio State University. (*Id.* at 876:15-18.). Respondents identified Dr. Frankel as an expert to testify about “the technical background of the products-at-issue in this Investigation; the design, structure, function, operation, and manufacturing the products-at-issue in this Investigation; issues relating to the technical prong of Complainant’s domestic industry allegations; invalidity, enforceability, lack of objective indicia of nonobviousness, and/or remedy; technical matters relating to the Asserted Patents; noninfringement of the Asserted Patents in this Investigation; the understanding of one skilled in the art of the claims and claim terms of the Asserted Patents; and other technical issues that may arise with respect to the products-at-issue in this Investigation and/or Asserted Patents.” (RPSt. at 2.). Dr. Frankel was accepted, without exception and objection, as an expert for the subject matter upon which he was called to testify. (Tr. at 881:14-23.).

variety of substrates that incorporated other metals were developed. (Tr. (Frankel) at 884:16–25.). For example, coatings comprised of alloys of zinc and aluminum were commercialized under the name “Galvalume®.” (*Id.*). Galvalume® advantageously extended corrosion protection as compared with pure zinc because the rate of corrosion of a zinc/aluminum alloy is reduced as compared to when pure zinc is used. (*Id.*).

After Galvalume®, there was research on other zinc alloys including nickel (Ni) and cobalt (Co) alloys, which improved corrosion resistance. (*Id.* at 885:1–7.). Despite these advances, the problem of metal corrosion remains significant—the estimated economic cost of metal corrosion is approximately \$2.2 trillion per year. (Tr. (Creech) at 238:9–11.).

Then, in the 1990s and 2000s, there was research on multilayered coatings, which are the types of coatings to which the Asserted Patents are directed. (*Id.* at 885:8–14.). More specifically, the technology of the Asserted Patents relates to multilayered nanolaminate<sup>4</sup> coatings that consist of a series of alternating (or repeating) layers, in which each layer has a thickness from about 5 nanometers (nm) to about 1,000 nanometers (nm), and where each layer comprises a metal alloy comprising metals such as cobalt (Co), iron (Fe), nickel (Ni), and zinc (Zn). (Joint Technology Stipulation, EDIS Doc. ID No. 856490 (July 10, 2025) (“JTS”) at 1.). (*Id.* at 32:19–33:2.). Ms. Christina Lomasney, Co-founder of Modumetal and named inventor of the Asserted Patents,<sup>5</sup> described “nano lamination” or “nano laminates” as a variation on

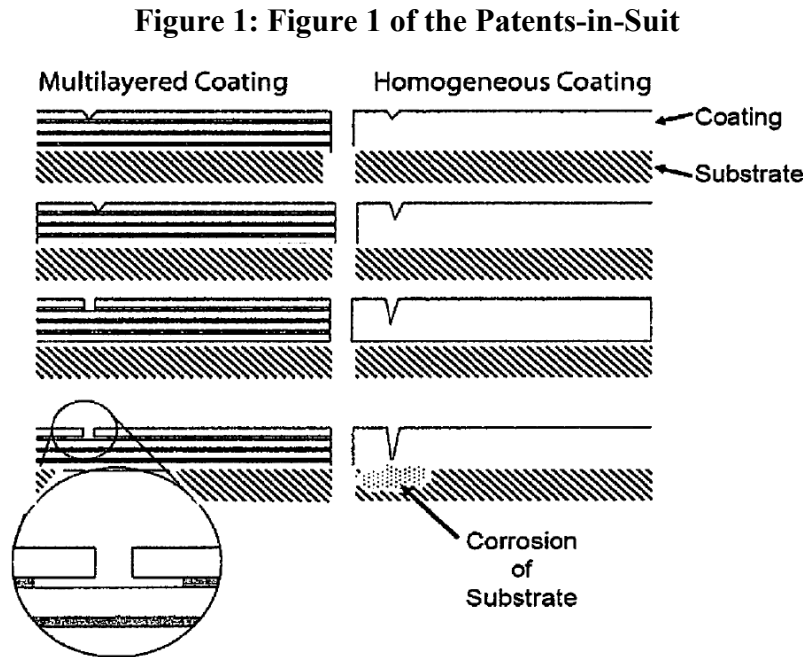
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<sup>4</sup> The Asserted Claims of the Asserted Patents require the “nanolaminate” coating to be from 5 microns (µm) to 50 microns (µm) (5,000 to 50,000 nanometers (nm)) thick and each individual layer to be from about 5 nanometers (nm) to about 1,000 nanometers (nm) (about 0.005 microns (µm) to about 1 micron (µm)) thick. (JX-0001.0010 at 11:1–21; JX-0002.0013 at 11:10–16; JTS at 2.).

<sup>5</sup> Ms. Lomasney gave deposition testimony on April 22, 2025. She has a Bachelor of Arts and Master of Arts in physics. At the time of her deposition, she was working on a Ph.D. in artificial intelligence and machine learning. (JX-0059C (Lomasney Dep. Tr.) at 25:6–18.).

“nanolayered alloys” and as layers of metals (alloys) that are measured in nanometers “on the nanometer scale.” (JX-0059C (Lomasney Dep. Tr.) at 30:20–31:01.).

Figure 1 of the Asserted Patents, reproduced in Figure 1 below, depicts the corrosion over time of a monolayered (or “homogenous”) coating of the prior art on the right and the corrosion over time of a multilayered coating according to the Asserted Patents on the left:



(JTS at 2; JX-0001.0004; JX-0002.0007.).

A feature of the claimed technology of the Asserted Claims is that one layer is less “noble” than the other, and therefore that layer will preferentially corrode instead of the substrate, thus delaying corrosion of the substrate. (JTS at 2–3; JX-0001.0005 at 1:38–2:58; JX-0001.0008 at 1:38–2:60.).<sup>6</sup>

<sup>6</sup> A major point of contention between the Parties that arose during the Hearing is what is meant by “nobility,” and how it affects infringement, technical domestic industry, and invalidity. The term was given its plain and ordinary meaning, which is discussed in more detail in Section VIII.B.3 below.

## B. Summary of Findings

Table 1 below contains a summary of this decision’s findings.

**Table 1: Summary of Findings**

| Product          | Patent      | Claims            | Determination |
|------------------|-------------|-------------------|---------------|
| Accused Products | ’419 patent | 1, 2, 3, 5, and 7 | No violation  |
|                  | ’613 patent | 1, 2, 3, and 5    | No violation  |
| DI Products      | ’419 patent | 1, 2, 3, 5, and 7 | Not satisfied |
|                  | ’613 patent | 1, 2, 3, and 5    | Not satisfied |

## II. BACKGROUND

### A. Institution and Selected Procedural History

On November 19, 2024, Complainant Modumetal, Inc. (“Modumetal” or “Complainant”) filed a complaint (“Complaint”) under Section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, alleging infringement of claims 1, 2, 3, 5, and 7 of the ’419 patent and claims 1, 2, 3, and 5 of the ’613 patent. (EDIS Doc. ID No. 837575 (“Compl.”) at ¶ 4.).

The Commission instituted this Investigation pursuant to subsection (b) of Section 337 of the Tariff Act of 1930, as amended, on January 22, 2025. (90 Fed. Reg. 7704–05 (Jan. 22, 2025).).

The Notice of Investigation (“NOI”) names as complainant: Modumetal, Inc. *Id.* at 7704. The NOI names as respondents: Parker Hannifin Corporation and Lu Chu Shin Yee Works Co., Ltd. *Id.* Commission Investigative Staff is not a party in this Investigation. *Id.*

On February 18, 2025, Parker Hannifin Corporation (“Parker”) filed a response to the

Complaint and NOI (“Resp.”)<sup>7</sup>. (EDIS Doc. ID No. 843687 (Feb. 17, 2025)<sup>8</sup>). On February 18, 2025, Lu Chu Shin Yee Works Co., Ltd. (“LCSYW”) also filed a response to the Complaint and NOI (“LCSYW Resp.”). (EDIS Doc. ID No. 843686 (Feb. 17, 2025)<sup>9</sup>).

On April 14, 2025, Modumetal filed a Motion to Amend the Complaint and NOI (“Motion to Amend”) to add the following new respondents: Jiangsu DVP Hi Pressure Technology Co., Ltd. (“Jiangsu”), Maxort Philippines Inc. (“Maxort”), Paloma Turning Co. Pvt. Ltd. (“Paloma”), Shanghai Overseas Enterprises Co., Ltd. (“SOE”), Shaoxing Xuanton Fluid Connectors Manufacturing Co., Ltd. (“Shaoxing”), and Zhejiang Fitting Machinery Co., Ltd. (“Zhejiang”). (Motion Dkt. Nos. 1431-005; 1431-009.).<sup>10</sup> The Motion to Amend was granted. (Order No. 13; Order No. 18.). The First Amended Complaint was filed on May 12, 2025. (EDIS Doc. ID No. 850992.).

On June 2, 2025, Respondents Parker Hannifin and LCSYW each filed a response to the First Amended Complaint. (EDIS Doc. ID No. 852561 (Parker Resp. to Am. Compl.); EDIS Doc. ID No. 852557 (LCSYW Resp. to Am. Compl.)). Additionally, on June 13, 2025, each of the added Respondents filed a response to the First Amended Complaint. (EDIS Doc. ID No.

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<sup>7</sup> Although each individual respondent filed its own separate response to the Complaint and NOI, Respondents are all represented by the same counsel and much of the material in each response is identical. So, for brevity and clarity only Parker Hannifin’s Response will be cited if the portion being cited to is the same in all material respects to the responses filed by all Respondents.

<sup>8</sup> Although Parker Hannifin submitted its response to the Complaint and NOI through EDIS on February 17, 2025, Parker’s response was not officially received by the Commission until February 18, 2025 because February 17, 2025 was a federal holiday.

<sup>9</sup> Although LCSYW submitted its response to the Complaint and NOI through EDIS on February 17, 2025, LCSYW’s response was not officially received by the Commission until February 18, 2025 because February 17, 2025 was a federal holiday.

<sup>10</sup> Motion Docket No. 1431-009, filed on June 6, 2025, is Modumetal’s Motion to Amend the Notice of Investigation to Correct Certain Respondents and/or Their Names, which was granted in Order No. 18.

(EDIS Doc. ID No. 853737 (Jiangsu Resp. to Am. Compl.); EDIS Doc. ID No. 853738 (Maxort Resp. to Am. Compl.); EDIS Doc. ID No. 853739 (Paloma Resp. to Am. Compl.); EDIS Doc. ID No. 853740 (Shaoxing Resp. to Am. Compl.); EDIS Doc. ID No. 853741 (SOE Resp. to Am. Compl.); EDIS Doc. ID No. 853745 (Zhejiang Resp. to Am. Compl.).).

On July 22, 2025, the Parties filed their respective Pre-Hearing Briefs and Pre-Hearing Statements. (EDIS Doc. ID No. 857476 (“CPBr.”); EDIS Doc. ID No. 857466 (“CPSt.”); EDIS Doc. ID No. 857491;<sup>11</sup> EDIS Doc. ID No. 857481 (“RPSt.”).).

On July 31, 2025, Modumetal filed two (2) motions *in limine* (“MIL”). (Motion Docket No. 1431-014 (July 31, 2025) (“MIL 1”); (Motion Docket No. 1431-015 (July 31, 2025) (“MIL 2”).). Respondents did not file any motions *in limine*. Respondents filed an opposition to each of Modumetal’s MILs. (EDIS Doc. ID No. 859040 (Aug. 7, 2025) (“MIL 1 Opposition”); EDIS Doc. ID No. 859043 (Aug. 7, 2025) (“MIL 2 Opposition”).).

Modumetal’s MIL 1 sought to exclude from evidence certain documents related to whether one of Respondents’ asserted invalidating prior art references, referred to as “Chawa,” was publicly available before the earliest priority date of the Asserted Patents. (MIL 1.). Modumetal’s MIL 1 was denied. (Order No. 25 (Sept. 3, 2025).). Modumetal’s MIL 2 sought to exclude from the record of this Investigation any reference to, or testimony about, two references, referred to as “Zhang 2005” and “Zhang 2017,” that were not identified by Respondents during fact discovery as invalidating prior art. (MIL 2.). Modumetal’s MIL 2 was denied. (Order No. 26 (Sept. 3, 2025).).

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<sup>11</sup> On August 5, 2025, Respondents filed an unopposed Motion for Leave to File a Corrected Pre-Hearing Brief (“MFLCPHB”), which attached as Exhibit A Respondents’ Corrected Pre-Hearing Brief. (Motion Dkt. No. 1431-016, Ex. A). Respondents’ MFLCPHB was granted. (Order No. 23 (Aug. 26, 2025).). Therefore, Exhibit A to Motion Dkt. No. 1431-016 is the operative version of Respondents’ Pre-Hearing Brief in this Investigation. (MFLCPHB, Ex. A (“RPBr.”)).

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The evidentiary hearing (“Hearing”) was held on September 4, 5, 8, 9, and 10, 2025. (EDIS Doc. ID No. 861353 (Sept. 4, 2025) (“Conf Day 1 Tr.”); EDIS Doc. ID No. 861357 (Sept. 4, 2025) (“Public Day 1 Tr.”); EDIS Doc. ID No. 861362 (Sept. 5, 2025) (“Conf. Day 2 Tr.”); EDIS Doc. ID No. 861363 (Sept. 5, 2025) (“Public Day 2 Tr.”); EDIS Doc. ID No. 861452 (Sept. 8, 2025) (“Conf. Day 3 Tr.”); EDIS Doc. ID No. 861453 (Sept. 8, 2025) (“Public Day 3 Tr.”); EDIS Doc. ID No. 861556 (Sept. 10, 2025) (“Conf Day 4 Tr.”); EDIS Doc. ID No. 861557 (Sept. 10, 2025) (“Public Day 4 Tr.”); EDIS Doc. ID No. 861664 (Sept. 11, 2025) (“Conf Day 5 Tr.”); EDIS Doc. ID No. 861655 (Sept. 11, 2025) (“Public Day 5 Tr.”) (collectively, “Tr.”).

On September 26, 2025, the *Markman* Order issued, which set forth the adopted constructions of the disputed claim terms and the rationale behind each construction.<sup>12</sup> (*See Markman* Order; *see also* Section VIII.B, *infra.*).

Due to a lapse in appropriations, the Commission was closed from October 1, 2025, through November 12, 2025. As a result, the target date was extended from April 20, 2026 to August 14, 2026; and the ID due was extended to April 14, 2026. (Order No. 33 (Dec. 2, 2025); EDIS Doc. ID No. 867155 (Commission Decision Not to Review)). Counsel in this Investigation also requested that the Procedural Schedule be modified consistent with the extension. (*Id.*; *see also* Order No. 32 (Nov. 24, 2025)).

In accordance with Order No. 32, which granted the Parties’ joint request to amend the Procedural Schedule, the Parties each filed an Initial Post-Hearing Brief and a Reply Post-Hearing. (EDIS Doc. ID No. 864718 (“CBr.”) (Nov. 21, 2025); EDIS Doc. ID No. 864723 (“RBr.”) (Nov. 21, 2025); EDIS Doc. ID No. 866450 (“CRBr.”) (Dec. 12, 2025); EDIS Doc. ID No. 866459 (“RRBr.”) (Dec. 12, 2025)).

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<sup>12</sup> A *Markman* hearing was not held in this Investigation. (*See* Order No. 12 (Apr. 22, 2025)).

On December 12, 2025, the Parties filed their Joint Statement of Undisputed Facts (“JSUF”). (EDIS Doc. ID No. 866435 (Dec. 12, 2025)).

On December 19, 2025, the Parties filed their Joint Outline of Issues (“JOI”). (EDIS Doc. ID No. 867045 (Dec. 19, 2025)).

**B. The Parties**

**1. Complainant Modumetal, Inc.**

Complainant Modumetal, Inc. (“Modumetal” or “Complainant”) is a Delaware corporation with its principal place of business at 20124 Broadway Ave, Snohomish, WA 98296. (CPBr. at 4; Compl. at ¶ 9.).

Modumetal described itself and its product, NanoGalv<sup>®</sup>, as follows:

Modumetal was founded in 2006 to advance the state-of-the-art development in electrochemical processes for depositing nanolaminate coatings for a variety of different purposes. Modumetal is now a world leader in developing anti-corrosion nanolaminate coatings. One of Modumetal’s innovative products is NanoGalv<sup>®</sup>, a zinc-nickel nanolaminate coating that provides corrosion resistance across a broad range of applications.

(Compl. at ¶ 10.).

**2. Respondent Parker Hannifin Corporation**

Respondent Parker Hannifin Corporation (“Parker” or “Parker Hannifin”) is an Ohio corporation with its principal place of business at 6035 Parkland Boulevard, Cleveland, Ohio. (EDIS Doc. ID No. 852561 (Parker Resp. to Am. Compl.) at ¶ 14.).

Respondents described Parker Hannifin as “a trusted global leader in motion and control technologies and offers its technologies in the aerospace, healthcare and life sciences, industrial manufacturing, off-road, power generation, electronics and semiconductors, HVACR, oil and gas, transportation, and industrial and chemical processing industries.” (RPBr. at 5–6.).

According to Respondents, Parker Hannifin “has been providing precision-engineered solutions

for more than a century.” (*Id.* at 5.).

**3. Respondent Lu Chu Shin Yee Works Co., Ltd.**

Respondent Lu Chu Shin Yee Works Co., Ltd. (“LCSYW”) is a Taiwanese company with its principal place of business at 46, Shin Ming Road, Luchu District, Kaohsiung City 82146, Taiwan. (EDIS Doc. ID No. 852557 (LCSYW Resp. to Am. Compl.) at ¶ 16.).

According to Respondents, LCSYW “previously supplied Accused Products to Parker and currently supplies Replacement Products to Parker.” (RPBr. at 6.).

**4. Respondent Jiangsu DVP Hi Pressure Technology Co., Ltd.**

Respondent Jiangsu DVP Hi Press Tech Co. (“Jiangsu”) is a Chinese company with its principal place of business at Lezhong Road 3-6, Zhangjiagang City, Jiangsu China 215621. (EDIS Doc. ID No. 853737 (Jiangsu Resp. to Am. Compl.) at ¶ 18.).

According to Respondents, Jiangsu “previously supplied Accused Products to Parker and currently supplies Replacement Products to Parker.” (RPBr. at 6.).

**5. Respondent Maxort Philippines Inc.**

Respondent Maxort Philippines Inc. (“Maxort”) is a Philippines company with its principal place of business at Units 5 & 6 Laguna Technopark SFB 3, Brgy. Mamlasan, Binan City, Laguna, Philippines. (EDIS Doc. ID No. 853738 (Maxort Resp. to Am. Compl.) at ¶ 20.).

According to Respondents, Maxort “previously supplied Accused Products to Parker and currently supplies Replacement Products to Parker.” (RPBr. at 6.).

**6. Respondent Paloma Turning Co. Pvt Ltd.**

Respondent Paloma Turning Co. Pvt Ltd. (“Paloma”) is an Indian company with its principal place of business at 173/2 Bandapura Village Road, Off Hosur Road Anekal, Taluka, Bengaluru, Karnataka, India 562106. (EDIS Doc. ID No. 853739 (Paloma Resp. to Am. Compl.) at ¶ 22.).

According to Respondents, Paloma “previously supplied Accused Products to Parker and currently supplies Replacement Products to Parker.” (RPBr. at 6.).

**7. Respondent Shaoxing Xuanton Fluid Connectors Manufacturing Co., Ltd.**

Respondent Shaoxing Xuanton Fluid Connectors Manufacturing Co., Ltd. (“Shaoxing”) is a Chinese company with its principal place of business at Liyan Village, Biaguan Street, Shaoxing City, Zhejiang, China 3112300. (EDIS Doc. ID No. 853740 (Shaoxing Resp. to Am. Compl.) at ¶ 24.).

According to Respondents, Shaoxing “previously supplied Accused Products to Parker and currently supplies Replacement Products to Parker.” (RPBr. at 6.).

**8. Shanghai Overseas Enterprises Co., Ltd.**

Respondent Shanghai Overseas Enterprises Co., Ltd. (“SOE”) is a Chinese company with its principal place of business at 11/F Jinglin International Mansion, 85 Ouyang Road, Shanghai, China 200081. (EDIS Doc. ID No. 853741 (SOE Resp. to Am. Compl.) at ¶ 26.).

According to Respondents, SOE “previously supplied Accused Products to Parker and currently supplies Replacement Products to Parker.” (RPBr. at 6.).

**9. Zhejiang Fitting Machinery Co., Ltd.**

Respondent Zhejiang Fitting Machinery Co., Ltd. (“Zhejiang”) is a Chinese company with its principal place of business at Damaiyu Economic Development Zone Yuhuan, Zhejiang, China 317604. (EDIS Doc. ID No. 853745 (Zhejiang Resp. to Am. Compl.) at ¶ 28.).

According to Respondents, Zhejiang “previously supplied Accused Products to Parker and currently supplies Replacement Products to Parker.” (RPBr. at 6.).

**III. JURISDICTION, IMPORTATION, AND STANDING**

The Parties agree that the Commission has jurisdiction over this Investigation,

Respondents have imported, sold for importation, or sold within the United States after importation products within the scope of this Investigation, and that Modumetal has standing. (JSUF at 2.).

**A. The Commission Has Jurisdiction**

To have the authority to decide a case, a court or agency must have both subject matter jurisdiction and jurisdiction over either the parties or the property involved. *See Certain Steel Rod Treating Apparatus and Components Thereof*, Inv. No. 337-TA-97, Comm’n Op., 215 U.S.P.Q. 229, 231 (U.S.I.T.C. 1981).

Each Respondent stipulated that it has “imported, sold for importation, or sold within the United States after importation” at least one Accused Product within the meaning of 19 U.S.C. §1337(a)(1)(B). (*See* Joint Statement of Undisputed Facts (“JSUF”) at 2; *see also* RPBr. at 13; CX-0658C.0002 at RFA No. 1; CX-0659C.0002–.0003 at RFA Nos. 2, 5; CX-0660.0002 at RFA No. 7; EDIS Doc. ID 853737 (DVP Resp. to Am. Compl.) at ¶ 19; EDIS Doc. ID 853738 (Maxort Resp. to Am. Compl.) at ¶ 21; EDIS Doc. ID 853739 (Paloma Resp. to Am. Compl.) at ¶ 23; EDIS Doc. ID 853740 (Shaoxing Resp. to Am. Compl.) at ¶25; EDIS Doc. ID 853741 (SOE Resp. to Am. Compl.) at ¶27; EDIS Doc. ID 853745 (Zhejiang Resp. to Am. Compl.) at ¶29).). The Commission therefore has statutory authority over the present Investigation. *See Certain Light-Based Physiological Measurement Devices & Components Thereof*, Inv. No. 337-TA-1276, Comm’n Op. at 15 (Nov. 14, 2023). Respondents did not contest importation or statutory authority. (RPBr. at 12–13.).

Additionally, Respondents appeared and participated in this Investigation and did not contest the Commission’s jurisdiction over them. (RPBr. at 12–13.). Accordingly, Respondents have consented to personal jurisdiction at the Commission. *See Certain Optical Disk Controller Chips & Chipsets & Prods. Containing Same, Including DVD Players & PC Optical Storage*

*Devices*, Inv. No. 337-TA-506, FID at 4-5 (May 16, 2005), *unreviewed in relevant part*.

**B. Modumetal Has Standing in the Commission**

The Commission recently clarified that 35 U.S.C. § 281 does not apply directly to the Commission.<sup>13</sup> *Certain Active Matrix Organic Light-Emitting Diode Display Panels & Modules for Mobile Devices, & Components Thereof*, Inv. No. 337-TA-1351, Comm’n Op. at 12–13 (Apr. 24, 2024). Rather, “the determination of who may bring a section 337 investigation begins with the language of the Commission’s governing statute and regulations promulgated pursuant to that authority.” *Id.* (citing 19 U.S.C. § 1337; 19 C.F.R. § 210.12); *see also id.* at 15 (“[T]he pertinent issue is whether [Complainant] satisfied the prerequisites of the Commission’s rules to bring a section 337 action as of the date the complaint was filed.”). Accordingly, consistent with the Commission’s rules and practice, “at least one complainant must be the owner or exclusive licensee of the patent.” *Id.* at 14; *see also id.* at 15–16 (finding it appropriate to consider whether complainant “is a ‘patentee’ who can bring a patent infringement action under 35 U.S.C. § 281” in determining whether complainant is the owner or exclusive licensee).

In this Investigation, the Parties did not dispute that Modumetal owns by assignment the right, title, and interest in the Asserted Patents. (RPBr. at 12–13; JSUF at 2.). The certified assignment documents filed with the Complaint show Modumetal’s ownership of the Asserted Patents. (*See* Compl. at Exs. 3–4; *see also id.* at ¶¶ 27, 40.).

**IV. THE ASSERTED PATENTS**

**A. The ’419 Patent**

The ’419 patent issued on April 9, 2019 based on U.S. Patent Application 13/314,948 (“the ’948 application”), which was filed on December 8, 2011. (JXM-0001.0002 (’419 patent)

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<sup>13</sup> 35 U.S.C. § 281 states: “A patentee shall have remedy by civil action for infringement of his patent.”

at (45), (21), (22).). The '948 application was filed as a continuation of International Patent Application No. PCT/US2010/037856 ("the '856 application"), which was filed on June 8, 2010. (*Id.* at (63).). The '948 application claims priority to U.S. Provisional Patent Application No. 11/185,020 ("the '020 application"), which was filed on June 8, 2009. (*Id.* at (60).).

According to the Abstract of the '419 patent:

Described herein are electrodeposited corrosion-resistant multilayer coating and claddings that comprises multiple nanoscale layers that periodically vary in electrodeposited species or electrodeposited microstructures. The coatings may comprise electrodeposited metals, ceramics, polymers or combinations thereof. Also described herein are methods for preparation of the coatings and claddings.

(JXM-0001.0002 at "Abstract.").

The technology described in the '419 patent is directed at electrodeposition methods and steps for forming "coatings" as used interchangeably with "claddings," that are corrosion resistant. (JXM-0001.0006 at 3:1–3; *id.* at 3: 44–55; *id.* at 4: 7–10; *id.* at 4: 12–16; *id.* at 4: 22–25.).

The '419 patent explains:

The corrosion behavior of organic, ceramic, metal and metal-containing coatings depends primarily on their chemistry, microstructure, adhesion, thickness and galvanic inter-action with the substrate to which they are applied. In the case of sacrificial metal or metal-containing coatings, such as zinc on an iron-based substrate, the coating is less electronegative than the substrate and so oxidation of the coating occurs preferentially, thus protecting the substrate. Because these coatings protect by providing an oxidation preferred sacrificial layer, they will continue to work even when marred or scratched.

(JXM-0001.0005 at "Background," 1:38–47.).

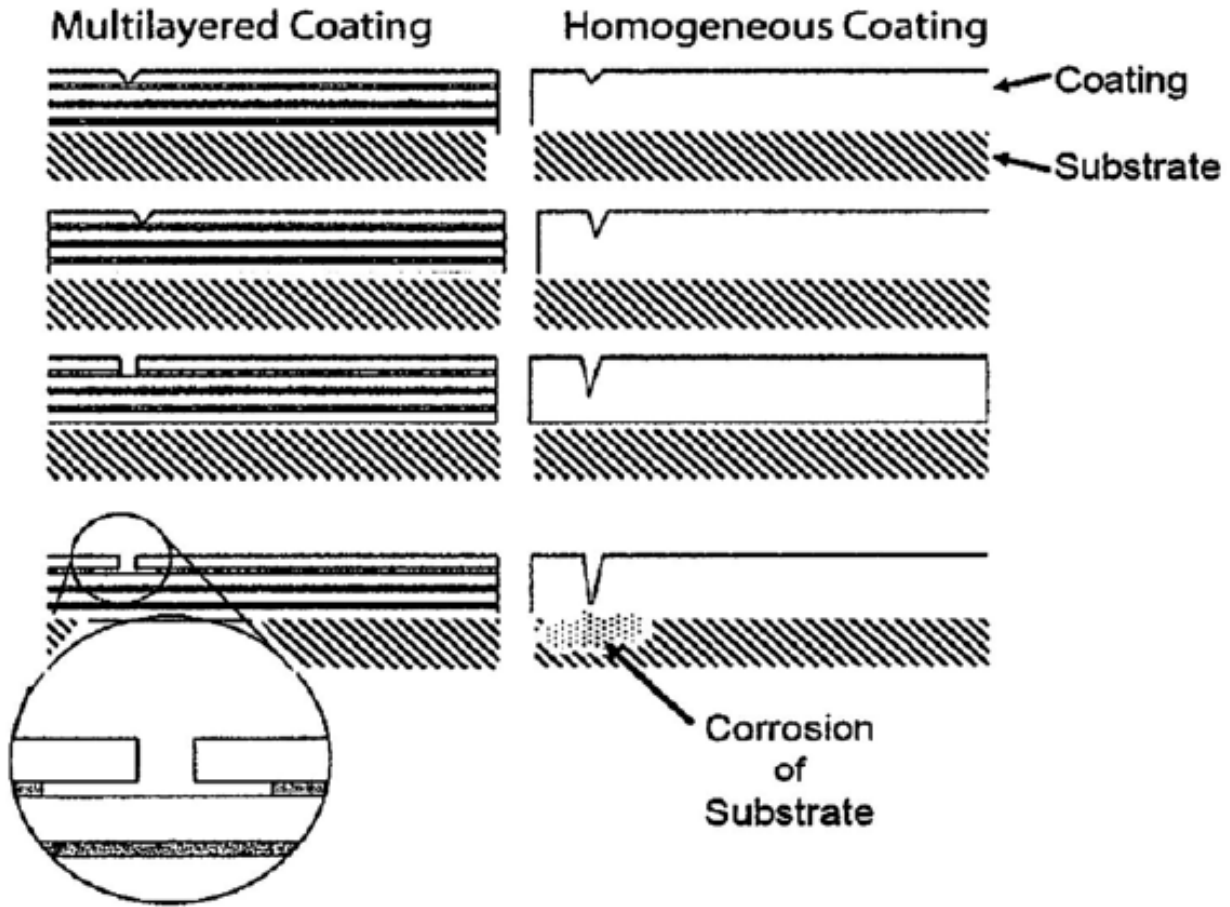
The '419 patent contains a single figure, Figure 1, which is reproduced in Figure 2 below and which the '419 patent describes as a "Multilayered Coating" of a preferred embodiment (on the 60 left of FIG. 1) and a schematic of a substrate having a "Homogeneous Coating" as is known in the art (on the right of FIG. 1 of the Asserted Patents). (JXM-0001.0004 ('419 Patent,

Figure 1); *id.* at 0006.). The lone figure of the '419 patent depicts, in the top left, a multilayered coating on a substrate with pinhole or micropore damage that, in successive depictions below, becomes larger and deeper because of corrosion. (JXM-0001.0006 at 3:59–4:4.).

By contrast, at the top right of Figure 1 is a homogenous coating on a substrate, also with pinhole or micropore damage, which also becomes deeper and larger in the depictions immediately below. (*Id.*). The multilayer coating on the left has “two alternating (light and dark) layers covering a substrate,” wherein “the light layer is a protective layer and the dark layer is a sacrificial layer.” (*Id.* at .0007, 6:8–12.). The hole in the protective light layer expands in a direction parallel to the surface of the substrate until the sacrificial dark layer is exposed, and then the sacrificial dark layer is consumed also in a direction parallel to the surface of the substrate. (*Id.* at 6:12–24.).

On the other hand, the hole in the prior art homogenous coating on the right expands toward the substrate below, eventually exposing the substrate and thereby subjecting the substrate to corrosion damage. (*Id.* at 6:25–31.).

Figure 2: Figure 1 of the Asserted Patents



(JXM-0001.0002; JXM-0001 at .0006–.0007, 3:59–6:24.).

The Asserted Patents disclose several embodiments for forming a coating.

For example, the '419 patent, describes different embodiments directed at different features of the invention.

One such embodiment, as the '419 patent describes, is directed to the thickness of the multilayer coatings or claddings in this fashion:

In one embodiment an electrodeposited corrosion-resistant multilayer coating comprised of individual layers with thicknesses on the nanometer scale is provided. In such an embodiment the individual layers can differ in electronegativity from adjacent layers.

(JXM-0001.6 at 4:7–11.).

In another embodiment, the technology is directed to the variation in the composition of the alloys, metals, polymer or ceramic components that can make up the “claddings” or coating, or as the “electrodeposited species.” (*See* JXM-0001.6 at 4:12–19.). The patent notes that the “variations in the compositions between layers results in galvanic interactions occurring between layers.” (*Id.* at 4:19–24.).

In yet another embodiment, or so the ’419 patent describes, the “nanoscale layers having variations in grain size, crystal orientation, grain boundary geometry, or combination thereof . . . (together herein referred to as “electrodeposited species microstructure(s)”). (*Id.* at 4:22–27.).

The ’419 patent also makes clear that the technology provides for multilayer coating or cladding “in which the layers vary in electronegativity or in nobility, and in which the rate of corrosion can be controlled by controlling the differences in electronegativity or in the reactivity (or ‘nobility’) of adjacent layers.” (*Id.* at 4:29–33.). The patent describes that there can be “periodic layers” in which one of the periodic layers is less noble than the other layer and is less noble than the substrate. (*Id.* at 4: 34–38.).

According to certain embodiments for describing the “method” or steps in which a coating or cladding may be formed, by placing a mandrel or substrate into a single “bath” as follows:

- a) placing a mandrel or a substrate to be coated in a first electrolyte containing one or more metal ions, ceramic particles, polymer particles, or a combination thereof; and
- b) applying electric current and varying in time one or more of the amplitude of the electrical current, electrolyte temperature, electrolyte additive concentration, or electrolyte agitation, in order to produce periodic layers of electrodeposited species or periodic layer of electrodeposited species microstructures; and
- c) growing a multilayer coating under such conditions until the desired thickness of the multilayer coating is achieved.

(JXM-0001.0007–.0008 at 6:32–7:9.).

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The steps defined above may be stopped at one “bath” or coating, or the steps may be repeated so that the mandrel or substrate goes through multiple baths/and receives multiple coatings. (*Id.*).

Asserted independent claim 1 of the '419 patent, from which Asserted Claims 2, 3, 5, and 7 depend, is reproduced below.

A coating or cladding comprising:

A series of alternating layers on a substrate or mandrel, each layer of the series of alternating layers having a thickness from about 5 nanometers to about 1,000 nanometers, the series of alternating layers comprising:

A) a first layer of a first alloy that is less noble than the substrate or the mandrel, the first alloy comprising:

i) a first metal in a first concentration that is at least about 1 wt.%, the first metal selected from Co, Fe, Ni, and Zn; and

ii) a second metal in a second concentration that is at least about 1 wt.%; and

B) a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel, the second alloy comprising:

i) the first metal in a third concentration that is at least about 1 wt.%; and

ii) the second metal in a fourth concentration that is at least about 1 wt.%;

the coating or cladding having a thickness from 5 microns to 50 microns.

(JXM-0001.0010 at 11:1–21.).

**B. The '613 Patent**

The '613 patent issued on February 8, 2022 based on U.S. Patent Application No. 16/726,079 (“the '079 application”), which was filed on December 23, 2019. (JXM-0003.0002 ('613 patent) at (45), (21), (22).). The '079 application results from a series of divisional and continuation applications, from the '856 application. (*Id.* at (60).). The '079 application, like the '948 application, claims priority to the '020 application. Therefore, the '613 patent and the '419 patent share a common specification.

Asserted independent claim 1 of the '613 patent, from which Asserted Claims 2, 3, and 5 depend, is reproduced below.

A method comprising:

forming a coating on a substrate or mandrel, the coating having a thickness from 5 microns to 50 microns, and comprising a series of layers arranged in a repeating pattern, each layer of the series of layers having a thickness from about 5 nanometers to about 1,000 nanometers, the series of layers comprising:

- A) a first layer of a first alloy that is less noble than the substrate or the mandrel, the first alloy comprising:
  - i) a first metal in a first concentration that is at least about 1 wt.%, the first metal selected from Co, Fe, Ni, and Zn; and
  - ii) a second metal in a second concentration that is at least about 1 wt.%; and
- B) a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel, the second alloy comprising:
  - i) the first metal in a third concentration that is at least about 1 wt.%; and
  - ii) the second metal in a fourth concentration that is at least about 1 wt.%;

the coating or cladding having a thickness from 5 microns to 50 microns.

(JXM-0003.0013 at 11:10–30.).

## **V. THE PRODUCTS AT ISSUE**

### **A. Accused Products**

Modumetal accused all metal parts coated with Parker Hannifin's ToughShield® Plus coating, as well as all bundles containing metal parts coated with ToughShield®, of infringing the Asserted Patents. (CPBr. at 12; CBr. at 10.). There are more than [REDACTED] part numbers associated with the accused ToughShield® coated metal parts that Parker Hannifin imports and sells. (JX-0037C (Part Number List).). The [REDACTED] part numbers associated with Parker Hannifin's accused ToughShield® coated metal parts include fasteners such as nuts and bolts as well as fittings for tubing, the same or similar types of products that also use Modumetal's

NanoGalv® coatings. (*Id.*).

Like Modumetal, there are two (2) methods that Parker Hannifin uses for making the coatings for the Accused Products: 1) barrel-plating; and 2) rack-plating. (Tr. (Michael Smerdel)<sup>14</sup> at 782:24–783:24; Tr. (Dr. Phillip Wagener)<sup>15</sup> at 792:9–24.). Rack-plating involves hanging the parts to be coated on a rack and then passing the entire rack through an electroplating bath. Barrel-plating involves inserting the parts into a barrel and then passing the barrel through the electroplating bath. (Tr. (Wagener) at 792:9–24; Tr. (Frankel) at 887:17–888:12.). Larger parts tend to be coated using a rack-plating process, whereas smaller more delicate parts are generally plated using a barrel-plating process. (Tr. (Wagener) at 792:9–24.). In the top right of Figure 3 below there is an example of a rack with parts hung thereon to be passed through an electroplating bath. (Tr. (Wagener) at 792:9–24; RDX-0005.01.). In the bottom right is an example of barrels filled with parts that will be passed through an electroplating bath. On the left is a depiction of electroplating baths. (*Id.*).

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<sup>14</sup> Parker Hannifin identified Mr. Michael Smerdel as a fact witness to testify as Parker Hannifin’s “corporate representative on non-technical matters.” (RPSt. at 3.). Mr. Smerdel worked for Parker Hannifin for almost 22 years. (Tr. (Smerdel) at 736:4–13.). Until January 31, 2025, Mr. Smerdel was the General Manager for Parker Hannifin’s tube fittings division. (*Id.*).

<sup>15</sup> Respondents identified Dr. Phillip Wagener as their corporate representative to testify “on technical matters, including the development and technical details of ToughShield Plus.” (RPSt. at 3.). At the time of the Hearing, Dr. Wagener had worked for Parker Hannifin for about ten years and was their Metals Innovation Center Manager. (Tr. (Wagener) at 790:19–791:5.). Dr. Wagener holds a Ph.D in chemistry from the University of Bietigheim. (*Id.*). Parker Hannifin’s Metals Innovation Center has two (2) locations, one in Bielefeld, Germany and the other in Columbus, Ohio. (*Id.* at 792:4–18.). Parker Hannifin’s Metals Innovation Center is a part of Parker’s High Pressure Connectors Europe Division, which works with the U.S. tube fittings division of Parker Hannifin. (*Id.*).

**Figure 3: Rack-Plating and Barrel-Plating**



(Tr. (Wagener) at 792:9–24; RDX-0005.01.).

Parker Hannifin contended that its ToughShield® Plus products that are rack-plated are representative of each other. (CX-0664C (Parker’s First Supplemental Objections and Responses to Modumetal’s First Set of Interrogatories) at .0024; CX-0661C (Parker Hannifin’s Objections and Responses to Modumetal’s Second Set of Requests for Admission (Nos. 7–20)). Parker Hannifin also contended that its ToughShield® Plus Products that are barrel-plated are representative of each other. (*Id.*). There is no dispute about the representativeness of Parker Hannifin’s ToughShield® Plus Products. (RPBr. at 10–12; RBr. at 4–8.).

To prove its infringement case, and out of the hundreds of products that Parker Hannifin and its manufacturers make, Modumetal analyzed only one (1) representative barrel-plated product, the Barrel-Plated ToughShield® Plus Seal-Lok Tube Nut (10BL-S) (“the 10BL-S”). (CPBr. at 12–14; CBr. at 10–11; Tr. (Kelly) at 395:8–396:19, 462:19–464:12; CDX-0001.0028–

.0029, .0100.). Modumetal also analyzed only one (1) rack-plated product, the Rack-Plated ToughShield® Plus Ferulok Flareless fitting (16-12FBU-S) (“the 16-12FBU-S”). (CPBr. at 12–14; CBr. at 10–11; Tr. (Kelly) at 395:8–396:19, 462:19–464:12; CDX-0001.0028–.0029, .0100.).

Modumetal also analyzed one (1) product that can be made by either rack-plating or barrel-plating, the ToughShield® Plus Elbow Fitting Seal Lok (8 C5OLO-S) (“the 8 C5OLO-S”). (CPBr. at 12–14; CBr. at 10–11; Tr. (Kelly) at 395:8–396:19, 462:19–464:12; CDX-0001.0028–.0029, .0100.). The rack-plated 10BL-S, the barrel-plated 16-12FBU-S, and the 8 C5OLO-S are collectively referred to as “the Representative Original Accused Products.”

On December 23, 2024, Parker Hannifin [REDACTED]

[REDACTED] (Tr. (Smerdel) at 761:22–763:24; RX-0225C (December 23, 2024 Letter from Parker Hannifin Representatives to [REDACTED]

[REDACTED] Specifically, Parker Hannifin [REDACTED]

[REDACTED] (*Id.*). Parker Hannifin has argued, therefore, that the Replacement Products cannot infringe. (*See* Section VIII.C.).

Mr. Smerdel testified that he was involved in [REDACTED] [REDACTED] that Parker Hannifin believed would be prior art to the Asserted Patents, and therefore non-infringing. (Tr. (Smerdel) at 761:22–762:19.). Parker Hannifin made [REDACTED] in this

Investigation for the [REDACTED] (*Id.*). Mr. Smerdel testified that he was [REDACTED] Mr. Smerdel testified that [REDACTED] [REDACTED] (Tr. (Smerdel) at 763:10–24.).

Modumetal conceded that Replacement Products made by rack-plating (“Rack Plated Replacement Products”), including the representative Triple Lok Pipe 6-6-FTX-S (“Representative Rack-Plated Replacement Product”), do not infringe the Asserted Patents. (JSUI at 3, 6.).

However, Modumetal accused the Replacement Products made by barrel-plating (“Barrel-Plated Replacement Products”) of infringement. (CPBr. at 13; CBr. at 11.). For the Barrel-Plated Replacement Products, Modumetal analyzed the Triple Lok Tube Nut 4 BTX-S (“the 4 BTX-S”) as the representative Barrel-Plated Replacement Product (“the Representative Barrel-Plated Replacement Product”). (CPBr. at 13; CBr. at 11; Tr. (Kelly) at 395:8–396:19; CDX-0001.0028–.0029.). The Parties agreed that the 4 BTX-S: (i) was sufficiently disclosed during discovery; (ii) is sufficiently fixed in design; (iii) has been imported into the United States; and (iv) is within the scope of this Investigation. (JSUF at 2.). However, neither of the Parties presented a separate analysis or discussion of the foregoing four (4) factors, which are typically used to determine if the Commission should adjudicate infringement with respect to a design-around or redesigned product. *Certain Human Milk Oligosaccharides and Methods of Producing the Same* (“*Human Milk*”), Inv. No. 337-TA-1120, Comm’n Op. at 18 (June 8, 2021).

The part numbers listed on JX-0037C that are coated using Parker Hannifin’s ToughShield® process, whether rack-plated or barrel-plated, [REDACTED] are referred to in this ID as “the Original Accused Products.” Part numbers listed on JX-0037C, but

that were made using a barrel-plating version of Parker Hannifin's ToughShield® [REDACTED]

[REDACTED] are referred to in this ID as "the Replacement Accused Products." The Original Accused Products and the Replacement Accused Products are collectively referred to as "the Accused Products." Products made using a rack-plated version of Parker Hannifin's ToughShield® Plus process after [REDACTED] are not included in this ID's definition of "Accused Products" because Modumetal agreed that they are no longer accused products. (JSUI at 3, 6.).

The four representative products: 1) the rack-plated 10BL-S; 2) the barrel-plated 16-12FBU-S; 3) the 8 C50L0-S; and 4) the barrel-plated 4 BTX-S are collectively referred to in this ID as "the Representative Accused Products."

To be clear, Modumetal has accused the "Original Accused Products" of infringing claims 1, 2, 3, 5 and 7 of the '419 patent, and of infringing claims 1, 2, 3 and 5 of the '613 patent. Modumetal has accused the Replacement Products of infringing 1, 2, 3, 5, and 7 of the '419 patent, and of infringing claims 1, 2, 3 and 5 of the '613 patent.

## **B. Domestic Industry Products**

Modumetal argued that all metal parts coated with its proprietary NanoGalv® laminate coating in the United States constitute its Domestic Industry Products ("DI Products"). (CPBr. at 10–11; CBr. at 10.). NanoGalv® is what Modumetal describes as its proprietary zinc-nickel nanolaminate coating which it uses to protect metal components in some of the harshest environments in the world. (CBr. at 1.). Parts coated with NanoGalv® are used in a variety of industries, most notably the oil and gas industry. (Tr. (Creech) at 86:8–19, 97:23–98:5, 100:3, 100:9–103:23.). Additionally, Modumetal has been expanding its licensing/use of its proprietary NanoGalv® into the automobile industry. (*Id.*). Modumetal uses both rack-plating and barrel-

plating processes to make the DI Products. (Tr. (Creech) at 275:16–20.).

Examples of the types of metal parts coated with NanoGalv<sup>®</sup> include various types of fasteners such as threaded nuts, threaded bolts, and washers, some specific examples of which are depicted in Figure 4 below.

**Figure 4: Examples of NanoGalv<sup>®</sup> Coated Fasteners**



(JX-0022C (NanoGalv<sup>®</sup> Technical Data Sheet) at .0004; Tr. (Creech) at 89:17–22.).

Despite the variety of different kinds of parts coated with NanoGalv<sup>®</sup> and their varying application in different fields and industries, Modumetal tested and analyzed only one (1) allegedly representative DI Product: the NanoGalv<sup>®</sup> L5040.5/8.2H.N part (“the DI Fastener”). (CPBr. at 10–11; CBr. at 10.). Modumetal argued that the DI Fastener (and all DI Products), practice claims 1, 2, 3, 5 and 7 of the ’419 patent. Modumetal argued that the DI Fastener (and all DI Products) practice claims 1, 2, 3, and 5 of the ’613 patent.

Modumetal’s expert, Dr. Kelly, could not say [REDACTED]

[REDACTED] (Tr (Kelly) at 571:3–9, 547:9–548:2.). More critical to

Modumetal’s allegations/arguments with respect to the “representativeness” of the DI Fastener with respect to all of its DI Products, Modumetal did not provide a sample of or test any other of the array of products that are coated with NanoGalv<sup>®</sup> that Modumetal claims are DI Products. Modumetal did not produce quality control logs or other evidence that might show the consistency of NanoGalv<sup>®</sup> coatings across even a sampling of products. Additionally, Modumetal’s expert, Dr. Kelly, did not offer an opinion about whether Modumetal’s DI Products have the same NanoGalv<sup>®</sup> coatings as the DI Fastener.

Dr. Kelly also did not provide an opinion or otherwise testify about the current density sequences, rectifiers, chemical baths, or other equipment that Modumetal used to create the DI Fastener coating as part of an electroplating process.<sup>16</sup> (*Id.* at 548:7–9, 548:19–549:3, 549:7–9.). Among other problems for Modumetal, Dr. Kelly did not provide an opinion that all NanoGalv<sup>®</sup>-coated parts are made using the same chemical bath compositions, have the same layer and coating thickness, or have the same number of layers. (*Id.* at 550:1–10.). Nevertheless, according to Modumetal, the DI Fastener is representative of all other metal parts that are part of Modumetal’s DI Products and that are coated with its proprietary NanoGalv<sup>®</sup> laminate coating in the United States. (CPBr. at 10–11; CBr. at 10.).

While Modumetal had the burden to prove by a preponderance of evidence that the DI

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<sup>16</sup> One of the co-founders of Modumetal, Ms. Christina Lomasney, testified by deposition on April 22, 2025, in which she described a general electroplating process of the type Modumetal uses without divulging any of Modumetal’s distinctive process secrets. (*See* JX-00059C (Dep. Tr. (Lomasney).). According to Ms. Lomasney, in electroplating “nanolayers of alloys” may be deposited on a substrate, although it does not have to have a substrate. (*Id.* at 33:03–6.). Then, “well, in a nutshell, you connect it to power and immerse the substrate or the template into an electrochemical solution that contains the metals, like that you want to produce an alloy from. You turn on the current and deposition will generally happen.” (*Id.* at 33:11–16.). In order to change layers, the power supplied must be changed, which can be accomplished by changing either “current” or “voltage.” The “frequency” may also be one of the conditions that is changed. (*Id.* at 33:17–34:07.).

Fastener is representative of all the DI Products, it did not do so. Although a complainant can rely on representativeness to prove that many products practice the patents, even if not all products were subjected to the same testing or analysis as the allegedly representative product, a complainant “cannot simply assume that other products are the same as the representative products.” *Certain Replacement Automotive Lamps II*, Inv. No. 337-TA-1292, FID at 111-12 (Jan. 24, 2023) (“*Replacement Automotive Lamps II*”), *rev’d on other grounds*, Comm’n Op. at 12, 26, 46 (Mar. 22, 2024).

A more extensive analysis of the problems with Modumetal’s arguments about the “representativeness” of the DI Fastener for all of Modumetal’s DI Products are contained in Sections IX.C and XI.C.

## **VI. METHODS USED FOR TESTING THE DI FASTNER AND ACCUSED PRODUCTS**

Modumetal relied on four (4) testing methods to prove its infringement and technical domestic industry cases: 1) STEM-HAADF;<sup>17</sup> 2) EDS or line scan testing;<sup>18</sup> 3) “etching,” which Modumetal also refers to as “accelerated corrosion” testing, and 4) optical microscopy, which are all discussed below. Modumetal described the basic principles of each method in its Pre-Hearing Brief and in its Initial Post-Hearing Brief. (CPBr. at 16–18; CBr. at 16–19.).

Modumetal subjected the Representative Accused Products and the DI Fastener to all four (4) testing methods, except that the Representative Replacement Product, the 4-BTX-S, was not subjected to optical microscopy. (*See* CPBr. at 16–18; CBr. at 16–19.). Parker Hannifin did not introduce any evidence that it conducted its own independent testing of the Accused Products

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<sup>17</sup> “STEM-HAADF” stands for scanning transmission electron microscopy. (Tr. (Kelly) at 410:17–20.). In his testimony, Dr. Kelly misspoke when he said “emission” instead of “transmission.”

<sup>18</sup> “EDS” stands for “Energy Dispersive Spectroscopy.” (Tr. (Kelly) at 425:2–19; CDX-0001C.0048.).

or the DI Products. (See RPBr. and RRBr. in their entirety.).

**A. STEM-HAADF**

STEM-HAADF is a testing method that is used to gain information about the elemental composition of metal (in this case) in a sample. (Tr. (Kelly) at 400:7–403:18; CDX-0001C.0032.). Specifically, STEM-HAADF can help determine the size, structure, and chemical elements/composition that are present in a sample. (*Id.*). Modumetal and Dr. Kelly relied on STEM-HAADF testing to obtain information about the metal content in the alleged layers of the coatings on the Accused Products and the DI Fastener.

In STEM-HAADF<sup>19</sup> a beam of electrons is focused onto the sample to be analyzed. The heavier the metal, the more likely it will deflect the electrons. The electrons go through the sample and, in so doing, they scatter at various angles. (*Id.*). Some electrons are scattered at high angles, which are the electrons that are detected by a ring-shaped STEM-HAADF detector. (*Id.*). The number of electrons detected by the STEM-HAADF detector increases with the square of the atomic number of the atoms in the sample. (*Id.*). Using information about atomic number obtained from STEM-HAADF, an image is generated where brighter areas indicate a higher atomic number and darker layers indicate a lower atomic number, i.e., loosely heavier metals versus lighter metals. (*Id.*).

Modumetal's expert, Dr. Kelly, and Respondents' expert, Dr. Frankel, agreed that the intensity in a STEM-HAADF image is proportional to the atomic number squared ( $Z^2$ ). (*Id.* at 401:23–402:5; Tr. (Frankel) at 1087:11–16.). This is useful because the atomic number is the number of protons in the nucleus of an atom, which if known, can be used to determine the

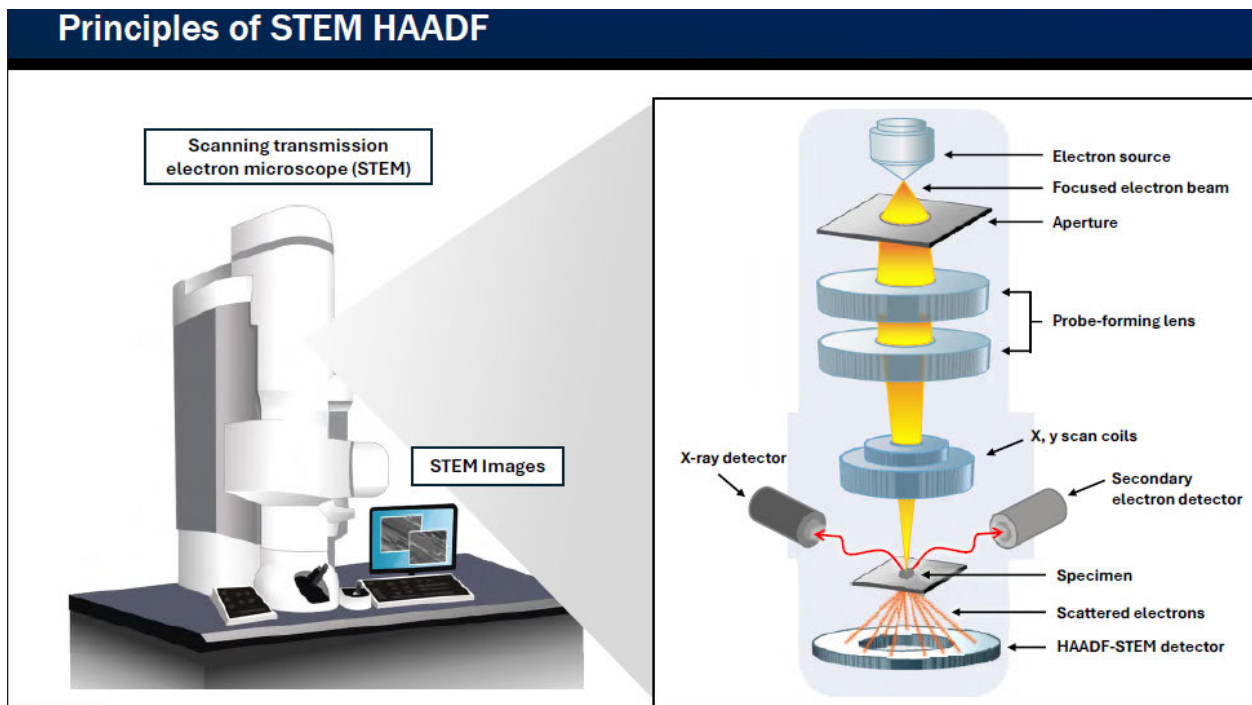
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<sup>19</sup> Respondents did not argue that STEM-HAADF is *not* an accepted method in the field for obtaining information about layer thickness and composition of layers and coatings, as it was used in this Investigation.

elemental identity of the atom because each element has its own atomic number. (Tr. (Kelly) at 400:7–403:18.). “[T]he brighter area will have a higher atomic number than the darker area on average.” (*Id.* at 401:23–402:11.).

Dr. Kelly provided depictions of a STEM-HAADF setup during the Hearing, which are reproduced in Figure 5 below. At the top of the STEM-HAADF image in Figure 5, as shown on the left, there is an electron source that produces a focused electron beam, then proceeding downward there is an aperture, a probe-forming lens, and x/y scan coils that help focus the electron beam onto the sample or specimen. On the left side of the specimen there is an X-ray detector, on the right side is a secondary electron detector, and beneath the specimen there is the STEM-HAADF detector that collects the primary scattered electrons. The X-ray detector is not strictly part of a standard STEM-HAADF setup. Its purpose is to collect emitted X-rays for EDS analysis, as will be described later. (Tr. (Kelly) at 425:2–429:7; CDX-0001.0048–.0050.).

**Figure 5: Illustrative STEM-HAADF Setup**



(Tr. (Kelly) at 400:7–403:18; CDX-0001C.0032.).

Dr. Kelly relied on STEM-HAADF images of the Accused Products and the DI Fastener to provide information about the composition and thickness of the coatings. (*E.g.*, Tr. (Kelly) at 403:19–405:17; CDX-0001C.0034–.0035; JX-0015.0001–.0002 (STEM-HAADF images of 10BL-S); JX-0016.0001–.0002 (STEM-HAADF images of 16-12FBU-S); JX-0017.0001–.0002 (STEM-HAADF images of 8 C5OLO-S); JX-0105.0001–.0002, .0008–.0009 (STEM-HAADF images of 4 BTX-S); JX-0018.0001–.0002 (STEM-HAADF images of DI Fastener).). The Representative Accused Products and the DI Fastener were subjected to STEM-HAADF testing by a third-party laboratory, Exponent.<sup>20</sup> (Tr. (Kelly) at 536:16–22.).

## **B. EDS**

EDS<sup>21</sup> line scan testing is used to more definitely identify the chemical elements present in a sample as a function of the position of those elements within the sample. (Tr. (Kelly) at 425:2–429:7.).

EDS uses the same setup and methodology as STEM-HAADF, except that in EDS line

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<sup>20</sup> Respondents argued that all test results (not just the STEM-HAADF test results) from Exponent are unreliable because Dr. Kelly did not observe the testing, he did not visit Exponent's facilities, and he did not inspect Exponent's equipment. He did not know certain details about how the samples were prepared. (RRBr. at 15–19 (citing Tr. (Kelly) at 534:22–24, 537:8–10, 537:11–13, 537:17–22.). Nobody from Exponent testified during the Hearing nor was there any deposition testimony introduced. Part of Respondents' criticisms rested on the facts that Dr. Kelly did not work directly with Exponent, but instead, he communicated his testing protocols and instructions to Modumetal's counsel who then relayed them to Exponent. (Tr. (Kelly) at 534:22–535:16.). Exponent then sent their testing results to Modumetal's counsel who then relayed the results back to Dr. Kelly. (*Id.* at 536:16–22.). Therefore, Dr. Kelly could not provide firsthand knowledge about how the samples were prepared that he relied upon.

As will be explained in greater detail below, Exponent is a reliable third-party testing firm, (*see, e.g., Certain Light-Emitting Diodes & Prods. Containing the Same*, Inv. No. 337-TA-784, ID at 50–51, n.32 (July 9, 2012) (relying on testing data from Exponent). The criticisms do not render Modumetal's STEM-HAADF results so unreliable that they must be excluded from the record of this Investigation. Instead, Respondents' criticisms affect the weight afforded Modumetal's STEM-HAADF test results.

<sup>21</sup> Respondents did not argue that EDS line scan testing is not an accepted method of testing for obtaining information about layer thickness and composition, or that it is otherwise an inappropriate test to use for this Investigation. (*See, e.g.,* RRBr. at 35-40.).

scan analysis, the setup includes an X-ray detector that detects X-rays that are emitted when the electrons pass through the sample. (Tr. (Kelly) at 425:2–429:7; CDX-0048–.0050.). The X-rays that are emitted are characteristic of the atoms contained in the sample, and so EDS line scans provide information about the elemental composition of the sample, i.e., the relative concentration of atoms in the sample. (*Id.*). It is also possible to move the electron beam, i.e., “scan” the electron beam, and thereby obtain information about the elemental composition of the sample as a function of location within the sample. (*Id.*).

Dr. Kelly relied on EDS line scan data to provide more detailed compositional information about the composition of the alleged layers of the coatings on the Accused Products and the DI Fastener than could be obtained using only STEM-HAADF. (Tr. (Kelly) at 425:2–429:7; JX-0015.0007 (EDS Image of 10BL-S-Accused Product); JX-0015.0006 (EDS Image of 16-12FBU-S, Accused Product); CX-0774 (EDS image of 8 C5OLO-S); JX-0018.0006 (EDS Image of DI Fastener); CDX-0048–.0050.). All the Representative Accused Products and the DI Fastener were subjected to EDS line scan testing. (*Id.*).

Respondents introduced un rebutted evidence that the metal composition determined from certain of Modumetal’s EDS line scans is exactly the opposite of the metal composition that would have been expected based on Modumetal’s STEM-HAADF results. (RRBr. at 19–23; Tr. (Frankel) at 913:9–916:4 (testifying that, according to Modumetal’s STEM-HAADF and EDS line scan data, the 10BL-S product and the 4 BTX-S product exhibit higher nickel content within a light-colored layer); RDX-0003C.0029; JX-0015.0002, .0007 (10BL-S); JX-0105.0010–.0011 (4 BTX-S).).

As explained in greater detail below in Sections VIII.C.2 and VIII.C.3 on infringement, Respondents’ un rebutted evidence and arguments undermined the credibility of Modumetal’s

STEM-HAADF and EDS line scan results.

**C. Etching, Which Modumetal Refers to as “Accelerated Corrosion” Testing**

Modumetal relied on a testing methodology called “etching,” which Modumetal also referred to as “accelerated corrosion” testing, to allegedly assess the relative nobility of the alleged layers in the DI Fastener and the Accused Representative Products. (CBr. at 18–19 (citing Tr. (Kelly) at 532:9–12).). The processes are related although “accelerated corrosion” testing is typically done in a laboratory to assess long-term corrosion/metal durability. In the etching testing method that Exponent used, a drop of an etchant solution, which is typically a solution that is either very alkaline or very acidic, is placed onto the surface of a cross section of a smooth, polished sample to dissolve portions of the surface of the sample to reveal the underlying microstructure. (Tr. (Kelly) at 407:2–408:9, 409:12–409:15, 431:7– 434:16; CDX-0001C.0039–.0040, .0052–.0054.). The portions of the sample that are more reactive to the etchant will dissolve faster than the portions of the sample that are less reactive. (*Id.*). Modumetal did not explain how the reactivity determined by its etching method relates to the reactivity that is relevant to the Asserted Patents, i.e., corrosion resistance.

Relying in part on Dr. Frankel’s testimony, Respondents argued that Modumetal’s “etching” testing methodology is not an accepted or recognized method for assessing relative nobility, regardless of how the term “nobility” is construed.<sup>22</sup> (RRBr. at 28–30.). Dr. Frankel testified that etching is not typically used as an accelerated corrosion test because it results in a form of corrosion that is different than would result if the metal/material were subjected to

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<sup>22</sup> The Parties did not seek a construction of the claim term “nobility” during *Markman* claim construction but hotly contested its meaning and application in their Pre-Hearing Briefs, (CPBr. at 23, 27–28; RPBr. at 20–26), and in their Post-Hearing Briefs, (CBr. at 13–16; RRBr. at 6–11). The dispute is dealt with in Section VIII.B.3 below.

outdoor or environmental exposure. (Tr. (Frankel) at 921:20–924:13.). According to Dr. Frankel, etching is a standard test used to reveal “details of the microstructure” of a sample, whereas a more standard “accelerated corrosion test” is a “salt spray test,” which involves applying a spray or mist of a concentrated salt solution to a sample in a very specific, standardized way. (*Id.* at 921:22–922:1, 922:16–923:3.). Modumetal’s expert, Dr. Kelly, admitted that he was not aware of any published, peer-reviewed protocol that used the etching protocol that he and Modumetal relied upon in this Investigation. (Tr. (Kelly) at 536:4–7.).

Modumetal’s only counterargument was that its former director of research and development, Dr. Marie Li, testified how [REDACTED] [REDACTED] (CBr. at 44–45; Tr. (Li) at 287:22–290:23, 295:16–22; CX-0097 (Work instruction for laminate verification in NanoGalv®-coated fasteners) at .0006; JX-0045.0004 (Etching standard operating procedure).). However, Dr. Li’s only testimony about the relationship between etching and nobility is as follows:

Q. Can etching be used to show nobility?

A. Yes.

(Tr. (Li) at 295:16–22.).

Dr. Li’s testimony was conclusory, and therefore, legally insufficient without more. *See, e.g., Trs. of Columbia Univ. in City of New York v. Gen Digital Inc.*, 169 F.4th 1320, 1335 (Fed. Cir. 2026) (unsupported conclusory testimony is the kind of testimony the Federal Circuit has “consistently held should be afforded no weight”).

There is no other evidence that corroborates Dr. Li’s testimony about the use of etching for testing the “nobility” let alone the layers of a material.

#### **D. Optical Microscopy**

In optical microscopy, a beam of light is focused onto the sample to be analyzed, and

lenses are used to convert the reflected light into a magnified image of the sample. (Tr. (Kelly) at 405:24–407:1; CDX-0001C.0037–.0038.). Dr. Kelly relied on optical microscopy images of the DI Fastener and the Original Representative Accused Products<sup>23</sup> after those products had undergone etching to visualize the products’ layers. (E.g., Tr. (Kelly) at 406:17–407:8, 407:21–408:9; JX-0015.0003–.0004 (Optical microscopy images of 10BL-S); JX-0016.0003–.0004 (Optical microscopy images of 16-12FBU-S); JX-0017.0003–.0004 (Optical microscopy images of 8 C5OLO-S);<sup>24</sup> JX-0018.0003–.0004 (optical microscopy images of the DI Fastener); CDX-0001C.0037–.0038.). Dr. Kelly also relied on images of the DI Fastener and Original Representative Accused Products after they were subjected to etching to allegedly provide information about the relative nobility of the layers. (E.g., Tr. (Kelly) at 430:5–11, 431:7–434:16; CDX-0001C.0052–.0053.).

## **VII. DEFINITION OF A PERSON OF ORDINARY SKILL IN THE ART<sup>25</sup>**

The adopted definition of a person of ordinary skill in the art (“POSITA” or “POSA”) that Modumetal proposed in its Pre-Hearing Brief was adopted. (*Markman* Order at 12–13.). As Modumetal proposed:

A POSA “would have possessed at least a bachelor’s degree in material science, metallurgy, chemical engineering, or chemistry, with at least two years of industry experience with corrosion resistance or electrodeposition (or equivalent degree or experience).” Moreover, “[a]dditional education (such as a Master of Science degree) may substitute for technical or professional experience, and vice versa.”

(*Id.* at 12 (quoting CPBr. at 61)).

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<sup>23</sup> Respondents’ Representative Replacement Product (the 4 BTX-S) was not subjected to optical microscopy analysis.

<sup>24</sup> Modumetal did not introduce into evidence any optical microscopy images of the 4 BTX-S.

<sup>25</sup> The legal standard for the level of ordinary skill in the art can be found in *Markman* Order. (See *Markman* Order at 5–6.).

## **VIII. INFRINGEMENT**

Although there are differences in the wording of the claims of the two (2) Asserted Patents, for the purpose of resolving the Parties' disputes, the Asserted Claims of the '419 patent are treated as having the same meaning as the Asserted Claims of the '613 patent. Therefore, the two (2) Asserted Patents and their Asserted Claims are analyzed together.

At the outset, it should be noted that Modumetal conceded that Parker Hannifin's Rack-Plated Replacement Products that were sold after December 26, 2024, including the Representative Rack-Plated Replacement Product, the Triple Lok Pipe 6-6-FTX-S, do not infringe the Asserted Patents. (JSUI at 3, 6.). Therefore, it is a finding of this ID that the Rack-Plated Replacement Products, including the representative Triple Lok Pipe 6-6-FTX-S, do not infringe the Asserted Patents.

### **A. Legal Standards**

"Determination of infringement is a two-step process which consists of determining the scope of the asserted claim (claim construction) and then comparing the accused product . . . to the claim as construed." *Certain Sucralose, Sweeteners Containing Sucralose, and Related Intermediate Compounds Thereof*, Inv. No. 337-TA-604, Comm'n Op. at 36 (Apr. 28, 2009) (citing *Litton Sys., Inc. v. Honeywell, Inc.*, 140 F.3d 1449, 1454 (Fed. Cir. 1998)).

An accused device literally infringes a patent claim if it contains each limitation recited in the claim exactly. *Litton*, 140 F.3d at 1454. Each patent claim element or limitation is considered material and essential. *London v. Carson Pirie Scott & Co.*, 946 F.2d 1534, 1538 (Fed. Cir. 1991). In a Section 337 investigation, the complainant bears the burden of proving infringement of the asserted patent claims by a preponderance of the evidence. *Enercon GmbH v. Int'l Trade Comm'n*, 151 F.3d 1376, 1384 (Fed. Cir. 1998). If any claim limitation is absent, there is no literal infringement of that claim as a matter of law. *Bayer AG v. Elan Pharm.*

*Research Corp.*, 212 F.3d 1241, 1247 (Fed. Cir. 2000).

**B. Claim Construction**

As noted in Section II.A, a claim construction order issued on September 26, 2025.

(*Markman* Order, Order No. 30 (Sept. 26, 2025)).

**1. “layer”**

The term “layer” is required by claim 1, and incorporated into claims 2, 3, 5, and 7 of the ’419 patent. It is also required by claim 1 and incorporated into claims 2, 3, 5 of the ’613 patent. (JX-0001 at 11:1–37 (’419 patent); JX-0002 at 11:11–39 (’613 patent)).

The term “layer” was given its “plain and ordinary meaning,” with the following explanations:

A claimed layer is formed on a substrate or mandrel.

A claimed layer is not limited to one formed by a particular method.

(Order No. 30 at 14; JX-0001 at 11:1–15 (’419 patent); JX-0002 at 11:10–25 (’613 patent)).

**2. “first concentration” / “second concentration” / “third concentration” / “fourth concentration”**

The terms “first concentration” / “second concentration” / “third concentration” / “fourth concentration” were construed to mean “[t]he first concentration and the third concentration are different.” (*Id.* at 25; JX-0001 at 11:9–19 (’419 patent); JX-0002 at 11:19–30 (’613 patent)).

**3. “noble”**

As noted in the *Markman* Order, the Parties did not ask that the claim term “noble” be construed during the *Markman* proceedings. (*Id.* at 41.). The Parties revealed only later, in the Parties’ Pre-Hearing Briefs, that the Parties had a dispute about the construction of the term “noble.” (CPBr. at 23, 27–28; RPBr. at 20–26.). Because neither party proposed the claim term “noble” for construction, on the first day of the Hearing, it was construed to have its “plain and

ordinary” meaning. The construction did not include any other meaning of the term. (Tr. at 11:8–15.).

Claim 1 of the Asserted Patents recites, in relevant part:

A first layer of a first alloy that is less noble than the substrate or the mandrel, the first alloy comprising:

A first metal in a first concentration that is at least about 1 wt.%, the first metal selected from Co, Fe, Ni, and Zn;

(JX-0001.0010 ('419 patent) at 11:7–11; JX-0002.0013 ('613 patent) at 11:17–25.).

In the context of the Asserted Patents, Modumetal argued that the plain and ordinary meaning of “nobility” is “non-reactivity.” (CBr. at 14; Tr. (Kelly) at 429:8–15 (“So in the context of this case, the '419 and '613 patents define noble as being – characterizing the reactivity. So the more noble a layer is, the less reactive it is. The less noble it is, the more reactive it is.”).). Respondents’ expert, Dr. Frankel, also conceded that the Asserted Patents equate nobility with non-reactivity. (Tr. (Frankel) at 1084:10–1085:5.). Dr. Frankel testified as follows:

Q. Dr. Frankel, could you please read paragraph 87 into the record?

A. The '419 patent equates nobility, quote, nonreactivity, in multiple instances, *id.* at 1:59–60, quote, it is generally true that the higher electronegativity, the greater the nobility (nonreactivity), end quote, *id.* at 4:29–33, quote, (in another embodiment multilayer coating or cladding is provided for, in which the layers vary in electronegativity or in nobility, and in which the rate of corrosion can be controlled by controlling the difference in electronegativity or in the reactivity (or, quote, nobility end quote, of adjacent layers) end quote.”

Q. Dr. Frankel, the first sentence of paragraph 87, the '419 patent equates nobility with nonreactivity in multiple instances, is that an opinion of yours?

A. Yes, it is, but it doesn’t define nobility as nonreactivity.

Q. Do you stand by that statement that you made in paragraph 87?

A. Yes. The patent equates nobility with reactivity parenthetically as indicated by the text.

(Tr. (Frankel) at 1084:10–1085:5; *see also* JX-0001.0005 at 1:55–2:7, .0006 at 4:29–33; JX-0002.0008 at 1:56–2:8.).

However, Modumetal’s “non-reactivity” argument is incomplete because, in the context of the Asserted Patents, “non-reactivity” refers specifically to resistance from, or protection against, corrosion. To that point, the title of the Asserted Patents is “Electrodeposited, Nanolaminate Coatings and Claddings for ***Corrosion*** Protection.” (JX-0001.0001 (’419 patent) (emphasis added); JX-0002.0001 (’613 patent) (emphasis added).). The Abstract states that as “[d]escribed herein are electrodeposited ***corrosion***-resistant multilayer coating and claddings.” (*Id.* (emphasis added).).

The Background to the Asserted Patents is also replete with references to corrosion resistance. (JX-0001.0005 at 1:15–2:47; JX-0002.0008 at 1:16–2:49.). For example, the Background of the Asserted Patents says, while certain coatings “are more noble than steel and aluminum in resistance to various ***corrosive environments***,” “pinholes and micropores that can occur during processing of these coating[sic] are detrimental to their ***corrosion resistance*** properties.” (JX-0001.0005 at 1:66–2:5; JX-0002.0008 at 1:66–2:5 (emphases added).).

The summary of the Invention and the Detailed Description also reference corrosion, corrosion resistance, and environmental corrosion. (*See, e.g.*, JX-0001.0005–.0009 at 2:51–10:67; JX-0002.0008–.0013 at 2:51–11:9.). The Asserted Patents assess a coating’s corrosion resistance by testing it in a corrosive (salt spray) environment in accordance with the procedures described in the ASTM B117 standard (Standard Practice for Operating Salt Spray). (JX-0001.0008–.0009 at 8:43–9:54; JX-0002.0012 at 9:18–10:2.).

Ms. Lomasney, the named inventor of the Asserted Patents, and Co-founder of Modumetal, testified that when one layer of an electroplated metal coating preferentially undergoes greater corrosion than another layer, “[t]hat’s referring to a difference in nobility

between the two layers.” (JX-0059C.0016 (Lomasney Dep. Tr.) at 60:10–17; *see also id.* at 59:14 (testifying that “nobility” and “reactivity” are “two terms of art that basically refer to – ‘nobility’ is the non-reactivity of a material, the ‘reactivity’ is the reactivity of a material. So it’s a reference to how readily in this context it’s going to oxidize.”)). Modumetal’s CEO, Mr. Creech, testified about an internationally recognized testing standard using a salt spray test to evaluate materials, coatings and to evaluate their corrosion resistance in a highly corrosive accelerated environment. Mr. Creech described the ASTM B117 standard as follows:

Q. Can you tell me what that is?

A. That is a test that’s performed and it has very, very specific requirements set out by ASTM B117, and we have consistently outperformed three thousand hours. [i.e. referring to NanoGalv® coated products that showed corrosion resistance up to 3,000 hours]

Q. All right. Are you familiar – you’re familiar then with the salt spray test described here?

A. I am.

Q. Can you tell the Court what the salt spray test involves?

A. Sure. It’s basically a cabinet that has a fine mist at a very specific temperature, and you have to put the product into this standard test environment and then run it to failure, and failure would be the appearance of red rust.

Q. Who sets the standards? This is an ASTM standard. Are there other standards?

A. There are. There’s obviously ASTM, there’s API, there’s SAE. I mean, the list goes on. There are a number of different organizations that have set out test standards. And the energy industry uses a lot of them, and so we were required to make sure we met every single one.

(Tr. (Creech) at 97:23–99:9; CX-0038 (Modumetal’s “NanoGalv® Fasteners Technical Datasheet) (referring to ASTM B117 salt spray testing rating of more than 3,000 hours)).

Parker Hannifin’s principal engineer, Dr. Ge, testified as follows:

Q. You’re familiar with the concept of a salt spray test, sir?

A. Yes.

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Q. And can you explain what it is?

A. It is to use a salt, a water solution of salt, to spray to test the ability to resist corrosion.

Tr. (Ge) at 348:19–349:5, 353:15–356:7 (describing assessing corrosion resistance by salt spray testing of Parker Hannifin’s ToughShield® and XTR products and Modumetal’s NanoGalv® products); *see also* Tr. (Wagener) at 740:17–741:6, 746:15–747:6, 757:21–758:19, 770:2–6, 771:22–25, 779:15–23, 857:14–17 (same.).

Dr. Frankel, Respondents’ expert, agreed with Parker Hannifin’s fact witness, Dr.

Wagener, that the ASTM B117 standard salt spray test is “probably the most common accelerated test using corrosion.” (Tr. (Frankel) at 921:12–923:23.). Therefore, the type of “non-reactivity” that is relevant, in the context of the Asserted Patents, is corrosion resistance.

Offering a different interpretation of the meaning of “nobility,” Respondents, supported by Dr. Frankel, argued that the plain and ordinary meaning of “nobility” in the Asserted Patents is “corrosion potential.” (RRBr. at 6–11; Tr. (Frankel) at 905:19–908:8.). However, Dr. Frankel conceded that the Asserted Patents do not explicitly mention the phrase “corrosion potential.” (Tr. (Frankel) at 1085:4–8 (“Q. Would you agree that the term corrosion potential does not appear anywhere in the ’419 patent? A. I believe so, yes.”).). Respondents’ proposed construction is at least partially grounded in extrinsic evidence.

Dr. Frankel testified that an undergraduate textbook he has used, Ed McCafferty, INTRODUCTION TO CORROSION SCIENCE (2009) (RX-0281 (“McCafferty”)), defines nobility by corrosion potential. (Tr. (Frankel) at 907:8–908:8; RDX-0003C.0026; RX-0281.0091.). Dr. Frankel’s Hearing testimony is quoted below.

Q. Let’s turn to slide 26 of RDX-0003. What evidence did you consider when forming your opinion regarding the plain and ordinary meaning of nobility or noble?

A. Well, here on slide 26 I show the cover of a textbook we use in our undergraduate class by Ed McCafferty. I could have used any other text, but here, on the right hand side of slide 26, is text taken from that book. The first line, again,

describing corrosion potential, which is indicated by  $E_{\text{corr}}$ ,  $E_{\text{sub c-o-r-r}}$ , indicating potential. So  $E_{\text{corr}}$ , which we call it,  $E_{\text{corr}}$  is the corrosion potential that is measured on the metal in a corrosive environment. And then there's the statement metals and alloys with more positive potentials, like platinum, are noble metals, and metals with more negative potentials, like magnesium, are active metals. So again, describing active and noble or nobility based on the corrosion potential, which is the plain and ordinary meaning of nobility.

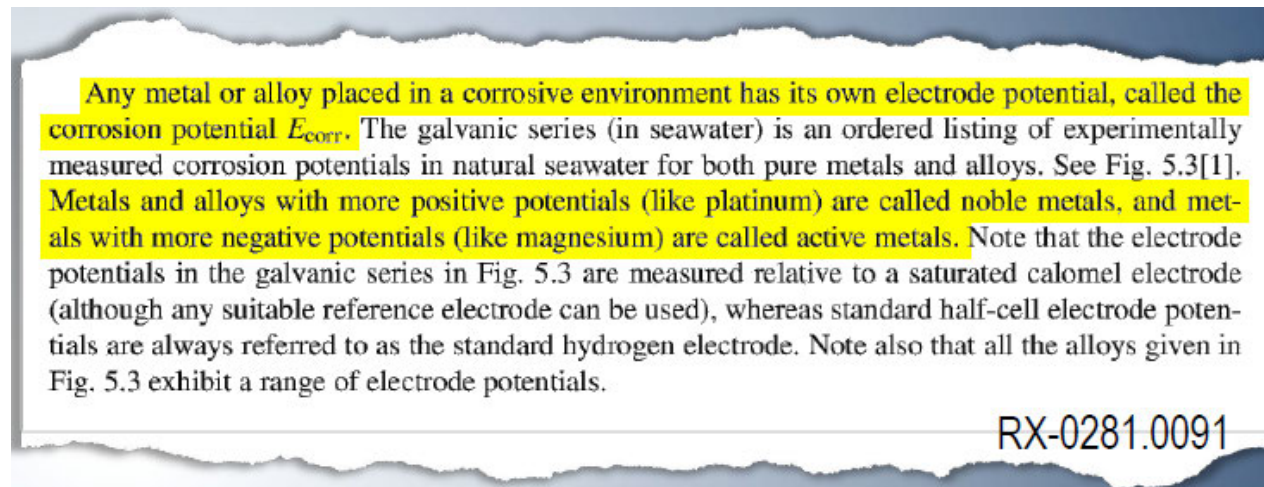
Q. And is the definition given in the McCafferty textbook, which is RX-0281, consistent with your understanding of the plain and ordinary meaning of noble or nobility before you ever had anything to do with this Investigation?

A. Yes.

(Tr. (Frankel) at 907:8–908:8; RDX-0003C.0026; RX-0281.0091.).

The relevant portion of McCafferty is reproduced in Figure 6 below, with Dr. Frankel's highlighting:

**Figure 6: Annotated Excerpt of McCafferty Textbook (RX-0281)**



(Tr. (Frankel) at 907:8–908:8; RDX-0003C.0026; RX-0281.0091 (annotated)).

Respondents also argued that a textbook chapter that Dr. Kelly authored defines “noble” in terms of corrosion potential. (RRBr. at 9–10; Robert Kelly, *Chapter 2: Electrochemical Thermodynamics and Kinetics of Relevance to Corrosion*, in *ELECTROCHEMICAL TECHNIQUES IN CORROSION SCIENCE AND ENGINEERING*, 9 (Robert G. Kelly, John R. Scully, David W. Shoesmith, and Rudolph G. Buchheit, eds. 2002) (RX-0304 (“Kelly Textbook Chapter”)); Tr.

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(Kelly) at 531:20–532:7 (testifying that he authored the Kelly Textbook Chapter and that he uses it for his graduate students who do not have a background in corrosion); RX-0304.0050.). The implication is that Dr. Kelly should have relied upon his own writings and teachings. Dr. Frankel did not testify about the Kelly Textbook Chapter. However, the Kelly Textbook Chapter notes: “material 1 is the more noble material (i.e., it has a more positive  $E_{\text{corr}}$ ) and has a lower circuit corrosion rate when it is uncoupled.” (RX-0304.0050.).

What McCafferty points out and what is clear from the Asserted Patents, is that certain metals (including ones that are identified in the Asserted Patents) have an electronegativity which suggests how susceptible it is to corrosion. (JX-0001.0005 at 1:38–45; JX-0002.0008 at 1:39–46; RX-0281.0091.). Certain metals are considered to be “less noble” because they have a higher tendency to corrode, and therefore, are considered to be more “reactive” to corrosion. (JX-0001.0005 at 1:15–2:47, .0006 at 4:29–33; JX-0002.0008 at 1:16–2:49, 4:29–33.).

Although McCafferty and the Kelly Textbook Chapter are extrinsic evidence, they are helpful in understanding the claim term “nobility” as it is used conceptually in the Asserted Patents. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1318 (Fed. Cir. 2005) (en banc).

Moreover, by pairing Dr. Kelly’s and Dr. Frankel’s testimonies, with the language of the Asserted Patents and McCafferty, it becomes clear that Dr. Frankel and Dr. Kelly were attempting false dichotomies in their definitions of nobility. “Reactivity” and “corrosion potential” both relate to nobility (potential of a metal to lose electrons) and the potential of a metal to “corrode” or “react” to certain environmental conditions because of its composition and whether it “more” or “less” noble.

McCafferty teaches that a metal or alloy placed in a corrosive environment has a corrosion potential. (RX-0281.0091.). Metals or alloys with more positive corrosion potentials

are called noble metals and metals or alloys with more negative corrosion potential are referred to as active metals. (*Id.*). In other words, McCafferty describes metals and alloys with more positive corrosion potentials as being more noble and those with more negative corrosion potentials as being more active. (*Id.*).

Similarly, the Kelly Textbook Chapter teaches that a more noble material has a “more positive corrosion potential.” (RX-0304.0050.). Therefore, it is a finding of this ID that a POSITA would have understood that “nobility” or “non-reactivity” in the Asserted Patents could be assessed by measuring corrosion potential, in addition to using salt spray testing (“SST”).

Respondents attempted to argue that Modumetal’s “non-reactivity” proposal is not supported by the intrinsic evidence. (RRBr. at 7.). Respondents argued that because independent claim 1 of the ’419 patent uses the term “noble” and independent claim 8 uses the term “reactive,” the word “noble” must have a different meaning than “non-reactive” in the Asserted Patents. (*Id.*). In other words, Respondents relied on the doctrine of claim differentiation in claim construction that holds there is a presumption that “different claim terms . . . have different meanings.” (*Id.* (citing *Bd. Of Regents of the Univ. of Tex. Sys. V. BENQ Corp.*, 533 F.3d 1362, 1371 (Fed. Cir. 2008))).

However, Respondents’ argument has been misapplied. It is incorrect to apply the doctrine of claim differentiation in the context of only a single claim term in two claims, rather than in the context of the scope of the two claims as a whole. “Under the doctrine of claim differentiation, two *claims* of a patent are presumptively of different scope.” *Kraft Foods, Inc. v. Int’l Trading Co.*, 203 F.3d 1362, 1366 (Fed. Cir. 2000) (emphasis added). “[T]hat the claims are presumed to differ in scope does not mean that every limitation must be distinguished from its counterpart in another claim, but only that at least one limitation must differ.” (*Id.* at 1368.).

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Claim 1 of the '419 patent has a different scope from claim 8 of the '419 patent because there are other limitations that differ between them, other than the claim terms “noble” and “reactive.” Claim 1 recites a series of alternating layers comprising “a first layer of a first alloy that is less noble than the substrate or mandrel, the first alloy comprising a first metal,” whereas claim 8 recites a series of alternating layers “having layers comprising a barrier layer of a first alloy comprising a first metal.” (*Compare* JX-0001 ('419 patent) at 11:6–9, *with* JX-0001 ('419 patent) at 12:5–8.). In claim 1, the first alloy is part of a “first layer” and is “less noble than the substrate or mandrel.” But in the claim 8, the first alloy is part of a “barrier layer” and does not have a limitation on its nobility relative to the substrate or mandrel.

Moreover, claim 1 recites “a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel, the second alloy comprising the first metal,” whereas claim 8 recites “a sacrificial layer of a second alloy that is more reactive than the first alloy, the second alloy comprising the first metal.” (*Compare* JX-0001 ('419 patent) at 11:14–17, *with* JX-0001 ('419 patent) at 12:13–16.).

In claim 1, the second alloy is part of the “second layer.” However, in claim 8, the second alloy is part of a “sacrificial layer.” (*Id.*). Moreover, in claim 8, the second alloy only has to be more reactive than the first alloy. (*Id.*). In contrast, in claim 1, the second alloy must be less noble than both the first alloy and the substrate or mandrel. (*Id.*). In other words, all the foregoing differences between claims 1 and 8 prove that claim 1 and claim 8 differ in scope, even if “noble” means the same thing as “non-reactive.” Therefore, the doctrine of claim differentiation does not apply here. Respondents’ claim differentiation argument fails as a matter of law.

Moreover, the doctrine of claim differentiation “only creates a presumption that each

claim in a patent has a different scope; it is not a hard and fast rule of construction. *Kraft Foods, Inc.*, 203 F.3d at 1368; *see also ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 541 (Fed. Cir. 1998) (“the presumption that separate claims have different scope is a guide, not a rigid rule”) (internal citations and quotations omitted). The presumption may be overcome where, as here, the rest of the intrinsic record requires a different result. *Kraft Foods, Inc.*, 203 F.3d at 1368–69 (finding that specification and prosecution history overcame any presumption arising from the doctrine of claim differentiation).

Similarly, when a patent specification uses different claim terms interchangeably, as occurs here with the terms “noble” and “non-reactive,” any presumption that different claim terms have different meanings is overcome. *Apple Inc. v. Omni MedSci, Inc.*, No. 2023-1034, 2024 WL 3084509, at \*3 (Fed. Cir. June 21, 2024) (“in the past we have found that different terms in the same patent have the same meaning because they have been used interchangeably”). Here, the specification clearly uses the term “noble” interchangeably with, and as a synonym for, “non-reactivity” by, among other ways, placing the term “non-reactivity” in quotes, and within parentheses, next to the word “nobility.” (JX-0001.0005 (‘419 patent) at 1:41–66, 2:42–47; Tr. (Kelly) at 429:8–430:4; Tr. (Frankel) at 1084:10–1085:5.). Placing a quoted word in parentheses next to another word is “a conventional manner by which one may define another term used in a document.” *MyPAQ Holdings Ltd. v. Samsung Elecs. Co.* (“*MyPAQ Holdings*”), No. 2023-2024, 2025 WL 1189920, at \*3 (Fed. Cir. Apr. 24, 2025) (non-precedential) (“To be sure, placing a quoted word or term inside parentheses is a conventional manner by which one may define another term used in a document . . . and we have found such formulations may be indicative of lexicography in a patent”) (citing *SkinMedica, Inc. v. Histogen Inc.*, 727 F.3d 1187, 1200 (Fed. Cir. 2013)). Such clear disclosures in the Asserted Patents overcome any presumption that the

two (2) claim terms have different meanings. (JX-0001.0005 ('419 patent) at 1:41–66, 2:42–47; Tr. (Kelly) at 429:8–430:4; Tr. (Frankel) at 1084:10–1085:5.).

In this instance, both experts neglected to mention that even the Asserted Patents recognize that “reactivity” is discussed in terms of how likely a metal is to corrode. (JX-0001.0001 ('419 patent title and abstract), .0005 at 1:15–2:47, .0008–.0009 at 8:43–9:54; JX-0002.0001 ('613 patent title and abstract), .0008 at 1:16–2:49, .0012 at 9:18–10:2.). The concepts are related. Claim differentiation is an attempt in this case to strip the meaning of “nobility” of what is clear in the meaning of the totality of the purpose and language of the Asserted Patents. *Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1383 (Fed. Cir. 2009) (“It is fundamental that we must read a claim term in a manner that comports with the written description of the patent as a whole.”)

As evidenced by the agreement between the Parties’ experts,<sup>26</sup> it is a finding of this ID

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<sup>26</sup> Even if the intrinsic record were interpreted to technically not formally define “nobility” as “non-reactivity,” the intrinsic record is supportive that the “nobility” of a metal is related to its “non-reactivity.” There is a relationship between the nobility of a metal and how reactive it is to oxidation and other corrosion. The shared specification of the Asserted Patents contains the following language:

In the case of sacrificial metal or metal-containing coatings, such as zinc or an iron-based substrate, the coating is less electronegative than the substrate and so oxidation of the coating occurs preferentially, thus protecting the substrate. Because these coatings protect by providing an oxidation-preferred sacrificial layer, they will continue to work even when marred or scratched. The performance of sacrificial coatings depends heavily on the rate of oxidation of the coating layer and the thickness of the sacrificial layer. Corrosion protection of the substrate only lasts so long as the sacrificial coating is in place and may vary depending on the environment that the coating is subjected to and the resulting rate of coating oxidation.

Alternatively, in the case of a barrier coating, such as nickel on an iron-based substrate, the coating is more electronegative than the substrate and thus works by creating a barrier to oxidative corrosion. ***In A-type metals, such as Fe, Ni, Cr and Zn, it is generally true that the higher the electronegativity, the greater the nobility (non reactivity).*** When the coating is more noble than the substrate, if that coating is marred or scratched in any way, or if coverage is not complete, these coatings will not work, and may accelerate the progress of substrate corrosion at the substrate: coating interface, resulting in preferential

that Modumetal’s “non-reactivity” argument is more supported by the patent specification.

However, it is also clear from the specification and the extrinsic evidence that the type of non-reactivity that is relevant to the Asserted Patents is corrosion resistance, which may be assessed in different ways, including salt spray testing (“SST”) and corrosion potential measurements.

For the foregoing reasons, it is a finding of this ID that the plain and ordinary meaning of “noble,” from the perspective of a POSITA reading the Asserted Patents, and with knowledge of the field of metallurgy and corrosion, is “non-reactivity” (or “reactivity”) **with** the additional explanation that the extent of the “non-reactivity” or “reactivity” of a metal or metal alloy is

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attack of the substrate. This is also true when ceramic coatings are used.

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Coatings that may represent the best of both the sacrificial coating and the barrier coating are those that are more noble than the substrate and creates a barrier to corrosion, but, in case that coating is compromised, is also less noble than the substrate and will sacrificially corrode, thus protecting the substrate from direct attack.

(JX-0001.0005 (’419 patent) at 1:41–66, 2:42–47 (emphasis added); JX-0002 at 1:42 – 67, 2:44–49 (’613 patent)).

The bolded and italicized language, when considered in context of the surrounding language and the patent as a whole, suggests that nobility and reactivity are linked. By placing “non reactivity” in parentheses next to “nobility,” the patent discloses that having greater nobility is the same as having greater non-reactivity. *MyPAQ Holdings*, 2025 WL \*3 (“To be sure, placing a quoted word or term inside parentheses is a conventional manner by which one may define another term used in a document . . . and we have found such formulations may be indicative of lexicography in a patent”) (citing *SkinMedica, Inc. v. Histogen Inc.*, 727 F.3d 1187, 1200 (Fed. Cir. 2013)).

Respondents disagreed with this interpretation, quoting certain language from *MyPAQ Holdings*. (RRBr. at 8 (quoting *MyPAQ Holdings Ltd.*, 2025 WL, at \*3 (not “every use of a quoted term inside a parenthetical in a patent document is definitional, each patent must be read individually, from the perspective of one of ordinary skill in the art”). This decision agrees that not every use of a quoted term inside parentheses is definitional as a matter of law. However, as the *MyPAQ* decision recognizes, such use of parentheses is a “conventional” manner to define a term. *Id.* Moreover, in the Asserted Patents, it is clear (as explained in the remainder of this section) that nobility is at least closely related, if not equivalent to, non-reactivity, and that non-reactivity is assessed by testing corrosion resistance or corrosion potential.

related to its “nobility” because of its corrosion resistance and corrosion potential.

**C. The Accused Products Do Not Infringe Claim 1 of the ’419 Patent or Claim 1 of the ’613 Patent**

- 1. ’419 Patent Claim Element 1[a]: “a coating or cladding comprising”  
and  
’613 Patent Claim Element 1[a]: “a method comprising, forming a  
coating on a substrate or mandrel, the coating having a thickness  
from 5 microns to 50 microns and”**

The Parties agreed that the Accused Products practice claim element 1[a] of the ’419 patent and claim element 1[a] of the ’613 patent. (JSUF at 2–3, 5–6; CBr. at 19–20, 60; RRBr. at 12, 50–51.).

During the Hearing, Modumetal introduced undisputed, uncontroverted evidence that the Accused Products have a “coating or cladding” that is “on a substrate or mandrel” the coating having a “thickness from 5 microns to 50 microns.” (Tr. (Kelly) at 464:21–465:24; JX-0015.0001 (STEM-HAADF image of 10BL-S); JX-0016.0001 (STEM-HAADF image of 16-12FBU-S); JX-0017.0001 (STEM-HAADF image of 8 C5OLO-S); JX-0105.0001 (STEM-HAADF image of 4 BTX-S).).

For the foregoing reasons, Modumetal has proven by a preponderance of the evidence that the Accused Products practice claim element 1[a] of the ’419 patent and claim element 1[a] of the ’613 patent.

- 2. ’419 Patent Claim Element 1[b]: “a series of alternating layers on a  
substrate or mandrel, each layer of the series of alternating layers  
having a thickness from about 5 nanometers to about 1,000  
nanometers, the series of alternating layers comprising”  
and**

**'613 Patent Claim Element 1[b]: “comprising a series of layers arranged in a repeating pattern, each layer of the series of layers having a thickness from about 5 nanometers to about 1,000 nanometers, the series of layers comprising”**

The Parties' dispute with respect to claim element 1[b] is whether the Accused Products have a series of layers, whether “alternating” as in the '419 patent claims or “in a repeating pattern” as in the '613 patent claims, where each layer has a “thickness from about 5 nanometers to about 1,000 nanometers.” (CBr. at 20–21, 60–62; RRBr. at 12–26, 50–51.). The Parties disputed both the existence of “layers” and whether any alleged “layers” have a thickness from about 5 nanometers to about 1,000 nanometers as required by the claim. (*Id.*).

To prove its infringement case, Modumetal introduced as evidence STEM-HAADF testing images, optical microscopy images, and related expert testimony for each of the Representative Accused Products. (Tr. (Kelly) at 405:18–424:20; JX-0015.0002 (STEM-HAADF image of 10BL-S), .0003–.0004 (optical microscopy images of 10BL-S); JX-0016.0002 (STEM-HAADF image 16-12FBU-S), .0003–.0004 (optical microscopy images of 16-12FBU-S); JX-0017.0002 (STEM-HAADF image of 8 C5OLO-S), .0003–.0004); JX-0105.0001–.0002, .0008–.0009 (STEM-HAADF images of 4 BTX-S)<sup>27</sup>).

Dr. Kelly testified that the STEM-HAADF images of the Representative Accused Products that Modumetal relied upon, and which are reproduced in Figures 7 and 8 below, depict alternating light and dark regions with thicknesses from about 5 nm to about 1,000 nm, which constitute the alternating or repeating layers required by the claims. (Tr. (Kelly) at 413:8–416:11; JX-0015.0002; JX-0016.0002; JX-0017.0002; JX-0105.0008.). Dr. Kelly explained that the layer thicknesses were determined using the size scales that are depicted at the bottom of

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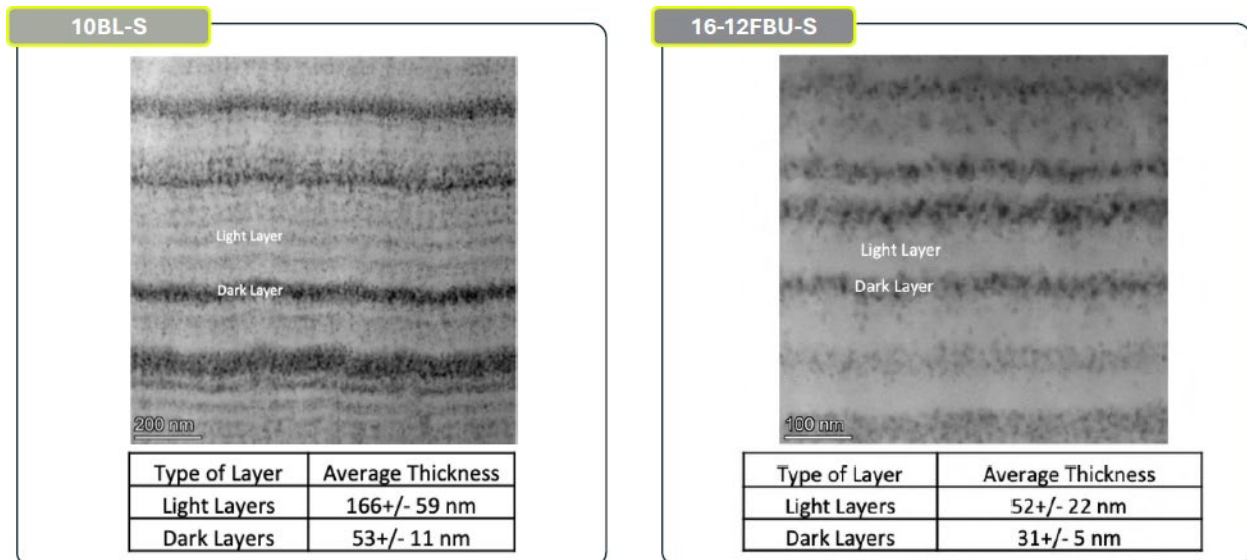
<sup>27</sup> Modumetal did not introduce into evidence any optical microscopy images of the 4 BTX-S.

each image. (*Id.*).

Modumetal’s STEM-HAADF image of the 10BL-S product is depicted on the left of Figure 7 below. (Tr. (Kelly) at 413:8–414:25; CDX-0001.0041; JX-0015.0002; JX-0016.0002.).

Modumetal’s STEM-HAADF image of the 16-12FBU-S product is depicted on the right of Figure 7 below. (*Id.*). In each of the images, there are alternating light and dark bands running horizontally, which Dr. Kelly testified are the claimed “layers.” (*Id.*). Below each image is a table that reports the thickness of the light and dark bands. (*Id.*).

**Figure 7: STEM-HAADF Images of the 10BL-S and the 16-12FBU-S From Dr. Kelly’s Demonstratives**



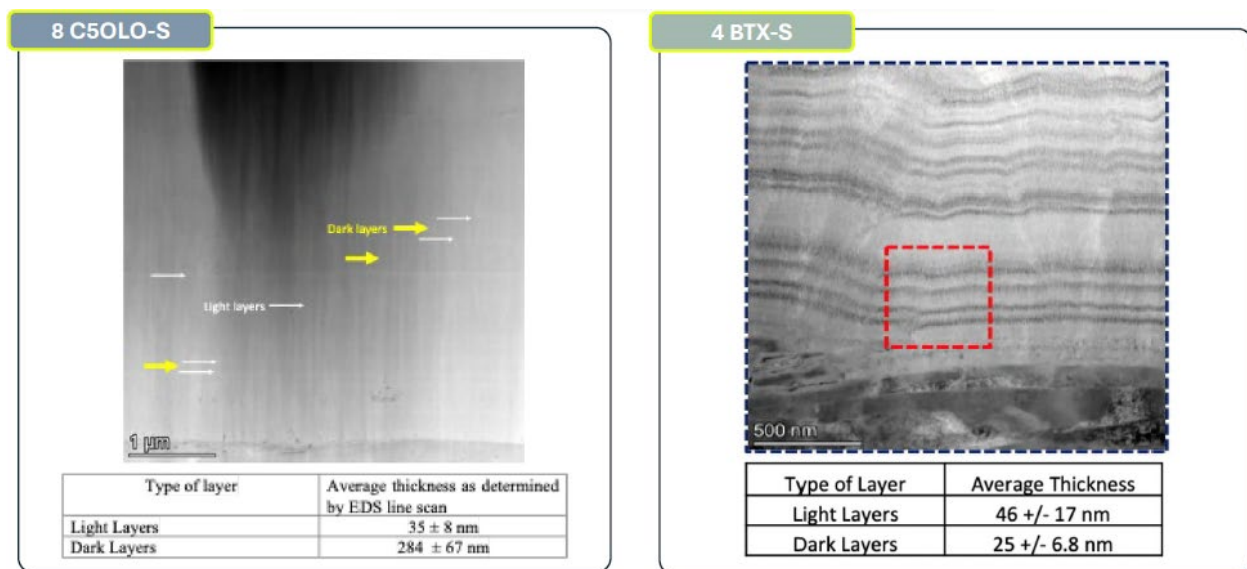
(Tr. (Kelly) at 413:8–414:25; CDX-0001.0041; JX-0015.0002; JX-0016.0002.).

Modumetal’s STEM-HAADF image of the 8 C5OLO-S product is depicted on the left of Figure 8 below. (Tr. (Kelly) at 415:1–416:11; CDX-0001.0042; JX-0017.0002; JX-0105.0008.).

Modumetal’s STEM-HAADF image of the 4 BTX-S product, which is the Representative Accused Replacement Product, is depicted on the right of Figure 8 below. (*Id.*). Dr. Kelly annotated the 4 BTX-S STEM-HAADF image with a red box, but he did not explain what that red box signified. (Tr. (Kelly) at 415:19–416:11.). In the 4 BTX-S image, there are clearly

alternating light and dark bands running horizontally, which Dr. Kelly testified are the claimed “layers.” (*Id.*). Although the 8 C5OLO-S image looks different, nonetheless, Dr. Kelly gave the same testimony about the 8 C5OLO-S image as he gave about the 4 BTX-S image. (*Id.*). No witness commented on the starkly different appearance of the 8 C5OLO-S STEM-HAADF image as compared to the other STEM-HAADF images in this Investigation. Below each image is a table that reports the thickness of the light and dark bands. (*Id.*).

**Figure 8: STEM-HAADF Images of the 8 C5OLO-S and the 4 BTX-S From Dr. Kelly’s Demonstratives**



(Tr. (Kelly) at 415:1–416:11; CDX-0001.0042; JX-0017.0002; JX-0105.0008.).

Respondents contended that Modumetal’s STEM-HAADF testing was insufficiently reliable because Modumetal and Dr. Kelly “failed to report numerous important details about the testing.” (RRBr. at 15–19.). Specifically, Respondents argued that the testing Dr. Kelly relied upon, and his associated infringement opinions, are not sufficiently reliable under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 409 U.S. 579 (1993) (“*Daubert*”) because Dr. Kelly did not perform the testing himself (it was performed by a testing lab called “Exponent”). (*Id.*). Respondents also argued that Dr. Kelly did not observe Exponent’s experiments. (*Id.*).

Dr. Kelly did not visit Exponent’s testing facilities or inspect the testing equipment. (*Id.*). He did not explain the details of how the samples were prepared for testing such as where the samples were cross-sectioned, how they were handled, and how long they were exposed to etchant. (*Id.*; *see also* Tr. (Frankel) at 900:4–901:3; RDX-0003C.0020.). Dr. Frankel also testified that, for the tests results Dr. Kelly relied upon, the following details are important but were not reported: 1) where on the parts samples were removed using FIB<sup>28</sup> sectioning or how many were removed from each section; and 2) how the resulting lamellae were handled including the times of exposure, the treatment afterwards and how they were rinsed. (Tr. (Frankel) at 901:4–902:11.). In Dr. Frankel’s view, the problems with Dr. Kelly’s failures to oversee the Exponent testing, and the problems with the manner in which the STEM-HADDF testing was conducted, undermined Modumetal’s and Dr. Kelly’s arguments. (*Id.*).

As a threshold legal matter, the *Daubert* doctrine is not applicable in administrative proceedings in the same way that it is in district courts, where there is a danger of jury confusion. *Certain Dermatological Treatment Devices and Components Thereof* (“*Dermatological Treatment*”), Inv. No. 337-TA-1356, Order No. 39 at 3 (Nov. 15, 2023) (collecting Commission cases and noting that Administrative Law Judges perform a threshold evaluation). Therefore, unsurprisingly, “allegedly irrelevant or unreliable expert testing and opinions in Section 337 proceedings are routinely not excluded.” *Id.* Instead, criticisms of expert testing and opinions such as Respondents’ and Dr. Frankel’s criticisms in this Investigation are “directed to the weight of the evidence, not its admissibility.” *Id.* (citing *Certain Radio Frequency Micro-Needle Dermatological Treatment Devices and Components Thereof* (“*Radio Frequency Micro-*

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<sup>28</sup> FIB stands for “Focused Ion Beam,” which was a method used in this Investigation to create very thin lamella samples for STEM-HAADF imaging. (Tr. (Kelly) at 403:7–10.).

*Needle*”), Inv. No. 337-TA-1112, Order No. 28 at 2 (Apr. 30, 2019)). Moreover, Respondents’ challenge is not supported because Respondents failed to provide evidence that the laboratory Modumetal relied on (Exponent) was unqualified or otherwise unreliable.

Moreover, testing data from Exponent has been credited by the Commission previously. *Certain Light-Emitting Diodes & Prods. Containing the Same* (“*Light-Emitting Diodes*”), Inv. No. 337-TA-784, ID at 50–51, n.32 (July 9, 2012). In *Light-Emitting Diodes*, there was a challenge to the reliability of third-party testing and analysis from several third-parties including Exponent. *Id.* The grounds for the challenge were that there was “no way to verify where the photographs contained in the analyses originated, what products they depict, or whether they have been altered in any way.” *Id.* Notwithstanding, the party challenging the third-party testing and analysis did “not provide any evidence to support its accusations,” nor did it “proffer its own analyses of the accused products to demonstrate that [complainant’s] analyses are inaccurate.” *Id.* There was “no indication” that the complainant’s expert relied on evidence “outside the normal bounds of practice in the art.” *Id.* Therefore, the Commission determined that the third-party testing and analysis were sufficiently reliable. *Id.*

Here, it is a finding of this ID that there is insufficient evidence that, as a threshold legal determination, the testing results provided by Exponent are so unreliable as to require exclusion from the evidentiary record. *Dermatological Treatment*, Inv. No. 337-TA-1356, Order No. 39 at 3. In weighing the evidence in this Investigation, as in prior investigations, Respondents’ criticisms will affect the weight afforded the evidence and expert testimony. *Id.*

Despite that Exponent’s test results satisfy the threshold legal determination of admissibility, Respondents presented more than a preponderance of evidence, described below, that Modumetal’s STEM-HAADF images and EDS line scan results should be afforded little

evidentiary weight because of certain anomalies and/or internal inconsistencies. (RRBr. at 19–23.). Specifically, Respondents argued that there are three (3) anomalies or internal inconsistencies, each of which is addressed below. (*Id.*).

First, Respondents proved that according to Modumetal’s and Dr. Kelly’s application of their EDS line scan data to their STEM-HAADF images for two (2) of the Accused Representative Products, the 10BL-S and the 4 BTX-S, the highest nickel content occurs in the lighter layers instead of the darker layers. (Tr. (Frankel) at 913:9–916:4 (testifying that, according to Modumetal’s STEM-HAADF and EDS line scan data, the 10BL-S product and the 4 BTX-S product exhibit higher nickel content within a light-colored layer); RDX-0003C.0029; JX-0015.0002, .0007 (10BL-S); JX-0105.0010–.0011 (4 BTX-S)). This is contrary to the test results for the other two (2) of the Accused Representative Products (the 16-12FBU-S and the 8 C5OLO-S). It is also contrary to Dr. Kelly’s testimony that the lighter layers should exhibit lower nickel content and vice versa. (Tr. (Kelly) at 401:15–402:5 (“there are bright areas where the atomic number is higher and darker areas where it’s lower”), 413:8–414:25, 415:1–416:11; CDX-0001.0041, .0042). In other words, according to Dr. Kelly’s own interpretation of Exponent’s test results, the STEM-HAADF images and the EDS line scan data yield polar opposite conclusions about the metal content in the alleged layers. (Tr. (Kelly) at 401:15–402:5 (“there are bright areas where the atomic number is higher and darker areas where it’s lower”), 413:8–414:25, 415:1–416:11; CDX-0001.0041, .0042.).

Neither Modumetal nor Dr. Kelly addressed this point. No witness from Exponent testified about what could have caused this apparent inconsistency. There are no lab notes, raw data, or other information about how Exponent conducted the testing or processed the data. Absent any rebuttal from Modumetal or Dr. Kelly, lacking any context or explanation from

Exponent, and without any documentary information from Exponent, Respondents' identification of internal self-contradictions within Modumetal's test results and analysis stands unrebutted. Moreover, although Respondents did not identify such anomalies with respect to the other two (2) Representative Accused Products (the 16-12FBU-S and the 8 C5OLO-S), there is no way to know that whatever caused the internal inconsistencies Respondents identified for the 4 BTX-S and the 8 C5OLO-S did not also degrade the accuracy of of Modumetal's other STEM-HAADF and EDS line scan test results.

It is a finding of this ID that such an unrebutted internal contradiction in Exponent's STEM-HAADF images and EDS line scan data undermines the credibility of all the STEM-HAADF images and EDS line scan data that Modumetal and Dr. Kelly relied on to purportedly identify the alleged "layers" and the layers' respective compositions. Therefore, the evidentiary weight to be afforded Dr. Kelly's testimony about Exponent's STEM-HAADF and EDS line scan results, as well as Exponent's STEM-HAADF and EDS line scan results themselves, is minimal.

Because Respondents undermined Modumetal's primary infringement evidence, Modumetal failed to carry its burden of proof on infringement for any of the Accused Products.

Second, Respondents demonstrated that in the STEM-HAADF image of the 8 C5OLO-S product, there are regions of higher brightness that also have higher nickel content and lower nobility. In the remaining Modumetal STEM-HAADF images, it is the regions of lower brightness that have higher nickel content and lower nobility. (RRBr. at 20; Tr. (Kelly) at 541:4–543:13 (testifying that darker layers have more nickel, lighter layers have less nickel, and that a STEM-HAADF image of 8 C5OLO-S has the darker layers with less nickel and vice versa); JX-0017.0002.).

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Dr. Kelly explained the discrepancy. (Tr. (Kelly) at 575:1–578:15.). Specifically, Dr. Kelly testified that Exponent experienced difficulties preparing the sample that resulted in the disputed STEM-HAADF image that caused the sample to bend, which resulted in a reversal of what should have been a bright/dark contrast pattern. (*Id.*).

In another STEM-HAADF image of the 8 C5OLO-S Accused Representative Product, which was created from a sample that Exponent did not have difficulty preparing, an expected contrast pattern is displayed. (*Id.*; JX-0017.0005.).

Neither Respondents nor Dr. Frankel rebutted Dr. Kelly’s explanation. Therefore, it is a finding of this ID that Dr. Kelly’s testimony, which explained the discrepancy in the STEM-HAADF image, is credible and adequately addresses this criticism from Respondents and Dr. Frankel.

Third, Respondents argued, but did not prove, that for the 10BL-S Accused Representative Product, there are changes in brightness within certain regions Dr. Kelly identified as “light layers,” but for the 16-12FBU-S product, Dr. Kelly identified the same changes in brightness as “dark layers.” (RRBr. at 20 (citing Tr. (Frankel) at 902:16–903:7 (testifying that the alternating light and horizontal bands are “striations” rather than layers, but not testifying that Dr. Kelly was inconsistent in identifying changes in brightness as either dark layers or light layers in JX-0015.0002 (10BL-S) as compared to JX-0016.0002 (16-12FBU-S); Tr. (Kelly) at 413:8–414:25 (testifying that the alternating horizontal light and dark bands in the STEM-HAADF images of the 10BL-S and the 16-12-FBU-S are the claimed “layers”; CDX-0001.0041; JX-0015.0002 (10BL-S); JX-0016.0002 (16-12FBU-S)).).

The cited testimony by Dr. Frankel does not say that Dr. Kelly was inconsistent in identifying changes in brightness as either dark layers or light layers in JX-0015.0002 (10BL-S)

as compared to JX-0016.0002 (16-12FBU-S), and therefore does support Respondents' argument. Therefore, it is a finding of this ID that Dr. Frankel's testimony did not rebut Dr. Kelly's testimony, and therefore, was not persuasive.

In addition to arguing that Modumetal's STEM-HAADF images and EDS line scan data are not reliable, Respondents argued that Modumetal and Dr. Kelly have selectively picked certain features in the STEM-HAAF images that would fit their definition of "layers." (RRBr. at 20–23; Tr. (Frankel) at 902:16–915:3).). According to Dr. Frankel and Parker Hannifin, in so doing, Modumetal and Dr. Kelly have accused prior art features known as "striations" rather than layers.

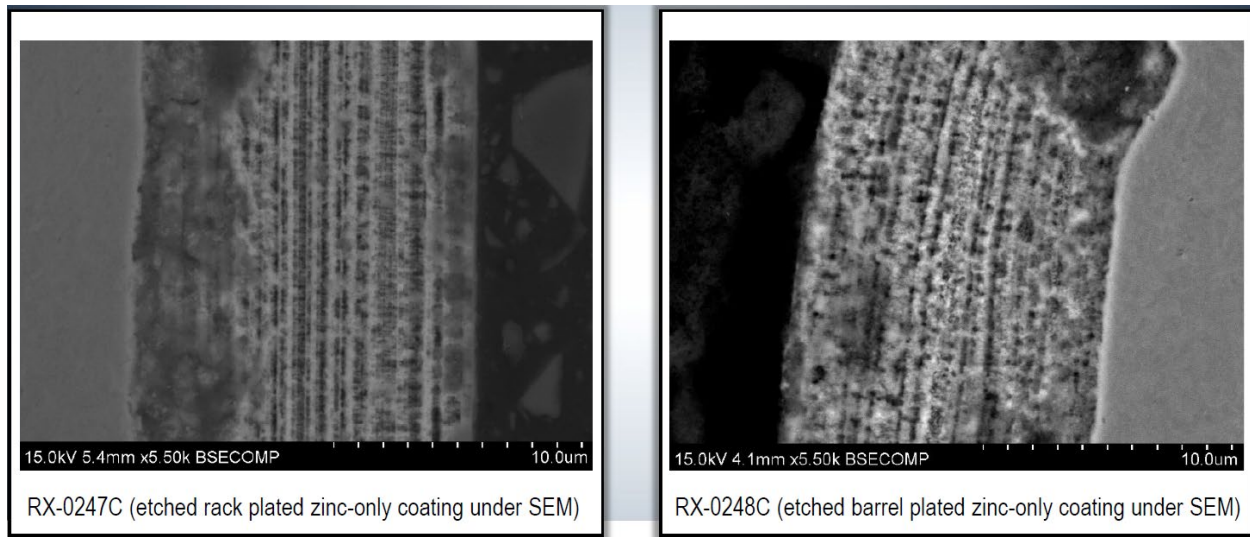
Dr. Frankel testified that two (2) SEM<sup>29</sup> images produced by Parker Hannifin depict pure zinc coatings with darker and lighter bands. (*Id.*; RDX-0003C.0022; RX-0247C; RX-0248C.). According to Dr. Frankel, because the coatings are pure zinc, the alternating light and dark bands cannot be due to compositional differences or differences in nobility, i.e., cannot qualify as the claimed "layers," required by Asserted Claims 1, 2, 3, 5 and 7 of the '419 patent and Asserted Claims 1, 2, 3, and 5 of the '613 patent, but instead should be identified as prior art "striations." (Tr. (Frankel) at 903:8–14, 903:24–905:12; RDX-0003C.0022; RX-0247C; RX-0248C.).

The SEM images of pure zinc-only coatings about which Dr. Frankel testified are reproduced in Figure 9 below. The image on the left is a SEM image of a rack-plated zinc-only coating and the image on the right is a SEM image of a barrel-plated zinc-only coating.

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<sup>29</sup> "SEM" stands for "Scanning Electron Microscopy." (Tr. (Kelly) at 410:3–24.). In addition to STEM-HAADF, SEM is another type of electron microscopy that is used to visualize features of a sample that are too small to resolve with optical microscopy. (*Id.*). Modumetal used SEM internally, before this Investigation, to analyze the structure of the layers of its NanoGalv<sup>®</sup> coatings. (Tr. (Li) at 281:3–16, 293:17–294:3; CX-0097.0009.). However, nobody explained the differences between SEM and STEM-HAADF testing and/or how to interpret images produced by one testing method versus the other.

**Figure 9: SEM Images of Parker’s Rack-Plated and Barrel-Plated Zinc-Only Coatings**



(Tr. (Frankel) at 903:8–14, 903:24–904:14; RDX-0003C.0022; RX-0247C; RX-0248C.).

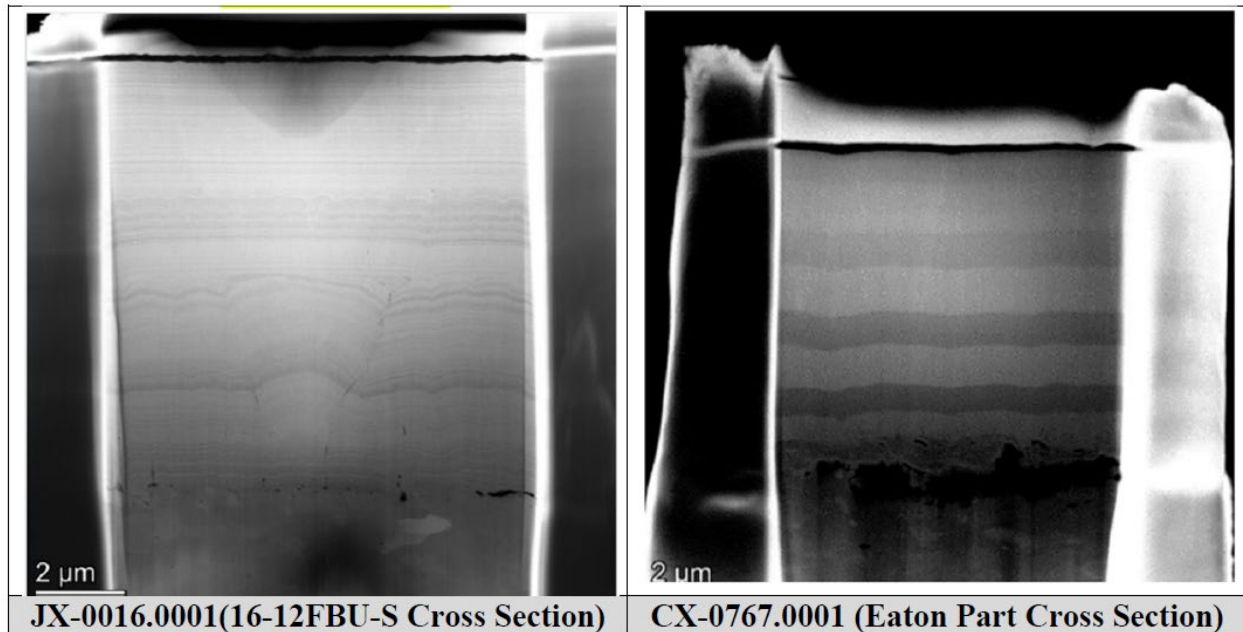
According to Respondents’ argument, because striations can occur in pure zinc coatings, striations do not differ in nobility or composition. (RRBr. at 21–22.). Therefore, according to Respondents’ argument, striations cannot be the claimed layers of Asserted Claims 1, 2, 3, 5, and 7 of the ’419 patent and 1, 2, 3, and 5 of the ’613 patent. (*Id.*). Moreover, according to Respondents’ argument, because pure zinc coatings have been known for almost 200 years, reading the claims to cover the kinds of striations that occur in pure zinc coatings is “not enabled by the Asserted Patents and would swallow whole the nearly two-hundred-year-old field of art.” (*Id.* (citing Tr. (Frankel) at 882:24–885:14).).

Modumetal’s two (2) responsive arguments are: 1) there is no prosecution disclaimer that distinguished the claimed “layers” from the prior art “striations;” and 2) what Respondents refer to as “striations” are not inherently formed in all electrodeposition processes, but rather result from changing electrodeposition parameters such as current density. (CBr. at 40–41.). In other words, according to Modumetal’s counterargument, the intrinsic record does not preclude Modumetal from applying a broad claim scope for the term “layer” that would encompass

“striations.” (*Id.* (“changing the current during deposition creates both layers and striations—because they are the ***same thing***”) (emphasis added).). Moreover, according to Modumetal’s counterargument, applying a broad claim scope for the term “layer” does not result in lack of enablement or “swallowing whole” the entire art because the allegedly infringing layers are formed by varying electrodeposition parameters, not as a side effect inherent to all electrodeposition processes. (*Id.*).

As evidence that the alleged layers are different from prior art “striations” because the alleged layers are formed by varying electrodeposition parameters such as current, rather than being formed inherently, Modumetal compared a STEM-HAADF image of the 16-12FBU-S Accused Representative Product with a STEM-HAADF image of a ToughShield® Plus product manufactured domestically at Parker Hannifin’s facility in Eaton, Ohio (“Eaton Part”). (CBr. at 41–42; Tr. (Kelly) at 423:6–424:14; JX-0016.0001 (STEM-HAADF image of 16-12FBU-S); CX-0767.0001 (STEM-HAADF image of Eaton Part); CDX-0001.0046.). The images Modumetal compared are reproduced in Figure 10 below. The STEM-HAADF image of the 16-12FBU-S is on the left and the STEM-HAADF image of the Eaton Part is on the right.

**Figure 10: STEM-HAADF Images of 16-12FBU-S Accused Representative Product and the Eaton Part**



(Tr. (Kelly) at 423:6–424:14; JX-0016.0001 (STEM-HAADF image of 16-12FBU-S); CX-0767.0001 (STEM-HAADF image of Eaton Part); CDX-0001.0046.).

Modumetal argued that the STEM-HAADF image of the 16-12FBU-S depicts “thin alternating light and dark layers (Respondents’ alleged “striations”),” whereas the STEM-HAADF image of the Eaton Part does not. (CBr. at 41–42; Tr. (Kelly) at 423:6–424:14.). Dr. Kelly’s testimony on this matter is quoted below.

Q. And now what are you showing on this slide 46 of CDX-1?

A. So if we look on the right side, which is the CX-0767.1, that’s [the Eaton Part], and you can see there are layers, horizontal stripes, altering in coloration from the substrate, which is at the bottom, stripes going up to the top, and the scale bar is 2 microns. And so those are certainly greater than a micron. So they can deposit layers thicker than a micron, as shown by this STEM-HAADF image.

Q. Okay. And what about – you’re talking about now which – just to be clear, which image were you just talking about?

A. That’s the image on the right.

Q. And the image on the left?

A. Is from the – again, another STEM-HAADF image from 16-12FBU-S. And you can say in this case there are many, many layers, starting with substrates at the bottom, platinum on the two sides and the top, and you can see they are very level near the top, but then they have some undulations, as you move left to right, as you get near the bottom, but they are clearly layers.

(Tr. (Kelly) at 423:6–424:14.).

However, Modumetal neither made this argument nor cited to CX-0767 in its Pre-Hearing Brief. Thus, Modumetal’s argument is deemed abandoned, waived, or withdrawn pursuant to Ground Rule 7.2.

Moreover, Modumetal’s argument, even if true and supported by the record, does not carry the day. Modumetal’s argument, at most, establishes that not all electrodeposition processes produce “striations.” However, Respondents are not saying that all electrodeposition processes produce striations. (RRBr. at 22.). Rather, Respondents are saying that the process for coating the Accused Representative Products results in striations. (*Id.*). Modumetal’s argument and evidence in support do not prove that the process for coating the Accused Representative Products results in layers but not striations.

Ultimately, the problem with Respondents’ “striations” argument is that it relies on a construction of the claim term “layer” that is neither correct nor consistent with the construction adopted by the *Markman* Order. (Order No. 30 at 14–25.). Specifically, Respondents and Dr. Frankel argued that “striations” cannot be “layers” because striations do not differ in composition or nobility. (Tr. (Frankel) at 903:8–14, 903:24–904:14; RRBr. at 21–22.). The adopted construction, and the correct construction, is “plain and ordinary meaning,” with no requirement that one layer differ in nobility or in composition from another layer. (Order No. 30 at 14.). There is no evidence, testimonial or otherwise, that the plain and ordinary meaning of

“layer” requires one layer to have a different composition or nobility than another layer.<sup>30</sup>

Moreover, as Dr. Kelly noted, the pure zinc coating “striations” are different from, and therefore do not encompass, the allegedly infringing layers because the allegedly infringing layers have differing average atomic number. (Tr. (Kelly) at 401:23–402:11 (testifying without rebuttal that the brighter area in a STEM-HAADF image “has a higher atomic number than the darker area on average”).). While differing atomic number is not required by the construction of the claimed “layer,” (Order No. 30 at 14–25), it does distinguish the accused layers from what Respondents and Dr. Frankel referred to as “striations,” thus effectively rebutting their argument that Modumetal is accusing non-infringing prior art striations. (Tr. (Kelly) at 401:23–402:11.).

Respondents also argued that their coating process could not create the claimed layers with thickness below 1,000 nanometers as required by the Asserted Claims because Respondents

[REDACTED]

[REDACTED]

[REDACTED] (RPBr. at 28–29;

RRBr. at 11–15.). In support of their argument, Respondents’ fact witness, Dr. Wagener,

testified during the Hearing, that, when [REDACTED] [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] (Tr.

(Wagener) at 805:23–807:7, 808:4–17; JX-0038 (Sadananda Rashmi, Liju Elias & Ampar

Chitharanjan Hegde, *Multilayered Zn-Ni alloy coatings for better corrosion protection of mild*

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<sup>30</sup> Other claim limitations introduce requirements on the composition and nobility of the claimed first layer and the claimed second layer, but claim element 1[b] does not contain those limitations.

steel, 20 Engineering Science and Technology 1227–1232 (2016) (“Rashmi”).).

Dr. Wagener testified that he found Rashmi as he was searching for ideas for the development of a new anti-corrosion coating. (*Id.*). Dr. Wagener explained that the Rashmi paper describes coating parameters that are “very close to industrial application,” i.e., plating “that could be done on the standard plating line that Parker had in its possession.” (*Id.*).

Dr. Wagener explained that Rashmi describes how to vary current density in the range of 2 to 5 amps per square centimeter as depicted in Table 2 of Rashmi to make a multilayered coating as depicted in Figure 7 of Rashmi. (Tr. (Wagener) at 808:18–810:14; JX-0038.0003 (Table 2), .0005 (Fig. 7).). Figure 7 and Table 2 of Rashmi are reproduced in Figure 11 below. Table 2 of Rashmi provides current density on the left column in units of amps per square decimeter ( $A/dm^2$ , which can also be expressed as  $A\cdot dm^{-2}$ ), the weight percent of nickel in a monolithic zinc-nickel alloy coating in the next column to the right, and the corrosion potential in the next column to the right. (JX-0038.0003.).

Figure 7 of Rashmi depicts the corrosive progress for a multilayered coating on the left versus the corrosive progress for a homogenous (monolayer) coating on the right. (JX-0038.0005.).

**Figure 11: Table 2 and Figure 7 of Rashmi**

**Table 2**

The variation in Ni content, appearance and corrosion rate of monolithic Zn-Ni alloy coatings with deposition current density (c.d.) at 303 K, pH = 6.0.

| c.d.<br>$A\ dm^{-2}$ | wt% of Ni | $-E_{corr}$<br>V vs SCE | $i_{corr}$<br>$\mu A\ cm^{-2}$ |
|----------------------|-----------|-------------------------|--------------------------------|
| 2.0                  | 2.31      | 1.05                    | 18.1                           |
| 3.0                  | 4.62      | 1.04                    | 11.3                           |
| 4.0                  | 6.86      | 1.04                    | 16.7                           |
| 5.0                  | 7.91      | 1.02                    | 19.2                           |

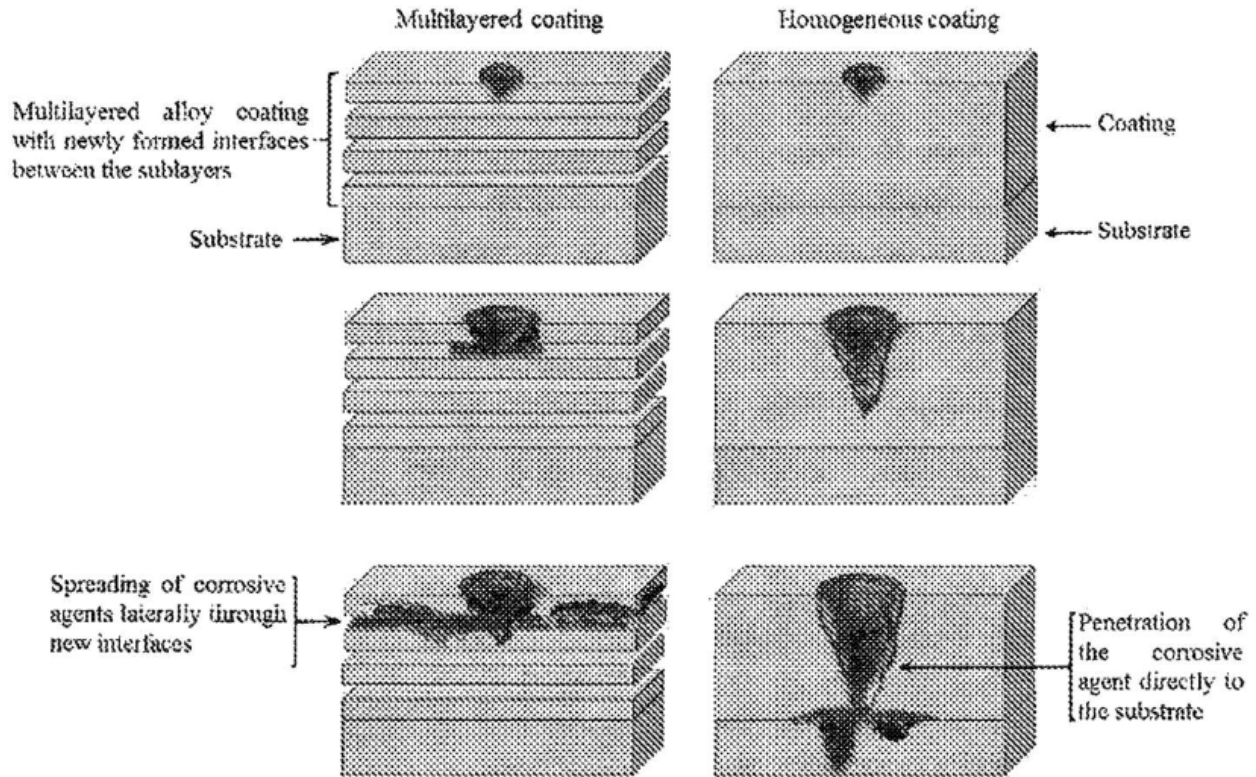


Fig. 7. Schematic of the corrosion mechanism in multilayer and monolayer alloy coatings.

(Tr. (Wagener) at 808:18–810:14; JX-0038.0003 (Table 2), .0005 (Fig. 7).

Dr. Wagener's Hearing testimony is quoted below.

Q. And if we take a look and pull up Fig. 7, which is on JX-0038.0005, Dr. Wagener, can you describe the hypothesis of the Rashmi paper?

A. Yes. Here you see the hypothesis. So on the left-hand side you see several sublayers, which are represented, and there is an interchanging interplay between stable, meaning corrosion-resistant, and noncorrosion-resistant layers. So that's why corrosion, which is coming from the top, it's not going to go down to the bottom, but it is deviated towards the side laterally. That means you have to develop a layer, one layer, with bad corrosion properties, for example, if you build nickel into that layer.

Q. To make sure I understand, when you say you had to build nickel into –

Interpreter: Include nickel into it is better said.

Q. Does the Rashmi paper discuss having different concentrations of nickel in the different layers that we're looking at on the left-hand side of Fig. 7?

A. Yes. So the layers with nickel, they interchange with the layers without the

nickel – with – okay, no.

Interpreter: Sorry.

A. In all of these layers nickel is included, but layers with more nickel are interchanging with layers with less nickel.

Q. Did the Rashmi paper describe how to create these different layers?

A. Yes, with variation of the current density.

Q. And if we could pull up table 2, which is on JX-0038.0003. What current densities did the Rashmi paper disclose using to change the layers?

A. So these are current densities in the range of 2 to 5 amps per square centimeter – oh, decimeter, sorry, square decimeter, not centimeter. This is very interesting for industrial application, because normally with industrial application you rarely exceed 3 or maximum 4 amp per square decimeter.

Q. What thickness did the Rashmi paper discuss for the different layers?

A. Do you mean now for the overall layer coating or for the sublayers?

Q. For the different layers, the layers of differing nickel concentration.

A. Yes. So the range was from nanometers to micrometers.

(Tr. (Wagener) at 808:18–810:14; JX-0038.0003 (Table 2), .0005 (Fig. 7).).

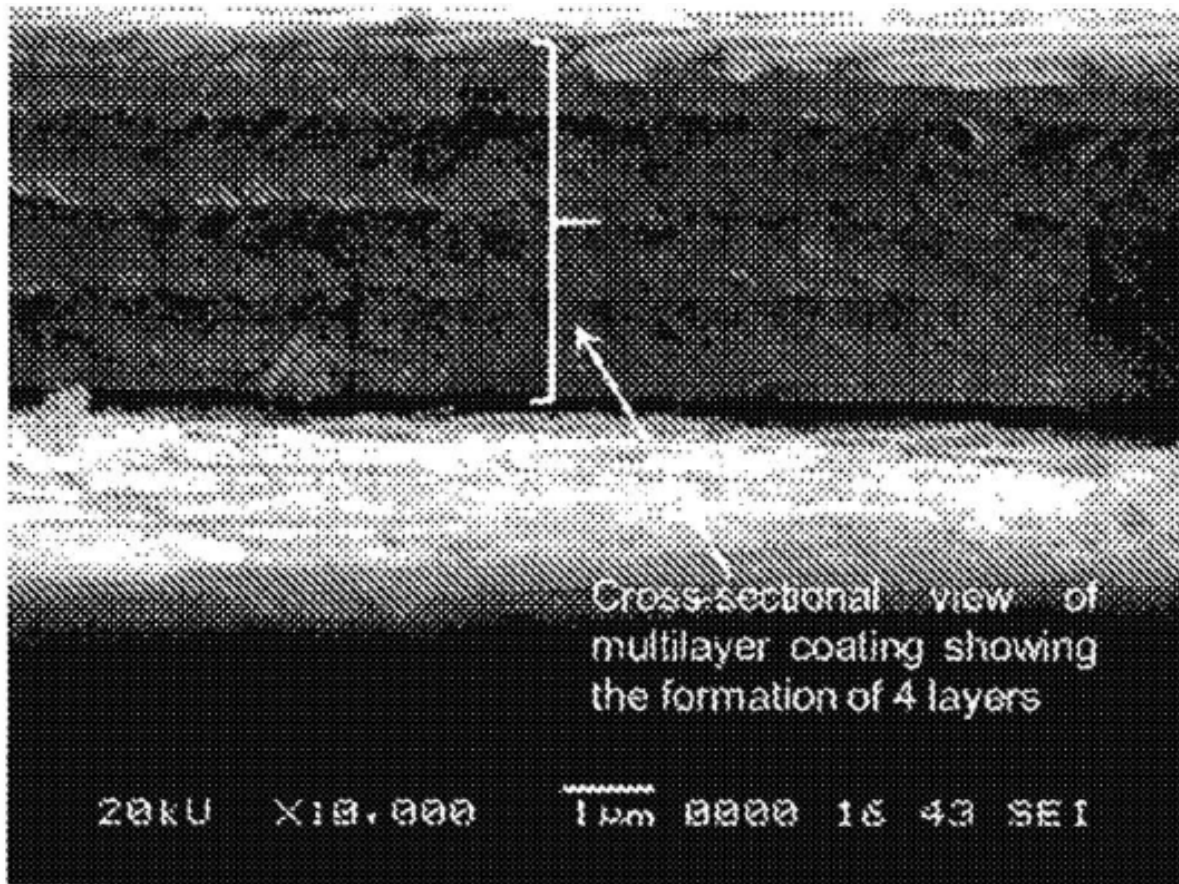
Dr. Wagener testified that he was primarily interested in Rashmi's disclosure, in Figure 6, of a multilayer structure where the individual layers are thicker than one (1) micron. (Tr. (Wagener) at 810:15–811:16; JX-0038.0005 (Fig. 6).). According to Dr. Wagener, the reason he was primarily interested in layers thicker than one (1) micron is because it was feasible with conventional equipment. (*Id.*). Additionally, [REDACTED]

[REDACTED] (Tr. (Wagener) at 7–13.).

Figure 6 of Rashmi, Figure 12 below, depicts an SEM image of a Zn-Ni coating with four (4) layers. (JX-0038.0005.). At the bottom center of Figure 6 of Rashmi, Figure 12 below, there is a distance scale indicating a thickness distance of one (1) micron in the image. (*Id.*). The four

(4) layers are indicated by an arrow and an annotation that says, “cross-sectional view of multilayer coating showing the formation of 4 layers.”

Figure 12: Figure 6 of Rashmi



**Fig. 6.** Cross-sectional SEM image of CMMA (Zn-Ni)<sub>3.0/5.0/4</sub> coating shows the formation of layered coatings.

(Tr. (Wagener) at 810:15–811:16; JX-0038.0005.).

According to Dr. Wagener, Parker Hannifin implemented the ideas in the Rashmi paper to make [REDACTED] (Tr.

(Wagener) at 811:17–20.). That effort was called [REDACTED] (*Id.* at 812:18–10.).

According to an early [REDACTED]

[REDACTED] (Tr. (Wagener) at 812:11–815:2;  
CX-0283C.0006, .0007.). Parker Hannifin's [REDACTED]  
[REDACTED] are reproduced in Figure 13 below.

**Figure 13: Parker's** [REDACTED]



[REDACTED]

(Tr. (Wagener) at 812:11–815:2; CX-0283C.0006, .0007.).

Parker Hannifin also used [REDACTED]

[REDACTED]

[REDACTED] (Tr. (Wagener) at 815:15–816:14; CX-0283C.0008.). Parker Hannifin's [REDACTED]

[REDACTED] are reproduced in Figure 14 below. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Figure 14: Parker's



(Tr. (Wagener) at 815:15–816:14; CX-0283C.0008.).

[REDACTED]

[REDACTED] (Tr. (Wagener) at 815:3–14.).

In another [REDACTED] progress report, dated June 2019, Parker reported having made progress in [REDACTED]

[REDACTED] (Tr. (Wagener) at 816:15–817:10; RX-0232C.0007.). The June 2019 [REDACTED] report contains a graph, which is reproduced in Figure 15 below, that [REDACTED] [REDACTED] (*Id.*).

From left to right, [REDACTED]

[REDACTED]

[REDACTED] (Tr. (Wagener) at 817:11–818:11; RX-0232C.0007.). The middle region is highlighted in green because it represents the effects of [REDACTED]

[REDACTED] (*Id.*).

From top to bottom, there is a

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] (*Id.*). That is because, according

to the Rashmi paper, [REDACTED]

[REDACTED]

[REDACTED] (*Id.*).

**Figure 15: Parker's June 2019 [REDACTED] Graph**



(Tr. (Wagener) at 816:15–817:10; RX-0232C.0007.).

According to Parker Hannifin's June 2019 [REDACTED] progress report, Parker Hannifin

[REDACTED]

[REDACTED] (Tr.

(Wagener) at 818:12–19; RDX-0232C.0009.).

In a later [REDACTED] progress report, Dr. Wagener stated that when he used [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] (Tr. (Wagener) at 818:12–820:10; RX-0140C.0002, .0003.). [REDACTED]

[REDACTED]

[REDACTED] (Tr. (Wagener) at 820:11–822:1;  
RX-0140C.0012.).

An undated [REDACTED]

[REDACTED]

[REDACTED] (Tr. (Wagener) at 822:2–823:7, 823:9–825:9; JX-0039C.0003.). [REDACTED]

[REDACTED]

[REDACTED]

**Figure 16: SEM Image of** [REDACTED]



(Tr. (Wagener) at 822:2–823:7, 823:9–825:9; JX-0039C.0003.).

Parker Hannifin's [REDACTED] Technical Discussion document also contains a slide

labeled [REDACTED] (Tr. (Wagener) at 842:8–846:22; JX-0039C.0004.). [REDACTED]



**Figure 17: Optical Microscopy and SEM Images of** [REDACTED]



(Tr. (Wagener) at 842:8–846:22; JX-0039C.0004.).

Finally, a number of Parker Hannifin's internal documents for its original ToughShield®

Plus product, i.e., the coating that is the subject of the Original Accused Products, [REDACTED]  
[REDACTED] (Tr. (Wagener) at 847:2–  
848:22, 849:17–852:18; RX-0242C [REDACTED]  
[REDACTED]  
[REDACTED] RX-0234C [REDACTED]  
[REDACTED] at .0002–.0003 [REDACTED]  
[REDACTED] [REDACTED]  
[REDACTED]  
[REDACTED] Respondents  
argued that the development history and process specifications are evidence that the Accused  
Original Products do not have layers smaller than 1 micron, and therefore fall outside the scope  
of the Asserted Claims. (RRBr. at 12–15.).

It is a finding of this ID that the evidence described above for Respondents’ development  
history for the Accused Original Products and the specifications for the Accused Original  
Products strongly suggests that the layers in the Accused Original Products are thicker than the 1  
micron (1,000 nm) upper limit recited in the Asserted Claims.

Respondents also contended that exhibit JX-0041C, which is Parker Hannifin’s “Process  
Standard” document titled “Zinc Nickel Plating (ToughShield Plus) Process Specification,” is  
dated January 28, 2025, proves that the Accused Replacement Products do not infringe. (RRBr.  
at 12–14; JX-0041C.). Dr. Wagener testified that paragraph 7.1 of JX-0041C describes the  
process for [REDACTED] i.e., the Accused Replacement  
Products for which the 4 BTX-S is representative. (Tr. (Wagener) at 853:3–15 (emphasis

added); JX-0041C.0003.).

Paragraph 7.1 of exhibit JX-0041 states [REDACTED]

[REDACTED] (*Id.*). Dr.

Wagener testified that the cited language means that, for the process of making [REDACTED]

[REDACTED] Parker Hannifin and its suppliers [REDACTED]

[REDACTED] (Tr. (Wagener) at 853:16–854:19.). Dr. Wagener

also testified that the process for making [REDACTED]

[REDACTED] (Tr. (Wagener) at 853:16–856:2; *see also*

RX-0246C [REDACTED] at

.0004.). An excerpt from JX-0041C that contains Parker Hannifin’s description of its process for making the Accused Replacement Products, or its [REDACTED] that Parker Hannifin claimed does not infringe the Asserted Patents, is reproduced in Figure 18 below:

**Figure 18: Annotated Excerpts from Parker's Process Specification for the Accused Replacement Products**



Dr. Wagener testified that Parker Hannifin's [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] (Tr. (Wagener) at 856:23–858:5; *see also* Tr. (Smerdel) at 761:22–763:24; RX-0225C [REDACTED]

[REDACTED]

Respondents' expert, Dr. Frankel, also offered his opinion that the Parker Hannifin internal documentation discussed above and in Dr. Wagener's testimony prove that the Accused Products cannot have layer thicknesses below 1,000 nm (one (1) micron), i.e., does not practice claims 1, 2, 3, 5, and 7 of the '419 patent or claims 1, 2, 3, and 5 of the '613 patent. (Tr. (Frankel) at 894:8–899:12; RDX-0003C.0015–.0019.).

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Modumetal counterargued that according to Dr. Wagener, the Rashmi paper says that deposition of nanometer-scale layers do not require a special rectifier. (CBr. at 39 (citing Tr. (Wagener) at 863:14–864:19.)). Modumetal evidently wanted to undermine Parker Hannifin’s argument and evidence that it developed ToughShield® Plus such that [REDACTED]

[REDACTED]

[REDACTED]

However, Modumetal’s characterization of Dr. Wagener’s testimony is not accurate. Dr. Wagener’s testimony is reproduced below.

Q. So my question is, Rashmi discloses the creation of nanolayers; is that right?

A. Yes, that’s right.

Q. And is it possible to tell, based on these parameters, how fast the current density would need to change based on this disclosure?

A. Well, if you deposit after ten minutes, and if you deposit 60 layers, then the scale must be in the seconds. A second, I mean, a scale of seconds.

Q. Approximately every ten seconds; is that right, sir?

A. Yes, according to this calculation, that would be correct.

Q. Can a standard rectifier change the current density on the order of once every ten seconds?

A. It depends on the rectifier, but under continuing operation this would not be something to recommend.

Q. But is it possible?

A. Possible maybe, but not for a continuous operation.

Q. In fact, the Rashmi paper reported on the equipment they were using; isn’t that right?

A. We would have to look at the paper, but I assume that’s the case.

Q. We can bring up JX-0038.0002. Focusing on the left side of this document, closer to the bottom, the end of the second full paragraph that starts with, “Further, the CMA coatings at the bottom, Rashmi discloses that it was using a computer-

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controlled DC power source, model N6705A, made by Agilent Technologies in the USA.” Do you see that?

A. Yes.

Q. Is this standard equipment?

A. I cannot – I cannot tell. I don’t know.

Q. Just to be clear, you don’t know whether this is standard plating equipment or the high-tech equipment that we were referring to earlier; is that right?

A. I do not know this device, so, therefore, I cannot say anything about it.

(Tr. (Wagener) at 863:14–865:3.).

When asked whether the rectifier used in Rashmi was standard, Dr. Wagener clearly testified that he did not know. He testified, “I do not know this device, so, therefore, I cannot say anything about it.” (Tr. (Wagener) at 865:2–3.). Moreover, when he was asked whether a standard rectifier could achieve the rate of current density change reported in Rashmi, i.e., every ten seconds, Dr. Wagener testified that it could, although it would not be suitable for “continuous operation.” (*Id.* at 864:2–10.). Modumetal’s attempt to argue that Dr. Wagener admitted Rashmi discloses depositing nanoscale layers without special equipment is not supported by the record. The evidence does not prove conclusively whether or not Rashmi used a standard rectifier to deposit nanoscale layers. Thus, Modumetal’s attempt to argue that [REDACTED]

[REDACTED]

[REDACTED]

Modumetal also counterargued that Parker Hannifin’s non-infringing descriptions in its product specifications and development documents are irrelevant to the infringement inquiry. (CBr. at 36–39.). Not so. The fact that Parker Hannifin was making and developing coatings

[REDACTED]

[REDACTED] Parker Hannifin’s non-infringing descriptions in its product

specifications and development documents corroborate, and thus further reinforce, this ID's determination that Modumetal failed to satisfy its burden to prove by a preponderance of evidence that the Accused Products have the claimed layers within the claimed thickness range. Weighing the evidence, Parker Hannifin's non-infringing descriptions in its product documentation and in its development process significantly outweigh Modumetal's flawed and undermined STEM-HAADF images and EDS line scan data.

Ultimately, Modumetal failed to prove infringement of the claimed "layers" of Asserted Claims 1, 2, 3, 5, and 7 of the '419 patent and Asserted Claims 1, 2, 3, and 5 of the '613 patent because its primary infringement evidence, its STEM-HAADF images and EDS line scans, were proven unreliable by Respondents and their expert Dr. Frankel, without rebuttal from Modumetal.

For the foregoing reasons, Modumetal has not proven by a preponderance of evidence that the Accused Products practice claim element 1[b] of the '419 patent and claim element 1[b] of the '613 patent.

3. **'419 Patent Claim Element 1[c]: "a first layer of a first alloy that is less noble than the substrate or the mandrel, the first alloy comprising;"**  
**and**  
**'613 Patent Claim Element 1[c]: "A) a first layer of a first alloy that is less noble than the substrate or the mandrel, the first alloy comprising"**

The Parties' main dispute with respect to claim element 1[c] is whether Modumetal proved by a preponderance of evidence that the first layer identified for claim element 1[b] is "less noble" than the substrate sitting beneath the layer. (CBr. at 21–23; RRB. at 27–33.).

Dr. Kelly testified that, to evaluate nobility of the layers in the Accused Products relative to the nobility of the substrate or mandrel, he analyzed "etching studies on cross sections." (Tr.

(Kelly) at 430:5–9.). Specifically, Dr. Kelly testified that [REDACTED]

[REDACTED] (*Id.* at 430:10–11, 431:7–432:23; CDX-0001C.0052–.0053.).

According to Dr. Kelly, [REDACTED]

[REDACTED] (Tr. (Kelly) at 432:24–434:5; CDX-0001.0056.). Dr. Kelly also testified that different etchant compositions can be used; [REDACTED]

[REDACTED] (Tr. (Kelly) at 434:6–438:13; CDX-0001C.0056; CX-0180C [REDACTED]

[REDACTED]; CX-0205C (Nital etch).).

Respondents argued that, regardless of how “noble” is construed, Modumetal’s etching tests (also referred to sometimes as “accelerated corrosion testing”) do not prove any of the relative nobility requirements of the Asserted Claims because there is no evidence that the etching testing methodology Modumetal and Dr. Kelly relied upon is an accepted method in the art for assessing relative nobility. (RRBr. at 28–30.). In support of Respondents’ argument, Dr. Frankel testified that etching is not typically used in an accelerated corrosion test because it results in a form of corrosion that is different than corrosion that occurs in environmental conditions. (Tr. (Frankel) at 921:20–924:13.). Dr. Frankel noted that etching is a standard test that is used to reveal “details of the microstructure” of a sample, whereas a more standard corrosion test is the “salt spray test,” which involves applying a spray or mist of a concentrated salt solution to a sample in a very specific, standardized way. (*Id.*). Dr. Kelly admitted on cross-examination that he was not aware of any standard or published, peer-reviewed protocol that

describes or uses the etching testing he relied on. (Tr. (Kelly) at 535:17–536:15.). Moreover, neither Dr. Kelly nor any other witness testified that etching is a common or accepted method in the field of the Asserted Patents for assessing nobility, non-reactivity, corrosion resistance, or corrosion potential.

Modumetal’s counterargument<sup>32</sup> is that their former director of research and development, Dr. Marie Li,<sup>33</sup> testified that Modumetal developed its etching technique as a standardized way to reveal the layers of their NanoGalv<sup>®</sup> product. (Tr. (Li) at 287:22–290:23, 295:16–19; CX-0097 (work instruction for laminate verification in NanoGalv-coated fasteners) at .0006; JX-0045.0004 (etching standard operating procedure)), and that the same etching technique can be used to assess relative nobility. (Tr. (Li) at 295:21–22; CBr. at 44–45.). Dr. Li’s testimony is vague, conclusory, and insufficient even if accepted at face value. The entirety of Dr. Li’s testimony about the use of etching to assess nobility is:

Q. Can etching be used to show nobility?

A. Yes.

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<sup>32</sup> Modumetal also argued that the same conclusion would be reached whether it used Modumetal’s alkaline ammonium hydroxide/hydrogen peroxide etchant or an acidic Nital etchant for their testing. (CBr. at 45–47.). Even if true, Modumetal’s argument is irrelevant to the issue at hand. The issue at hand is whether Modumetal’s use of an etchant is the type of “accelerated corrosion testing” that is recognized and accepted in the field of the Asserted Patents for the purpose of assessing nobility, not whether the tests were performed with the proper etchant solution.

<sup>33</sup> Modumetal identified Dr. Marie Li as a fact witness who would provide testimony about: “1. The research and development of NanoGalv<sup>®</sup>; 2) Modumetal nanolaminate coating protocol, standards, and specifications; 3) Modumetal’s Domestic Industry Products and facts supporting Modumetal’s domestic industry; 4) Parker Hannifin’s Accused Products; 5) Representativeness of the NanoGalv<sup>®</sup> Fastener of all Nanogalv<sup>®</sup> Domestic Industry Articles.” (CPSt. at 2.). Dr. Li earned a Ph.D in chemical engineering from Northeastern University in China and later was hired by Modumetal in 2006 as a research engineer. (Tr. (Li) at 263:21–265:3.). Dr. Li eventually became a “prototyping manager” for Modumetal in 2015 and then became Modumetal’s head of R&D in 2016. (*Id.*). Dr. Li left Modumetal in 2025. (*Id.*). As Modumetal’s prototyping manager, Dr. Li worked on “scaling up work for nanolaminated alloys.” (*Id.*). As director of R&D, Dr. Li worked on “scaling up of the NanoGalv technology.” (*Id.*; *see also* Tr. (Li) at 272:20–273:5.).

(Tr. (Li) at 295:21–22.).

It is a finding of this ID that Modumetal’s etching-based testing is insufficiently reliable to support Modumetal’s burden of proving, by a preponderance of evidence, that the accused layers have the nobility required in the Asserted Claims. Although *Daubert* doctrine does not apply to Commission Investigations in the same way it applies to jury proceedings, ALJs do perform a threshold evaluation. As a threshold legal matter, Dr. Li’s testimony is not so lacking in credibility or foundation as to require exclusion from the record. (*See*, n.33.). However, to determine the weight afforded her testimony and Modumetal’s etching test results, it is helpful to consider the following factors that trial courts also consider when evaluating the reliability of scientific expert testimony and evidence:

- (1) Whether an expert’s technique or theory can be or has been tested;
- (2) Whether the technique or theory has been subject to peer review and publication;
- (3) The known or potential rate of error in the technique or theory when applied;
- (4) The existence and maintenance of standards and controls; and
- (5) Whether the technique or theory has been generally accepted in the scientific community.

Fed. R. Evid. 702, Committee Notes on Rules (2000); *Daubert v. Merrill Dow Pharms., Inc.*, 509 U.S. 579, 590–91 (1993).

With respect to factors (1) and (2) above, Modumetal, Dr. Kelly, and Dr. Li failed to provide evidence that their etching technique’s validity for assessing nobility could be tested or that the technique has been subjected to peer review and publication. With respect to factors (3), (4), and (5), Modumetal, Dr. Kelly, and Dr. Li also failed to provide evidence of their etching technique’s error rate for assessing nobility, that standards and controls exist and are maintained, or that their etching technique is generally accepted in the field. Modumetal’s reliance on their

etching test fails every one of the five (5) elements considered by trial courts when evaluating the reliability of scientific evidence and testimony.

Although Dr. Li's testimony was grounded in her own expertise and experience, it did not support Modumetal's use of its etching procedure as a standard, approved method that is used in the field of the Asserted Patents to assess relative nobility of metals. Dr. Li testified at length about how Modumetal used its etching procedure to [REDACTED] [REDACTED] not to assess their nobility. (Tr. (Li) at 287:22–290:23, 295:16–19; CX-0097.0006; JX-0045.0004.). The only testimony that could potentially support Modumetal's position was Dr. Li's statement that "yes," etching "can" be used to show nobility. (Tr. (Li) at 295:21–22.). Dr. Li did not describe the conditions under which etching "can" be used to show nobility. She did not provide a basis or foundation for her conclusion. She did not testify that the specific etching process she used to test NanoGalv<sup>®</sup>, or the process used on the Accused Representative Products, is reliable for assessing nobility. Perhaps most significantly, there was no expert testimony that supported Dr. Li.

In contrast, Dr. Frankel's testified credibly and persuasively that standard tests such as the salt spray test are accepted for assessing corrosion resistance, which is one way to assess nobility according to the Asserted Patents, not etching procedures such as the ones employed by Modumetal.<sup>34</sup> (Tr. (Frankel) at 921:20–924:13.). Dr. Frankel's testimony was more credible and persuasive because it was grounded in the intrinsic evidence, as set forth in Section VIII.B.3, which established that assessing nobility (or non-reactivity) in the Asserted Patents means assessing corrosion resistance or corrosion potential. Moreover, during the stage of his testimony where he described his qualifications, Dr. Frankel set a strong foundation for his

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<sup>34</sup> See Section VIII.B.3.

expertise in the field of evaluating corrosion as it affects metals and alloys.

For example, Dr. Frankel was the director of the Fontana Corrosion Center at Ohio State University, which is a world-renowned corrosion center. (Tr. (Frankel) at 875:1–876:22.). Dr. Frankel’s advisor during his studies for his Doctor of Science degree was Mars Fontana, who Dr. Frankel described as “one of the fathers of corrosion engineering.” (*Id.*). Dr. Frankel was also a technical editor for the Journal of the Electrochemical Society for 10 years. (*Id.*). Additionally, Dr. Frankel taught courses on the effects of corrosion at Ohio State University, including a set of one-week courses on corrosion for practicing engineers since 1996. (*Id.*). Dr. Frankel has also hosted webinar-style seminars called CorroZoom with individuals who he has described as the top corrosion scientists in the world. As many as 300 and 1,300 people a month from as many as 78 countries have attended the lectures. (Tr. (Frankel) at 876:23–880:3; RX-0368; RDX-0003C.002–.003.). Additionally, Dr. Frankel testified that he holds six (6) patents related to corrosion protection. (*Id.*). He also testified that he has published more than 350 peer-reviewed papers, most of which are related to corrosion protection. (*Id.*). He testified that he has received many awards, including the Olin Palladium Award from the Electrochemical Society, which he testified is the highest technical award the Electrochemical Society offers. (Tr. (Frankel) at 880:4–881:13.).

Dr. Frankel’s testimony about how etching methods are not representative of corrosion that occurs naturally through environmental exposure was credible. Similarly, his testimony that the standard salt spray test (SST) is more representative of the type of testing used to observe corrosion resistance, was also credible. (Tr. (Frankel) at 921:20–924:13.). In the absence of responsive testimony from Dr. Kelly, it is a finding of this ID that Respondents successfully rebutted Modumetal’s argument and Dr. Kelly’s opinion that their etching testing proved

infringement of the relative nobility requirement of claim element 1[c].

The Parties also disputed whether Modumetal proved by a preponderance of evidence that the Accused Products have the claimed “first alloy.”

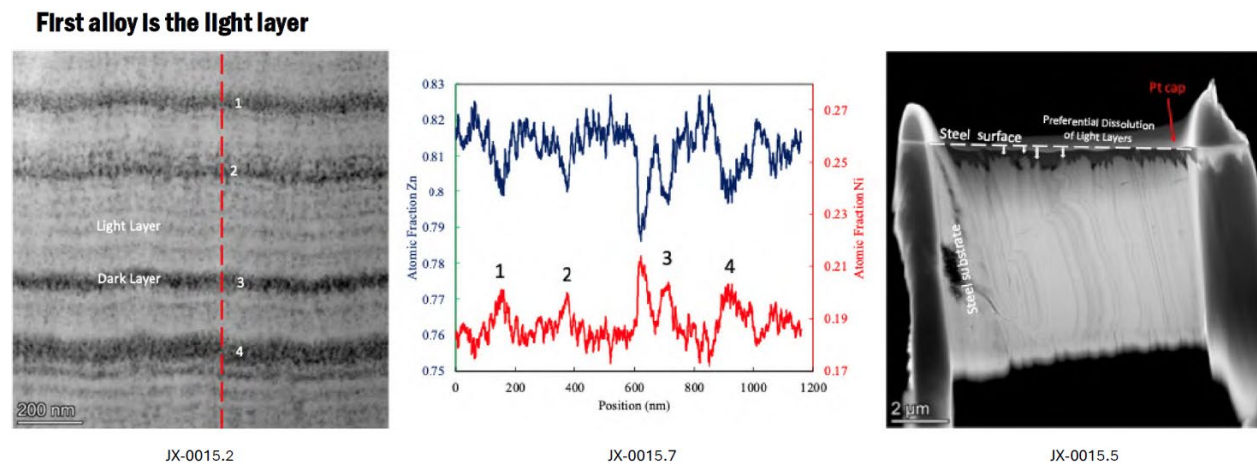
Dr. Kelly testified that EDS line scan data proves that the 10BL-S Representative Accused Product has a first layer with a first alloy. (Tr. (Kelly) at 439:4–440:13; CDX-0001C.0057; JX-0015.0002; JX-0015.0007.). Specifically, Dr. Kelly testified that the alternating light and dark bands in the STEM-HAADF image of the 10BL-S, which is shown in Figure 19 below, occur in the same place within the sample as where the EDS line scan graph depicts alternating regions where first the zinc content increases simultaneously with the nickel content decreasing, and then the zinc content decreases simultaneously with the nickel content increasing. (*Id.*). According to Dr. Kelly, in the EDS line scan graph in the center, the red line purportedly represents nickel content while the blue line represents zinc content. It appears that there is a peak in nickel content (and concomitant valley in zinc content) between the layer labeled “2” and the layer labeled “3,” but the STEM-HAADF image does not depict an associated dark band between layers labeled “2” and “3.” (*Id.*). According to Dr. Kelly, the fact that the alternating light and dark bands occur in the same place in the STEM-HAADF image where the EDS line scan graph depicts alternating regions of simultaneously increasing zinc and decreasing nickel and vice versa, shows that there are two (2) different Zn/Ni alloys. (*Id.*).

Dr. Kelly also testified that the lighter bands, again referencing Figure 19 below, which coincide with lower nickel content, were preferentially dissolved by an etchant, whereas the steel substrate was not dissolved, which according to Dr. Kelly proves that the lighter bands are less noble than the substrate. (Tr. (Kelly) at 440:14–441:4; CDX-0001C.0057–.0058; JX-0015.0005.). In other words, according to Dr. Kelly, the STEM-HAADF image on the right of

Figure 19 below shows that the lighter bands (the claimed “first layer”) have lower nobility than the underlying steel substrate. (*Id.*).

Dr. Kelly’s demonstrative, which contains the STEM-HAADF testing upon which he testified as described above, is reproduced in Figure 19 below. Figure 19 below depicts the STEM-HAADF image of the 10BL-S Accused Representative Product on the left with numerals 1, 2, 3, and 4 labels for the four (4) accused “first layers”; the EDS line scan graph data in the center also shows four (4) numerals which purport to label the “first layers.” There is a STEM-HAADF image of an etched sample on the right.

**Figure 19: 10BL-S STEM-HAADF, EDS Line Scan, and Etching Results From Dr. Kelly’s Demonstrative**



(Tr. (Kelly) at 439:4–441:4; CDX-0001C.0057–.0058; JX-0015.0002; JX-0015.0007; JX-0015.0005.).

Dr. Kelly provided comparable images and testimony for the rest of the Representative Accused Products. (Tr. (Kelly) at 441:11–445:6; CDX-0001.0059–.0064; JX0016.0002 (STEM-HAADF of 16-12FBU-S); JX-0016.0006 (EDS line scan of 16-12-FBU-S); JX-0016.0005 (image of etched sample of 16-12-FBU-S); JX-0017.0002 (STEM-HAADF of 8 C5OLO-S); JX-0774 (EDS line scan of 8 C5OLO-S); JX-0017.0005 (image of etched sample of 8 C5OLO-S); JX-0105.0009 (STEM-HAADF of 4 BTX-S); JX-0105.0010 (EDS line scan of 4 BTX-S); JX-

0105.0006 (image of etched sample of 4 BTX-S).).

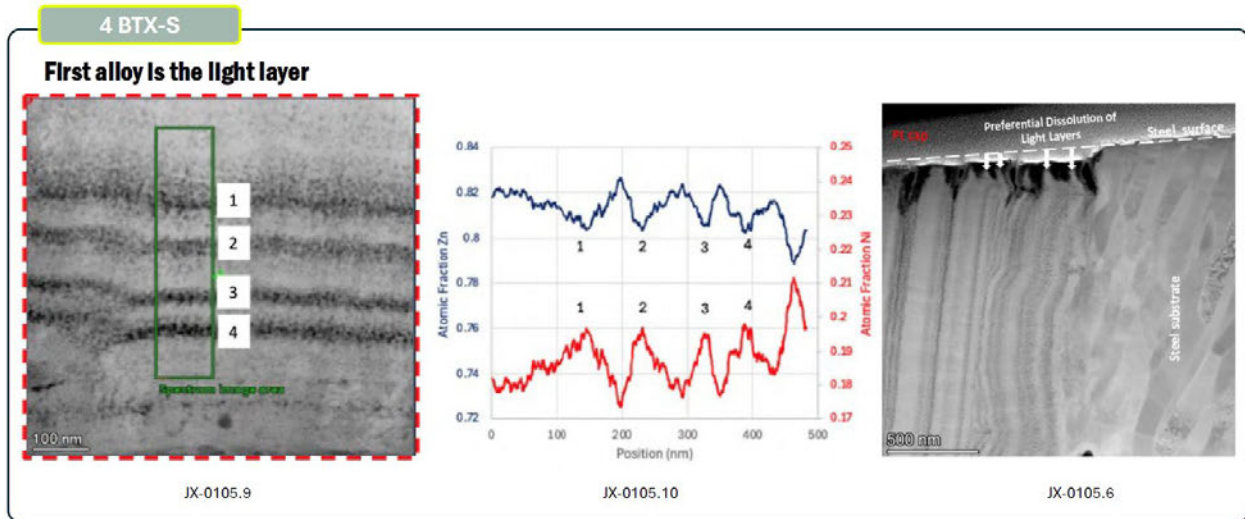
Respondents argued that the EDS line scan data cannot prove relative nobility because an alloy's composition does not determine its properties. (RRBr. at 27 (citing Tr. (Kelly) at 532:18–534:18 (testifying that many, many factors affect an alloy's resistance to corrosion, and further that two alloys with the same composition could exhibit different resistance to corrosion))).). Neither Modumetal nor Dr. Kelly had any rebuttal. Therefore, it is a finding of this ID that, even if Modumetal's EDS line scan data were reliable, Modumetal's EDS line scan data would not prove that the Accused Products meet any of the claimed "nobility" limitations, including the relative nobility of the "first layer" compared to the substrate or mandrel as recited in claim element 1[c].

Respondents also argued that Modumetal's STEM-HAADF and EDS line scan testing are unreliable to prove the Accused Products have the claimed "first alloy." (RRBr. at 31–33.). This is because, as Dr. Frankel credibly and persuasively testified, in Modumetal's EDS line scans and STEM-HAADF images of the 4 BTX-S and the 10BL-S, the highest nickel content occurs in the light layers instead of the darker layers, which is contrary to the other two (2) of the Accused Products and also contrary to Dr. Kelly's testimony that the lighter layers should exhibit lower nickel content. (Tr. (Frankel) at 913:9–916:4 (testifying that, according to Modumetal's STEM-HAADF and EDS line scan data, the 10BL-S product and the 4 BTX-S product exhibit higher nickel content within a light-colored layer); RDX-0003C.0029; JX-0015.0002, .0007 (10BL-S); JX-0105.0010–.0011 (4 BTX-S)).).

The anomalies Dr. Frankel described are depicted above in Figure 19 for the 10BL-S Accused Product, where the anomaly occurs between the layers labeled "2" and "3." In a comparable figure, Figure 20 below, the STEM-HAADF image and EDS line scan data for the 4

BTX-S Accused Product exhibit the same kind of anomaly after the layer labeled “4.”

**Figure 20: 4 BTX-S STEM-HAADF, EDS Line Scan, and Etching Results from Dr. Kelly’s Demonstrative**



(Tr. (Kelly) at 443:15–444:9; CDX-0001C.0063–.0064; JX-0105.0009; JX-0105.0010; JX-0105.0009.).

Neither Modumetal nor its witnesses provided an explanation for the described anomalies.

In the regions of the STEM-HAADF image that should be the darkest because the nickel concentration is the highest, it is the exact opposite. (Tr. (Frankel) at 913:9–916:4.). This is not akin to a baseball pitcher who sometimes throws a ball a little outside the strike zone but nevertheless receives a “strike” call from the umpire. The described anomalies undermine the credibility and reliability of Modumetal’s EDS line scan data and Dr. Kelly’s opinions about them. (Tr. (Frankel) at 913:9–916:4.). In the absence of any explanation from Modumetal, it is a finding of this ID that Modumetal’s EDS line scan data is insufficiently reliable to quantify the relative concentrations of nickel and zinc in the Accused Products. Therefore, Modumetal has failed to satisfy its burden of proof by a preponderance of evidence that the Accused Products have the claimed “first alloy.”

For these reasons, Modumetal has not proven by a preponderance of evidence that the Accused Products practice claim element 1[c] of the '419 patent and claim element 1[c] of the '613 patent.

4. **'419 Patent Claim Element 1[d]: “i) a first metal in a first concentration that is at least about 1 wt. %, the first metal selected from Co, Fe, Ni, and Zn; and”**

**and**

**'613 Patent Claim Element 1[d]: “i) a first metal in a first concentration that is at least about 1 wt. %, the first metal selected from Co, Fe, Ni, and Zn; and”**

The Parties agreed that the Accused Products practice claim element 1[d] of the '419 patent and claim element 1[d] of the '613 patent. (JSUF at 2–3, 5–6; CBr. at 23–26, 64–66; RRBr. at 27–41 (not disputing claim element 1[d]).)

During the Hearing, Modumetal introduced undisputed evidence that the Accused Products have the claimed “first metal” (zinc) in the claimed “first concentration” that is “at least about 1 wt. %,” wherein the first metal is selected from Co, Fe, Ni, and Zn. (Tr. (Kelly) at 445:7–446:12, 446:23–447:3; CDX-0001.0066, .0068.).

For the foregoing reasons, Modumetal has proven by a preponderance of the evidence that the Accused Products practice claim element 1[d] of the '419 patent and claim element 1[d] of the '613 patent.

5. **'419 Patent Claim Element 1[e]: “i) a second metal in a second concentration that is at least about 1 wt.%; and”**

**and**

**'613 Patent Claim Element 1[e]: “i) a second metal in a second concentration that is at least about 1 wt.%; and”**

The Parties agreed that the Accused Products practice claim element 1[e] of the '419 patent and claim element 1[e] of the '613 patent. (JSUF at 2–3, 5–6; CBr. at 26–27, 66–67;

RRBr. at 27–41 (not disputing claim element 1[e].).

During the Hearing, Modumetal introduced undisputed evidence that the Accused Products have the claimed “second metal” (nickel) in the claimed “second concentration” that is “at least about 1 wt. %.” (Tr. (Kelly) at 445:7–19, 446:13–447:3; CDX-0001C.0067, .0068.).

For the foregoing reasons, Modumetal has proven by a preponderance of the evidence that the Accused Products practice claim element 1[e] of the ’419 patent and claim element 1[e] of the ’613 patent.

6. **’419 Patent Claim Element 1[f]: “B) a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel, the second alloy comprising”**

**and**

**’613 Patent Claim Element 1[f]: “B) a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel, the second alloy comprising”**

The Parties’ dispute with respect to claim element 1[f] of the ’419 patent and claim element 1[f] of the ’613 patent is substantively the same as their dispute with respect to claim element 1[c]. (CBr. at 27–29; Tr. (Kelly) at 447:4–451:23; CDX-0001C.0069–.0077; JX-0015.0002 (STEM-HAADF for 10BL-S); JX-0015.0007 (EDS line scan for 10BL-S); JX-0015.0005 (etching results for 10BL-S); JX-0016.0002 (STEM-HAADF for 16-12FBU-S); JX-0016.0006 (EDS line scan for 16-12FBU-S); JX-0016.0005 (etching results for 16-12FBU-S); JX-0017.0002 (STEM-HAADF for 8 C5OLO-S); JX-0774.0001 (EDS line scan for 8 C5OLO-S); JX-0017.0005 (etching results for 8 C5OLO-S); JX-0105.0009 (STEM-HAADF for 4 BTX-S); JX-0105.0010 (EDS line scan for 4 BTX-S); JX-0105.0006 (etching results for 4 BTX-S); RRBr. at 27–34.).

For the same reasons as provided for claim element 1[c], it is a finding of this ID that Modumetal failed to satisfy its burden of proof, by a preponderance of evidence, that the

Accused Products have the claimed “second alloy” or that the claimed “second layer” is “less noble” than the first alloy and “less noble” than the substrate or mandrel as required by claim element 1[f] of the ’419 patent and claim element 1[f] of the ’613 patent.

**7. ’419 Patent Claim element 1[g]: “i) the first metal in a third concentration that is at least about 1 wt.%; and”**

**and**

**’613 Patent Claim Element 1[g]: “i) the first metal in a third concentration that is at least about 1 wt.%; and”**

According to the *Markman* Order’s claim construction of the claimed “first concentration” and “third concentration,” the claimed “first concentration” must be different than the claimed “third concentration.” (Order No. 30 at 25–41.). In the context of the Parties’ infringement dispute, this means that the weight percent zinc (Zn) in the accused first layer must be different than the weight percent zinc (Zn) in the accused second layer.

The Parties’ dispute is whether Modumetal’s EDS line scan testing was sufficiently precise and reliable to prove that the wt.% of the accused “first metal” (zinc or Zn) in the accused “first layer” is different than the wt.% of the accused “first metal” (zinc or Zn) in the accused “second layer.” (RRBr. at 34–38.).

Dr. Kelly testified that EDS line scan data as applied to STEM-HAADF images of the Representative Accused Products proves that the accused first layer (lighter bands on the STEM-HAADF images) in the Accused Products has a wt.% zinc (the claimed “first metal” in the claimed “first concentration”) that is about 1–2 wt.% lower than the wt.% zinc (the claimed “first metal” in the claimed “third concentration”) in the accused second layer (darker bands). (Tr. (Kelly) at 451:24–452:23, 478:3–18; CDX-0001C.0078.). Dr. Kelly’s reported weight percents of zinc and nickel (Ni) in the accused first layer and accused dark layer are reproduced in Figure 21 below.

**Figure 21: Dr. Kelly's Weight Percent Zinc and Nickel in the Accused First Layer and Accused Second Layer from His Demonstrative**

|               | 10BL-S      | 16-12FBU-S  | 8 C5OLO-S   | 4 BTX-S     |
|---------------|-------------|-------------|-------------|-------------|
| Type of Layer | Wt. %       | Wt. %       | Wt. %       | Wt. %       |
| Light Layers  | 82 Zn-18 Ni | 85 Zn-15 Ni | 81 Zn-19 Ni | 84 Zn-16 Ni |
| Dark Layers   | 81 Zn-19 Ni | 83 Zn-17 Ni | 83 Zn-17 Ni | 82 Zn-18 Ni |

(Tr. (Kelly) at 451:24–452:23, 478:3–18; CDX-0001C.0078 (highlighting in original).).

Respondents argued that Modumetal's EDS line scan results as reported by Dr. Kelly are not sufficiently precise to prove that the zinc concentration in the accused first layer is different from the zinc concentration in the accused second layer. (RRBr. at 35–38.). During cross-examination, Dr. Kelly acknowledged that his reported weight percents of zinc and nickel represent integer-rounded percentage values. (Tr. (Kelly) at 540:19–24.).

Moreover, Dr. Frankel testified that, according to the website of the manufacturer of the EDS equipment that Modumetal used (Thermo Fisher Scientific), EDS analysis has a “high degree of relative precision” that is “typically 2–4%.” (Tr. (Frankel) at 911:17–25, 920:15–921:10; RX-0222.0001; RX-0001C.0141; RDX-0003C.0031.). Dr. Frankel testified that EDS line scan testing is appropriate for assessing “[l]arge difference[s]” in composition such as going from 0% to 20%. (Tr. (Frankel) at 912:10–913:6; RDX-0003C.0029.). Dr. Wagener testified that the margin of error for EDS line scan data can exceed 2 wt.%. (Tr. (Wagener) at 814:12–27.). According to Respondents' argument, Dr. Kelly's mathematical rounding of the weight percents in combination with the alleged imprecision in EDS line scan data renders it difficult to tell if his reported wt.% numbers are “different.” (Tr. (Frankel) at 911:17–25, 920:15–921:10.).

Modumetal counterargued that Respondents relied on EDS line scan data to distinguish individual zinc-nickel alloy layers with compositional differences of less than four (4) wt.%. (CBr. at 43–44.). Specifically, exhibit CX-0283C.0007 depicts weight percents measured using

EDS line scans for several layers of Parker Hannifin's [REDACTED] prototype product, which was an early developmental version of the ToughShield® Plus product that is accused in this Investigation. (CX-0283C.0007.). CX-0283C.0007 is reproduced in Figure 22 below.

**Figure 22: Parker Hannifin's EDS Analysis of Multilayer Coating for [REDACTED]**



(Tr. (Wagener) at 812:11–815:2; CX-0283C.0007.).

Dr. Kelly's demonstrative, which is reproduced in Figure 23 below, [REDACTED]

[REDACTED]

[REDACTED] (Tr. (Kelly)

at 517:14–520:25; CDX-0001.0188; CX-0283C.0007.). According to Dr. Kelly's demonstrative and accompanying testimonial explanation, the differences between the layers Parker Hannifin identified are less than 2 wt.% nickel. (*Id.*). This is evidence that it is reasonable to use EDS line scan data to distinguish wt.% differences of less than 2% in the way Modumetal has done.

Therefore, Respondents' argument has been successfully rebutted.

**Figure 23: Dr. Kelly's Demonstrative Depicting Error Bars Overlaid on Parker Hannifin's EDS Line Scan Data**



(Tr. (Kelly) at 517:14–520:25; CDX-0001.0188; CX-0283C.0007.).

It is a finding of this ID that Modumetal's reliance on EDS line scan data, *in general*, to distinguish weight percentages smaller than 2–4 wt.% is not unreasonable or unreliable. This is because Parker Hannifin and the scientists and engineers that worked on Parker Hannifin's Project Tiger relied on EDS line scan analysis to distinguish smaller weight percentage differences in their Project Tiger prototype, as can be seen on Dr. Kelly's demonstrative reproduced in Figure 23 above. (Tr. (Kelly) at 517:14–520:25; CDX-0001.0188; CX-0283C.0007.).

Respondents also argued that numerous precision problems with EDS line scan testing impair the reliability of Modumetal's EDS line scan data. (RRBr. at 37–38.). During cross-

examination, Dr. Kelly admitted that the difficulty of assessing quantitative differences in concentration in the way Dr. Kelly has attempted raises questions of the reliability of the test data. (Tr. (Kelly) at 538:7–12, 539:13–22, 539:7–12, 540:19–24, 545:1–546:11.).

Specifically, Dr. Kelly acknowledged and agreed that an EDS signal would convolute adjacent areas of a material if the volume of the material from which the EDS X-rays are generated is larger than the volume from which the scattered electrons that make up the STEM-HAADF image are generated. (*Id.* at 538:7–12.). Dr. Kelly also admitted that EDS data represents a 2D projection of a 3D volume which “blur” the images. (*Id.* at 538:13–19, 539:13–16.). Finally, Dr. Kelly admitted that “image drift” in combination with the aforementioned “blurring” makes precision with EDS line scanning “very difficult.” (*Id.* at 539:17–540:21.).

Modumetal counterargued that, notwithstanding the criticisms, EDS line scan testing is “commonly used to characterize samples and even Dr. Frankel has reported EDS results in peer-reviewed work prior to this litigation.” (CBr. at 44; Tr. (Kelly) at 573:13–15 (testifying that EDS is used “extensively” in materials science despite the known “blurring” effect); Tr. (Frankel) at 1088:1–11 (testifying that EDS is a widely used tool in the study of metal films, including in his own coauthored, peer-reviewed papers).).

Modumetal also counterargued that there is no dispute that the contrast variations in the STEM-HAADF images (light and dark bands) correspond directly to differences in average atomic number which, together with the EDS line scans, proves that the zinc and nickel concentrations are anticorrelated, which means that there are different compositional layers. (CBr. at 42–43; Tr. (Frankel) at 1087:7–16 (testifying that, in STEM-HAADF images, the intensity is proportional to the square of the atomic number of the element in the region); Tr. (Kelly) at 401:23–402:11 (testifying that the bright areas of a STEM-HAADF image has a higher

atomic number than the darker areas according to the square of the atomic number.). According to Modumetal, if EDS line scans were unable to distinguish between the compositions in the different layers, the measured zinc and nickel concentrations would not be anticorrelated but rather would exhibit random variations. (CBr. at 43.). This last argument appears to be attorney argument because Modumetal did not provide an evidentiary citation, and so it is entitled to no weight.

Modumetal and Dr. Kelly attempted to apply their EDS line scan data to their STEM-HAADF images to “line up” the compositional differences against the light and dark bands to allegedly prove the compositional makeup of the light and dark bands in the STEM-HAADF images. (*See, e.g.*, Tr. (Kelly) at 439:4–441:4; CDX-0001C.0057–.0058; JX-0015.0002; JX-0015.0007; JX-0015.0005.). As a threshold matter, as described in Section VIII.C.2, it is a finding of this ID that Modumetal’s STEM-HAADF images and EDS line scans are unreliable. Respondents and Dr. Frankel undermined the validity of applying Modumetal’s EDS line scan data to its STEM-HAADF images. (Tr. (Frankel) at 913:9–916:4 (testifying that, according to Modumetal’s STEM-HAADF and EDS line scan data, the 10BL-S product and the 4 BTX-S product exhibit higher nickel content within a light-colored layer); RDX-0003C.0029; JX-0015.0002, .0007 (10BL-S); JX-0105.0010–.0011 (4 BTX-S).). In Modumetal’s EDS line scans and STEM-HAADF images for the Accused Representative Products, specifically the 4 BTX-S and the 10BL-S, the highest nickel content occurs in the light layers instead of the darker layers. (*Id.*).

The anomalies Dr. Frankel described are depicted above in Figure 19 for claim element 1[c] for the 10BL-S product, where the anomaly occurs between the layers labeled “2” and “3.” The 4 BTX-S images also exhibit the anomaly Dr. Frankel described after the layer labeled “4,”

as depicted in Figure 20 above for claim element 1[c].

Neither Modumetal nor its witnesses provided an explanation for the anomalies whereby light and dark layers signify a metal concentration that is the opposite of what would be expected. As noted above, in the regions of the STEM-HAADF image that should be the darkest because the nickel concentration is the highest, it is the exact opposite. The anomalies undermine the credibility and reliability of Modumetal's EDS line scan data as they were applied to its STEM-HAADF images. In turn, Dr. Kelly's opinions were undermined.

In the absence of a scientifically supported explanation from Modumetal, it is a finding of this ID that Respondents' EDS line scan data as applied to its STEM-HAADF images is insufficiently reliable to identify and quantify the relative concentrations of nickel and zinc in the bright and dark bands of the STEM-HAADF images of the Accused Products.

Therefore, Modumetal has not satisfied its burden of proof by a preponderance of evidence that the wt.% zinc in the accused first layer is "different" from the wt.% zinc in the accused second layer.

Finally, Modumetal and Dr. Kelly argued that statistical analysis of the EDS line scan data revealed that the differences in composition between the light and dark bands were statistically significantly different. (Tr. (Kelly) at 456:24–457:12.). Dr. Kelly testified that two (2) statistical tests, called the Wilcoxon two-sample test and the Kolmogorov-Smirnov (K-S) test, were applied to the EDS line scan data to assess the statistical significance of the 2 wt.% difference in zinc concentrations between the accused first layer and accused second layer. (Tr. (Kelly) at 455:13–458:5; CDX-0001C.0082.).

Dr. Kelly testified that the weight percentages in the accused first and second layers are different to a level of statistical significance of  $p < 0.001$ , which is even lower than the commonly

accepted level of  $p < 0.05$ . (*Id.*). The variation, even according to Dr. Kelly’s testimony, provides a strong likelihood that the differences in the weight percentages measured by EDS line scans are statistically significant. (*Id.*). Dr. Kelly did not perform the statistical analysis and could not say who had performed them. (*Id.* at 536:19–22, 543:15–23, 544:6–12.). Dr. Kelly did not produce evidence of the statistical analysis or how exactly it was done. Tr. (Kelly) at 544:2–19.). The statistical analysis Dr. Kelly relied upon was not authenticated. It was unverified, and was not subjected to cross-examination. Therefore, it is afforded little evidentiary weight. *See, e.g., Sound View Innovations, LLC v. Hulu, LLC*, 33 F.4<sup>th</sup> 1326, 1338–39 (Fed. Cir. 2022) (excluding unreliable expert testimony because it relied on report by third-party that the expert never saw).

For these reasons, Modumetal has not proven by a preponderance of evidence that the Accused Products practice claim element 1[g] of the ’419 patent and claim element 1[g] of the ’613 patent.

**8. ’419 Patent Claim Element 1[h]: “ii) the second metal in a fourth concentration that is at least about 1 wt. %.”**

**and**

**’613 Patent Claim Element 1[h]: “ii) the second metal in a fourth concentration that is at least about 1 wt. %.”**

There is no dispute with respect to claim element 1[h] of the ’419 patent and claim element 1[h] of the ’613 patent. (CBr. at 31–32; RRB. at 41–42.). Respondents waived, withdrew, and abandoned any non-infringement argument for this claim element for purposes of appeal under Ground Rules 7.2 and 10.1.

Unlike for claim element 1[g], Modumetal did not have the burden of proving that the wt.% is “different.” Specifically, to prove infringement of claim element 1[h], Modumetal did not have to prove that the wt.% of the “second metal” (nickel) in the accused first layer is “different” than the wt.% nickel in the accused second layer. Modumetal only had to prove that

the wt.% nickel in the accused second layer is “at least about 1 wt.%.”

During the Hearing, Modumetal introduced un rebutted evidence that the Accused Products have the claimed “second metal” (nickel) in a “fourth concentration” that is “at least about 1 wt.%.” (Tr. (Kelly) at 447:13–20, 448:9–22, 449:13–450:19, 451:10–18, 577:20–578:15; CDX-0001.0079.).

For these reasons, Modumetal has proven by a preponderance of evidence that the Accused Products practice claim element 1[h] of the ’419 patent and claim element 1[h] of the ’613 patent.

**9. ’419 Patent Claim Element 1[i]: “the coating or cladding having a thickness from 5 microns to 50 microns.”**

The Parties agreed that the Accused Products practice claim element 1[i] of the ’419 patent. (JSUF at 2–3; CBr. at 32.).

During the Hearing, Modumetal introduced undisputed, uncontroverted evidence that the Accused Products have a “coating or cladding having a thickness from 5 microns to 50 microns.” (Tr. (Kelly) at 458:16–459:21.).

For these reasons, Modumetal has proven by a preponderance of evidence that the Accused Products practice claim element 1[i] of the ’419 patent.

**D. The Accused Products Do Not Practice Claims 2, 3, 5, and 7 of the ’419 Patent**

**1. ’419 Patent Claim 2: “the coating or cladding of claim 1, wherein the first metal is Ni or Zn.”**

**and**

**’613 Patent Claim 2: “the method of claim 1, wherein the first metal is Ni or Zn.”**

Parker Hannifin did not articulate a basis for its argument that the Accused Products do not practice the additional language of claim 2 of the ’419 patent and claim 2 of the ’613 patent.

(RRBr. at 42, 54–55 (arguing non-infringement based only on the reasons discussed for claim 1)). Respondents waived, withdrew, and abandoned any non-infringement argument for the additional language of claim 2 for purposes of appeal under Ground Rules 7.2 and 10.1.

During the Hearing, Modumetal introduced undisputed, uncontroverted evidence that the Accused Products practice the additional language of claim 2. (Tr. (Kelly) at 479:25–480:9.).

However, because Modumetal did not prove by a preponderance of evidence that the Accused Products infringe claim 1, Modumetal also did not prove by a preponderance of evidence that the Accused Products infringe claim 2. *Muniauction v. Thomson Corp.*, 532 F.3d 1318, 1328–29, n.5 (Fed. Cir. 2008) (“A conclusion of noninfringement as to the independent claims requires a conclusion of noninfringement as to the dependent claims”); *Monsanto Co. v. Syngenta Seeds, Inc.*, 503 F.3d 1352 at 1359 (Fed. Cir. 2007) (“One who does not infringe an independent claim cannot infringe a claim dependent on (and thus containing all limitations of) that claim”).

**2.     ’419 Patent Claim 3: “the coating or cladding of claim 1, wherein each layer of the series of alternating layers is discrete.”**

**and**

**’613 Patent Claim 3: “the method of claim 1, wherein each layer of the series of layers is discrete.”**

Parker Hannifin did not articulate a basis for its argument that the Accused Products do not practice the additional language of claim 3 of the ’419 patent and claim 3 of the ’613 patent. (RRBr. at 42, 54–55 (arguing non-infringement based only on the reasons discussed for claim 1)). Respondents waived, withdrew, and abandoned any non-infringement argument for the additional language of claim 3 for purposes of appeal under Ground Rules 7.2 and 10.1.

During the Hearing, Modumetal introduced undisputed, uncontroverted evidence that the Accused Products practice the additional language of claim 3. (Tr. (Kelly) at 460:8–20.).

However, because Modumetal did not prove by a preponderance of evidence that the Accused Products infringe claim 1, Modumetal also did not prove by a preponderance of evidence that the Accused Products infringe claim 3. *Muniauction*, 532 F.3d at 1328–29, n.5; *Monsanto Co.*, 503 F.3d at 1359.

3. **'419 Patent Claim 5: “the coating or cladding of claim 1, wherein the second metal is selected from Co, Fe, Ni, and Zn, the second metal being different than the first metal.”**

**and**

**'613 Patent Claim 5: “the method of claim 1, wherein the second metal is selected from Co, Fe, Ni, and Zn, the second metal being different than the first metal.”**

Parker Hannifin did not articulate a basis for its argument that the Accused Products do not practice the additional language of claim 5 of the '419 patent and claim 5 of the '613 patent. (RRBr. at 42, 54–55 (arguing non-infringement based only on the reasons discussed for claim 1)). Respondents waived, withdrew, and abandoned any non-infringement argument for the additional language of claim 5 for the purposes of appeal under Ground Rules 7.2 and 10.1.

During the Hearing, Modumetal introduced undisputed, uncontroverted evidence that the Accused Products practice the additional language of claim 5. (Tr. (Kelly) at 461:12–462:1.).

However, because Modumetal did not prove by a preponderance of evidence that the Accused Products infringe claim 1, Modumetal also did not prove by a preponderance of evidence that the Accused Products infringe claim 5. *Muniauction*, 532 F.3d at 1328–29, n.5; *Monsanto Co.*, 503 F.3d at 1359.

4. **'419 Patent Claim 7: “the coating or cladding of claim 1, wherein the first concentration, the second concentration, the third concentration, and the fourth concentration are independently at least about 5 wt.%.”**

Parker Hannifin did not articulate a basis for its argument that the Accused Products do

not practice the additional language of claim 7 of the '419 patent. (RRBr. at 42 (arguing non-infringement based only on the reasons discussed for claim 1).). Respondents waived, withdrew, and abandoned any non-infringement argument for the additional language of claim 7 for the purposes of appeal under Ground Rules 7.2 and 10.1.

During the Hearing, Modumetal introduced undisputed, uncontroverted evidence that the Accused Products practice the additional language of claim 7. Of the '419 patent. (Tr. (Kelly) at 462:2–18.).

However, because Modumetal did not prove by a preponderance of evidence that the Accused Products infringe claim 1, Modumetal also did not prove by a preponderance of evidence that the Accused Products infringe claim 7. *Muniauction*, 532 F.3d at 1328–29, n.5; *Monsanto Co.*, 503 F.3d at 1359.

## **IX. TECHNICAL PRONG OF THE DOMESTIC INDUSTRY REQUIREMENT**

Although there are differences in the wording of the claims of the two (2) Asserted Patents, for the purpose of resolving the Parties' disputes and deciding the issues that are in dispute, the '419 patent claims are the same as the '613 patent claims. Therefore, this ID analyzes the two (2) Asserted Patents together.

### **A. Legal Standards**

A complainant in a patent-based Section 337 investigation must demonstrate that it is practicing or exploiting the patents at issue. *See* 19 U.S.C. § 1337(a)(2) and (3); *Microsphere Adhesives*, Inv. No. 337-TA-366, Comm'n Op. at 8. "In order to satisfy the technical prong of the domestic industry requirement, it is sufficient to show that the domestic industry practices any claim of that patent, not necessarily an asserted claim of that patent." *Certain Ammonium Octamolybdate Isomers*, Inv. No. 337-TA-477, Comm'n Op. at 55 (U.S.I.T.C. Jan. 5, 2004).

The test for claim coverage for the purposes of the technical prong of the domestic

industry requirement is the same as that for infringement. *Certain Doxorubicin and Preparations Containing Same*, Inv. No. 337-TA-300, FID at 109, 1990 WL 710463 (U.S.I.T.C. May 21, 1990), *aff'd*, Views of the Commission at 22 (October 31, 1990) (“*Doxorubicin*”). “First, the claims of the patent are construed. Second, the complainant’s article or process is examined to determine whether it falls within the scope of the claims.” *Id.*

**B. Modumetal’s Coating and Testing of the DI Fastener**

As noted in Section V.B., the only DI Product Modumetal offered as representative of all of its DI Products, the DI Fastener, is also the only DI product that Modumetal had tested to prove that the DI Fastener, and purportedly all NanoGalv<sup>®</sup> coated products, practice the Asserted Patents.

The DI Fastener, a small metal nut, was coated in March 2024 using Modumetal’s NanoGalv<sup>®</sup> electroplating process at Modumetal’s “ModuCoatings” facility in Houston, Texas. (Tr. (Creech) at 105:16–20, 164:9, 165:9–167:14, 182:25–183:20; CX-0894C (NanoGalv<sup>®</sup> TDS Revision 1)). After the DI Fastener was coated, it was sent to Modumetal’s Snohomish, Washington facility and then to the third-party laboratory, Exponent, for testing. (Tr. (Creech) at 183:21–184:14; CX-0037.). According to Mr. Creech’s testimony, Modumetal ensured a continuous chain of custody for the DI Fastener from its coating in Houston, Texas through its testing by Exponent. (Tr. (Creech) at 105:16–20, 183:21–184:14.). Exponent took photographs dated April 16, 2024 of the front, side and back of the DI Fastener, which are reproduced in Figure 24 below.

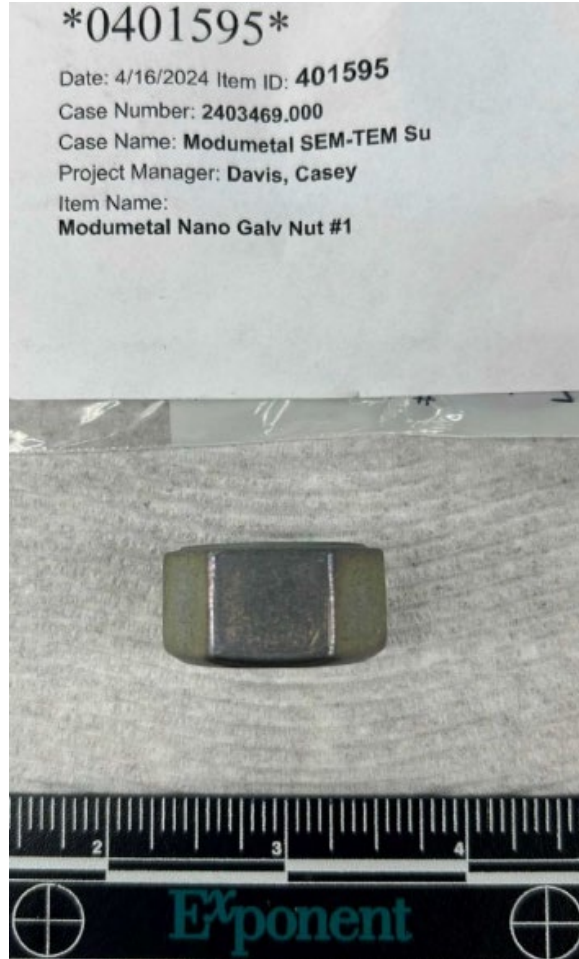
**Figure 24(a): Exponent's Photograph of the Back of the DI Fastener**



**Figure 24(b): Exponent's Photograph of the Front of the DI Fastener**



**Figure 24(c): Exponent's Photograph of the Side of the DI Fastener**



(Tr. (Creech) at 183:21–184:14; CX-0037.).

At the direction of Modumetal’s lawyers, Exponent subjected the DI Fastener to four (4) types of testing: (i) STEM-HAADF testing;<sup>35</sup> (ii) EDS line scan testing;<sup>36</sup> (iii) etching, which Modumetal also refers to “accelerated corrosion” testing<sup>37</sup>; and (iv) optical microscopy.<sup>38</sup> (Tr. (Kelly) at 483:15–484:4; CX-0764.0001 (STEM-HAADF image of DI Fastener); JX-0018C at

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<sup>35</sup> STEM-HAADF testing is described in Section VI.A.

<sup>36</sup> EDS line scan testing is described in Section VI.B.

<sup>37</sup> Etching testing is described in Section VI.C.

<sup>38</sup> Optical microscopy is described in Section VI.D.

.0001, .0005 (STEM-HAADF images of DI Fastener after etching), .0002 (STEM-HAADF image of DI Fastener that has not been subjected to etching), .0003–.0004 (optical microscopy images of DI Fastener that has not been subjected to any other testing), and .0006 (EDS line scan of DI Fastener).).

Respondents did not contest the validity or appropriateness of STEM-HAADF testing in general. However, Respondents argued that the STEM-HAADF testing in this case was unreliable because: i) STEM-HAADF images of certain Representative Accused Products depict light regions with higher nickel content and vice versa, the exact opposite of what it should be, (Tr. (Frankel) at 913:9–916:4; RDX-0003C.0029; JX-0015.0002, .0007 (10BL-S); JX-0105.0010–.0011 (4 BTX-S)); and ii) STEM-HAADF images and EDS line scans of the DI Fastener are inconsistent with NanoGalv<sup>®</sup> specifications, (Tr. (Frankel) at 941:9–942:13 (testifying that Modumetal’s test results do not match what is depicted in the NanoGalv<sup>®</sup> specification); Tr. (Kelly) at 571:10–17 (testifying that DI Fastener’s test results did not match the Modumetal’s specifications he reviewed)). (RRBr. at 19–20, 31–33, 45–47; *see also* Sections VIII.C.2 and VIII.C.3 (Infringement)).

The Parties’ dispute over Modumetal’s/Exponent’s methodology for using the STEM-HAADF testing, or how that testing was conducted, is set forth in detail in Sections VIII.C.2 and VIII.C.3. For the reasons set forth therein, it is a finding of this ID that all of Modumetal’s STEM-HAADF testing and images as produced are unreliable. (*See* Sections VIII.C.2 and VIII.C.3.).

Similarly, Respondents also did not contest the validity and applicability of EDS line scan testing, in general. However, as supported by Dr. Frankel’s testimony about some of the inconsistencies in the images, Respondents argued that Modumetal’s EDS line scan testing in

this Investigation was unreliable because: i) EDS line scan testing is too imprecise to detect the compositional differences between the alleged layers in the NanoGalv® coated DI Fastener, (Tr. (Frankel) at 911:17–25, 912:10–913:6, 920:15–921:10; RDX-0003C.0031); ii) EDS line scans are 2D projections of 3D sample volumes “which effectively blurs images,” (Tr. (Kelly) at 538:7–12, 539:13–22); iii) EDS line scans generally have “image drift” resulting in scanning areas outside of the desired area thus further contributing to imprecision, Tr. (Kelly) at 539:17–22; and iv) Modumetal’s EDS line scans of certain Representative Accused Products depict peak nickel content in areas where there should be the lowest nickel content, (Tr. (Frankel) at 913:9–916:4; RDX-0003C.0029; JX-0015.0002, .0007 (10BL-S); JX-0105.0010–.0011 (4 BTX-S)). (RRBr. at 35–39.).

The Parties’ dispute over Modumetal’s EDS line scan testing is also set forth in detail in Sections VIII.C.2 and VIII.C.3 above (infringement). For the reasons set forth in both those sections, it is a finding of this ID that the disputes over Modumetal’s EDS line scan testing results undermines Modumetal’s arguments that they provided the necessary proof by a preponderance of evidence.

With respect to Modumetal’s etching testing, which Modumetal also refers to as “accelerated corrosion” testing, Respondents argued that it is not a valid method for determining nobility. (RRBr. at 28–31; Tr. (Frankel) at 921:12–923:23 (Etching is used in a laboratory to reveal details of the microstructure of a sample. Unlike true accelerated corrosion testing, etching causes a type of corrosion that is different than long-term environmental or simulated testing, and therefore is “not a meaningful accelerated test.”). (*Id.*). Respondents also argued that Modumetal’s etching test results are not credible because the differences in corrosion between the allegedly less noble layers and the allegedly more noble layers in the DI Fastener

coating is on the order of only 1 micron. (RRBr. at 30–31; Tr. (Frankel) at 923:8–924:24.). Respondents argued the difference is attributable to “general corrosion” rather than to any layered structure. (*Id.*).

Notably, Modumetal failed to introduce evidence that its etching testing method is an accepted method in the field for assessing nobility. For that reason, and as set forth in Section VIII.C.3, it is a finding of this ID that Modumetal did not satisfy its burden to prove that its etching testing method is an accepted method in the field for determining nobility, whether nobility is construed as non-reactivity or corrosion potential. Therefore, Modumetal’s etching test results do not satisfy Modumetal’s burden of proof by a preponderance of evidence.

**C. Modumetal Did Not Introduce Sufficient Evidence to Prove That the DI Fastener Is Representative of the DI Products**

Respondents argued that Modumetal failed to prove that the DI Fastener is representative of all of Modumetal’s DI Products, and therefore Modumetal can only rely on investments in the DI Fastener to support its domestic industry. (RRBr. at 57–69; *see* Sections XI.C.1 and XI.C.2.).

There is no dispute that Modumetal had the burden to prove, by a preponderance of evidence, that the DI Fastener is representative of all the DI Products. *Replacement Auto Lamps*, FID at 112. Notably, Modumetal’s expert Dr. Kelly offered no opinion on representativeness of the DI Fastener. (Tr. (Kelly) at 548:4–550:20, 571:3–17; *see also* Section XI.C.1.)

Modumetal’s proof that the DI Fastener is representative of all DI Products is deficient as a matter of law for the following reasons. The Asserted Claims recite a coating on a substrate, where the coating comprises at least two (2) different layers of different metals in different weight percents, and where the first layer is less noble than both the substrate and the other layer. (JX-0001 (’419 patent) at 11:7–19 (emphasis added); *see also* JX-0002 (’613 patent) at 11:17–30.).

**Public Version**

Claim 1 of the '419 patent, which is reproduced below in relevant part, is representative of the Asserted Claims 1–3, 5, and 7 of the '419 patent and claims 1–3 and 5 of the '613 patent.

Claim 1: a first layer comprising a first metal selected from Co, Fe, Ni, and Zn<sup>39</sup> in a concentration that is at least about 1 wt.% and a second metal in a concentration that is at least about 1 wt.%, the first layer being less noble<sup>40</sup> than the substrate; and 2) a second layer comprising the first metal in a concentration that is at least about 1 wt.% and a second metal in a concentration that is at least about 1 wt.%, ***the second layer being less noble than the substrate and less noble than the first layer.***

(JX-0001 ('419 patent) at 11:7–19 (emphasis added); *see also* JX-0002 ('613 patent) at 11:17–30.).

The limitation emphasized above is relevant to the deficiency of Modumetal's evidence, and for convenience will be referred to as the "Relative Nobility Limitation." As set forth below, none of Modumetal's witnesses testified that Modumetal's NanoGalv<sup>®</sup> process consistently results in a product with a coating where one type of layer is both less noble than the other layer and less noble than the substrate as required by claim 1 of the '419 patent and claim 1 of the '613 patent. In other words, no witness testified that NanoGalv<sup>®</sup> consistently produces coatings that practice the Relative Nobility Limitation. Moreover, even if Modumetal had satisfied its burden of proof with respect to representativeness, if Modumetal failed to satisfy its burden of proof by a preponderance of the evidence that the DI Fastner meets at least one of the claims of the Asserted Patent, then it follows that Modumetal has failed to prove that it meets the technical industry prong of the domestic industry requirement.

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<sup>39</sup> As noted elsewhere, but reiterated here as a reminder, Co is Cobalt, Fe is Iron, Ni is nickel, and Zn is zinc.

<sup>40</sup> The Parties did not ask for construction of the term "noble" during claim construction. (*Markman* Order at 41.). However, on the first day of the Hearing, the term was construed to have its plain and ordinary meaning pursuant to *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1360, 1362 (Fed. Cir. 2008) ("when the parties present a fundamental dispute regarding the scope of a claim term, it is the court's duty to resolve it." *Id.* at 1362. (Tr. (ALJ) at 11:8–15.). Nonetheless, the Parties disagreed about the meaning of "noble." (*See* Section VIII.B.3.).

To prove representativeness, Modumetal relied principally on the testimony of Dr. Marie Li, who was Modumetal's director of R&D starting in 2016. (CBr. at 96–105.). Although she is a scientist, (n. 5, *infra*), Modumetal called Dr. Li as a fact witness. Modumetal heavily relied upon Dr. Li's testimony, purportedly to establish that despite the many different types of products that are coated, using different process parameters by different manufacturers, the composition of the NanoGalv<sup>®</sup> coating nonetheless always results in a coated product that falls within the scope of the Asserted Claims. (*Id.*). Modumetal also relied on certain limited testimony of its CEO, Mr. Creech, which is also referenced below.

Dr. Li testified that Modumetal ensures consistent deposition of NanoGalv<sup>®</sup> coatings on different metal or other parts by using a different waveform<sup>41</sup> for each part. Modumetal then performs iterative testing for that waveform to confirm that using the waveform consistently results in a NanoGalv<sup>®</sup> coated part. (Tr. (Li) at 297:18–300:7.). Therefore, according to Dr. Li, varying the waveform does not result in a product that is not NanoGalv<sup>®</sup>, but rather ensures the product is NanoGalv<sup>®</sup>. (*Id.* at 300:11–301:2.). Mr. Creech also testified that Modumetal uses waveforms that are tailored to specific parts to consistently produce NanoGalv<sup>®</sup> coated parts. (Tr. (Creech) at 92:10–23, 121:18–122:10.).

Dr. Li described Modumetal's protocol for changing its manufacturing processes.<sup>42</sup> Dr. Lee explained that all changes are documented and memorialized, including in documents

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<sup>41</sup> Modumetal's "waveform" refers to a set of instructions for how to modulate current density over time to coat a specific metal part, which can vary based on the part's size and shape. (Tr. (Creech) at 92:10–23, 198:15–199:1, 199:14–24; Tr. (Li) at 297:18–298:25.). Modumetal's "NanoPro" device, generates Modumetal's proprietary waveform that is needed to coat a particular type of metal part. (Tr. (Creech) at 199:3–9.). The NanoPro device sends the waveform to the rectifier and the rectifier then applies the preprogrammed current densities during the preprogrammed timeframes. (Tr. (Creech) at 199:10–13.).

<sup>42</sup> The manufacturing process depends on the sizes of the parts being coated, and the type of plating (rack versus barrel).

known as Technical Data Sheets (“TDS”). Modumetal provides TDS to Modumetal’s manufacturers and operators to inform them of how to maintain the proper process conditions and parameters for the NanoGalv® coatings. (*Id.* at 273:6–274:14.). Dr. Li also testified that certain documents known as Applications Requirement Documents (“ARDs”) provide additional information to manufacturers that explains how to make a NanoGalv® coating for a specific industry or application. (*Id.* at 274:15–276:3.).

According to Dr. Li, there is one set of TDS’s that is the same for all manufacturers, industries and applications. (*Id.*). Also, according to Dr. Li, the TDS and the ARD, when read together, explain to a specific manufacturer exactly how to make the intended NanoGalv® coating for a specific application market. (*Id.*).

Dr. Li testified that a [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>43</sup> [REDACTED] However, it was excluded from the evidentiary record because its existence was not revealed until two (2) weeks before the Hearing. (Tr. at 138:1–156:14, 157:3–160:15.). This is because, until approximately two (2) weeks before the Hearing, [REDACTED]

[REDACTED] (*Id.*). Modumetal needed to introduce sufficient evidence into the record to prove that the DI Fastener was manufactured in accordance with the NanoGalv® specification. (*Id.*). For this reason, Modumetal sought permission pursuant to Federal Rule of Evidence 612 to show Revision 1 to Dr. Li and Mr. Creech to refresh their recollections about [REDACTED]

[REDACTED] (*Id.*). Federal Rule of Evidence 612 allows documents and things to be used with a witness to refresh their recollection, even if those documents and things are not admitted into evidence. (Fed. R. Evid. 612; *Certain Silicon-on-Insulator Wafers*, Inv. No. 337-TA-1025, ID at 11–13 (Feb. 8, 2017) (permitting witnesses to rely on excluded documents to refresh recollection under Fed. R. Evid. 612 so long as they had personal knowledge of the information consistent with Fed. R. Evid. 602.). Therefore, Modumetal was permitted to show Revision 1 to Dr. Li and Mr. Creech and, pursuant to thereto, to introduce testimony from Dr. Li and Mr. Creech about the content of Revision 1 [REDACTED] (*Id.*). Dr. Li testified that [REDACTED]

[REDACTED] (Tr. (Li) at 278:8–18.). Dr. Li also testified that,

NanoGalv<sup>®</sup>, (JX-0026C.0032–.0058). (Tr. (Li) at 277:11–278:7.). Together, those documents are used by [REDACTED] (Id.).

Dr. Li testified that if a manufacturer follows the instructions in [REDACTED]  
[REDACTED]  
(Tr. (Li) at 281:3–285:11; JX-0026C [REDACTED] [REDACTED] at .0037, .0045.).

Modumetal's Executive Chairman, Mr. Creech, corroborated Dr. Li's testimony that if a manufacturer [REDACTED]  
[REDACTED] (Tr. (Creech) at 129:8–132:33.). Mr. Creech also provided testimony that Modumetal's licensee, ModuCoatings, [REDACTED]  
[REDACTED]

[REDACTED] (Tr. (Creech) at 131:20–132:3.).

Mr. Creech also testified that [REDACTED]  
[REDACTED]  
[REDACTED] Referencing both ModuCoatings and other manufacturers, Mr. Creech testified: [REDACTED]  
[REDACTED]

[REDACTED] (Id. at 132:4–15.). Mr. Creech testified that [REDACTED]  
[REDACTED]  
[REDACTED] (Id. at 133:14–135:7.). Notably, Mr. Creech did not testify that [REDACTED]

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[REDACTED] (Id. at 278:19–279:8.).  
[REDACTED] (Id. at 279:24–281:2.).

Modumetal relied exclusively on its fact witnesses for representativeness of the DI Fastener. Modumetal's expert, Dr. Kelly, did not offer an opinion, let alone testify, about whether the DI Fastener is representative of any other Modumetal coated DI Product. (Tr. (Kelly) at 548:4–550:20, 571:3–17.). Therefore, the burden to prove that the DI Fastener is representative of all DI Products fell primarily on Dr. Li.

Dr. Li defined and described NanoGalv<sup>®</sup> as:

NanoGalv is nanolaminated alloys with alternating layers. Each layer, they have an individual thickness from 5 [nanometers] to 1,000 [nanometers].<sup>44</sup> Their nobility is less noble than the substrate. The overall thickness of the NanoGalv<sup>®</sup>, it's 5 to 50 micrometers.

(Tr. (Li) at 265:11–18, 269:17–270:6.).

Dr. Li's definition does not include a requirement that the second layer is less noble than both the substrate and the first layer, i.e., the Relative Nobility Limitation, which is found in claim 1 of the '419 patent and claim 1 of the '613 patent. This is a fatal flaw in Modumetal's burden of proof because Dr. Li's testimony about representativeness relies on her definition of NanoGalv<sup>®</sup> from her testimony. (Tr. (Li) at 265:11–18, 269:17–270:6,<sup>45</sup> 276:4–278:7, 297:18–301:2.).

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<sup>44</sup> Dr. Li initially incorrectly testified that the thicknesses were in micrometers. She corrected her testimony to say nanometers. (Tr. (Li) at 269:17–270:6.).

<sup>45</sup> Although Dr. Li asserted that the Asserted Patents cover Modumetal's NanoGalv<sup>®</sup> coating and process, (Tr. (Li) at 265:11–21, 267:3–5, 267:17–268:5, 269:1–20, 270:24–271:5, 272:10–17), that assertion was conclusory and unsupported, and therefore afforded minimal evidentiary weight. Dr. Li did not map any element of the Asserted Claims to any feature or test result of any NanoGalv<sup>®</sup> coated product let alone to the DI Fastener or its testing. Therefore, the cited testimony that Dr. Li gave has been given no weight other than for descriptive purposes. *Trs. of Columbia Univ.*, 169 F.4th at 1335 (unsupported conclusory testimony is the kind of testimony the Federal Circuit has “consistently held should be afforded no weight”).

***Public Version***

Modumetal argued that Dr. Li testified that the NanoGalv<sup>®</sup> layers “alternate in nobility.” (CBr. at 97.). Modumetal’s argument mischaracterizes Dr. Li’s testimony. Dr. Li testified that “[the layers’] nobility is less noble than the **substrate**.” (Tr. (Li) at 265:11–18, 269:17–270:6 (emphasis added).). Dr. Li did not testify about the nobility of one **layer** relative to the nobility of another **layer**. (*Id.*).

The deficit in Dr. Li’s testimony undermined Modumetal’s argument. The nobility of the layers relative to each other is a claimed feature of the coatings and coating methods of the Asserted Patents. (JX-0001 at cl. 1; JX-0002 at cl. 2.). Moreover, Dr. Kelly, Modumetal’s own expert, testified that by varying the conditions of the electroplating process, such as the waveform used, the plating method (rack versus barrel), and the chemical bath formulation, changes can affect the coating’s properties including the thickness, composition, and **nobility** of the layers. (Tr. (Kelly) at 569:8–14, 569:19–570:15 (emphasis added).). Moreover, neither Dr. Li nor any other witness testified that any NanoGalv<sup>®</sup> coated product is tested to confirm that the Relative Nobility Limitation is satisfied.

It was Modumetal’s burden to prove that the nobility changes caused by different versions of its NanoGalv<sup>®</sup> process, such as different waveforms and rack versus barrel-plating, do not result in a product that falls outside the scope of the claims.

Therefore, even if Dr. Li’s testimony could be credited as proving by a preponderance of evidence that all DI Products that are made according to Modumetal’s NanoGalv<sup>®</sup> process are representative with respect to all other limitations of the Asserted Claims, nonetheless, Modumetal would have failed to prove that products made using its NanoGalv<sup>®</sup> coating are representative with respect to the Relative Nobility Limitation. For this reason, Modumetal has failed to satisfy its burden of proving, by a preponderance of evidence, that the DI Fastener is

representative of its DI Products.

**D. The DI Fastener Does Not Practice Claim 1 of the '419 Patent and Claim 1 of the '613 Patent**

Modumetal failed to prove that the DI Fastener practices every element of the Asserted Claims. Therefore, Modumetal failed to satisfy its burden to prove by a preponderance of evidence that the technical prong of the domestic industry requirement is satisfied. *Doxorubicin*, Inv. No. 337-TA-300, FID at 109, 1990 WL 710463.

1. **'419 Patent Claim Element 1[a]: “a coating or cladding comprising”  
and  
'613 Patent Claim Element 1[a]: “a method comprising, forming a  
coating on a substrate or mandrel, the coating having a thickness  
from 5 microns to 50 microns and”**

The Parties agreed that the DI Fastener practices claim element 1[a] of the '419 patent and claim element 1[a] of the '613 patent. (JSUF at 3–5.).

During the Hearing, Modumetal introduced undisputed, uncontroverted evidence that the DI Fastener has a “coating or cladding” that is “on a substrate or mandrel,” the coating having a “thickness from 5 microns to 50 microns.” (Tr. (Kelly) at 484:16–485:17, 491:13–24; CX-0764.0001.).

For the foregoing reasons, Modumetal has proven by a preponderance of the evidence that the DI Fastener practice claim element 1[a] of the '419 patent and, even though it is a method claim, claim element 1[a] of the '613 patent.

2. **'419 Patent Claim Element 1[b]: “a series of alternating layers on a  
substrate or mandrel, each layer of the series of alternating layers  
having a thickness from about 5 nanometers to about 1,000  
nanometers, the series of alternating layers comprising”  
and**

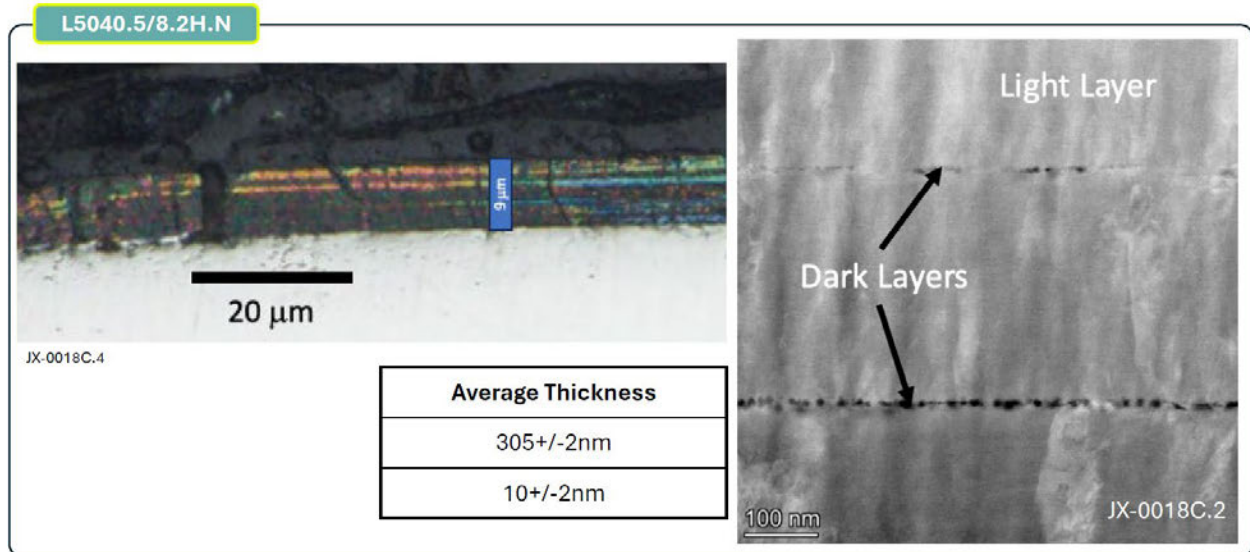
**'613 Patent Claim Element 1[b]: “comprising a series of layers arranged in a repeating pattern, each layer of the series of layers having a thickness from about 5 nanometers to about 1,000 nanometers, the series of layers comprising”**

The Parties' dispute with respect to claim element 1[b] is whether the DI Fastener has a series of layers, whether “alternating” as in the '419 patent claims or “in a repeating pattern” as in the '613 patent claims, where each layer has a “thickness from about 5 nanometers to about 1,000 nanometers.” (CBr. at 48–50; RRBr. at 43–47.).

Dr. Kelly testified that, according to optical images and STEM-HAADF images for the DI Fastener, the DI Fastener has a series of alternating or repeating layers (light and dark layers) as indicated by the black arrows in Dr. Kelly's demonstrative, which is reproduced in Figure 25 below). (Tr. (Kelly) at 485:18–486:22; CDX-0001C.0145; JX-0018C.0002, .0004.). The so-called light layers have an average thickness of  $305 \pm 2$  nanometers while the dark layers have a thickness of  $10 \pm 2$  nanometers. (*Id.*).

On the left of Figure 25, there is an optical image of multiple layers of the coating on the DI Fastener. (*Id.*). The layers shown on the left are about 9 microns thick as indicated by the blue box. On the right of Figure 25, there is a STEM-HAADF image which, according to Dr. Kelly, depicts alternating light and dark layers, as demarcated by the black arrows. (Tr. (Kelly) at 485:18–486:22; CDX-0001C.0145; JX-0018C.0002, .0004.). The optical image on the left also contains a table listing the average thickness of the light and dark layers as  $305 \pm 2$  nanometers and  $10 \pm 2$  nanometers, respectively.

**Figure 25: Optical Image and STEM-HAADF Image of the DI Fastener from Dr. Kelly’s Demonstrative**



(Tr. (Kelly) at 485:18–486:22; CDX-0001C.0145; JX-0018C.0002, .0004.).

As discussed above in Sections VIII.C.2 and VIII.C.3, Respondents took issue with the reliability and/or accuracy of Modumetal’s STEM-HAADF testing and results. (Tr. (Frankel) at 913:9–916:4, 941:9–942:13; RDX-0003C.0029; JX-0015.0002, .0007 (10BL-S); JX-0105.0010–.0011 (4 BTX-S); Tr. (Kelly) at 571:10–17; RPBr. at 30–31, 51, 55–56; RRBr. at 19–20, 31–33, 45–47.).

Specifically with respect to the DI Fastener, Respondents advanced three (3) rebuttal arguments to Dr. Kelly’s opinion that the STEM-HAADF testing of the DI Fastener allegedly satisfies claim element 1[a] of the ’419 patent and claim element 1[a] of the ’613 patent. (*Id.*).

First, Respondents argued that gaps in the alleged dark layers (appearing as discontinuities in the dark line running horizontally across the right side of Figure 25 above) do not satisfy the construction of “layer” that was adopted by the *Markman* Order. (*Markman* Order at 24; *see also* RRBr. at 43–44; Tr. (Frankel) at 942:22–944:2; RDX-0003C.0055–.0057.).

According to Respondents, the *Markman* Claim Construction Order incorporated into the

meaning of the claim term “layer” a requirement that the claimed “layer” cannot have any gaps or discontinuities. (*Id.*). Respondents’ argument is predicated on the *Markman* Claim Construction Order’s rejections of Modumetal’s proposal that the claimed “layer” must cover “at least a portion of a surface.” (*Id.* (citing *Markman* Order at 24).). However, Respondents have misread the *Markman* Order. Modumetal’s claim construction proposal that the claimed “layer” must cover “at least a portion of a surface” was rejected in the *Markman* Order because there is no claim language or language in the specification that mentions the word “portion” or the concept of limiting the coating or cladding of the invention such that its layers cannot cover only “portions of a surface.” (*Markman* Order at 24.). The claim construction of layer did not limit the claim term “layer” such that the claimed “layer” must not have any gaps or discontinuities. (*Id.*).

Respondents also argued that the proper construction of the claim term “layer” precludes any gaps or discontinuities because the Asserted Patents say, “if coverage is not complete, these coatings will not work.” (RRBr. at 43 (citing JX-0001 at 1:62–63); RPBr. at 55 (citing JX-0001 at 1:62–63.)). Respondents, again, have misread the Asserted Patents and taken the quoted language out of context.

The preceding quoted language is taken from the “Background” section of the Asserted Patents and describes a disadvantage of a known coating called a “barrier coating,” right after a description of another type of known coating called a “sacrificial coating.” (JX-0001 at 1:55–2:7.). At the end of the “Background” section, the Asserted Patents describe coatings “that may represent the best of both the sacrificial coating and the barrier coating are those that are more noble than the substrate and creates a barrier to corrosion, but, *in case that coating is compromised*, is also less noble than the substrate and will sacrificially corrode, thus protecting

the substrate from direct attack.” (*Id.* at 2:42–47 (emphasis added)). If the “Background” section is read in context, the Asserted Patents do not define the invention as requiring continuous or complete coverage. To the contrary, the Asserted Patents contemplate that the invention described has the advantage that the coating is still protective even if it is “compromised,” i.e., if it there is no longer complete coverage. (*Id.*).

Second, Respondents argued that Modumetal’s STEM-HAADF testing is inconsistent with Modumetal’s own NanoGalv<sup>®</sup> process specifications. (RRBr. at 45–46; cite to evidence/testimony/documents.). Respondents argued that, according to Modumetal’s STEM-HAADF testing, the two (2) alternating layers of the DI Fastener coating are  $305\pm 2$  nm and  $10\pm 2$  nm respectively, but the NanoGalv<sup>®</sup> process specifications states that the layers are “each 30 nanometers thick.” (RRBr. at 45–47.). Modumetal’s expert, Dr. Kelly, testified that the thicknesses he concluded exist from Modumetal’s testing of the DI Fastener do not meet the NanoGalv<sup>®</sup> specification. (Tr. (Kelly) at 571:10–13, 580:11–23.). Dr. Kelly’s testimony is reproduced below.

Q. Now, you recall that your test results on the DI Fastener don’t match what Modumetal’s specification says you would expect to obtain, correct?

A. Correct.

\*\*\*

Q. One more question. A moment ago Mr. Maiorana asked you whether your tests of the DI technical prong product matched the NanoGalv specification, and you said no. Can you elaborate on that?

A. So in the NanoGalv specification that I’ve seen, they have 30 nanometer blocks of one layer and the other layer, and these are – that’s not what you see here. The dark layers are about 30 nanometers, but the light layers are thicker. So in terms of – in terms of the layers’ thicknesses as described in the specification, this does not meet those specifications because the dark layer is roughly that thickness, but the light layer is thicker.

(Tr. (Kelly) at 571:10–13, 580:11–23.).

Modumetal's counterargued that NanoGalv<sup>®</sup> is not defined solely by the process specification, but also requires the manufacturing specification (TDS Revision 1 or Revision 2). (CBr. at 58 (citing Tr. (Li) at 265:13–18, 269:17–270:7, 279:17–23, 284:21–285:11).). Mr. Creech testified that layer thicknesses do not have to be 30 nm to qualify as NanoGalv<sup>®</sup> because the 30 nm number is only for the specific process development and rack method set forth in Modumetal's process specification, i.e., it does not incorporate or account for other coating methods or for manufacturing specifications. (Tr. (Creech) at 285:12–286:1; JX-0019.0004 (NanoGalv<sup>®</sup> Process Specification).).

Dr. Li's and Mr. Creech's testimony that NanoGalv<sup>®</sup> is defined in part by the manufacturing specification, not only the process specification, provided some explanation for the discrepancy between Modumetal's test results for the DI Fastener and Modumetal's process specification. (Tr. (Li) at 265:13–18, 269:17–270:7, 279:17–23, 284:21–285:11; Tr. (Creech) at 285:12–286:1.). However, Dr. Li's and Mr. Creech's explanation is inadequate. Dr. Li and Mr. Creech did not explain why the manufacturing specification does not inform the reader that the layer thickness is expected to vary and/or inform the reader of what the different layer thickness should be.

Therefore, it is a finding of this ID that the fact that Modumetal's test results for the DI Fastener are not consistent with Modumetal's own NanoGalv<sup>®</sup> process specification for layer thickness tends to undercut the credibility and validity of Modumetal's test results and, ultimately, Modumetal's argument that it has satisfied its burden of proof by a preponderance of evidence.

Third, Respondents argued that Modumetal's test results and expert opinion are unreliable and not credible "for the same reasons discussed previously with respect to the

Accused and Replacement Products.” (RRBr. at 47; *see* Sections VIII.C.2 and VIII.C.3.).

Respondents’ arguments and evidence are persuasive for the same reasons expressed in Sections VIII.C.2 and VIII.C.3. Modumetal’s STEM-HAADF testing and results are not sufficiently reliable to satisfy Modumetal’s burden of proof, by a preponderance of evidence, that the DI Fastener has a series of alternating or repeating layers each with thickness from about 5 nanometers to about 1,000 nanometers as required by the claims. (*See* Sections VIII.C.2 and VIII.C.3.).

For the foregoing reasons, Modumetal has not proven by a preponderance of evidence that the DI Fastener practices claim element 1[b] of the ’419 patent and claim element 1[b] of the ’613 patent.

**3. ’419 Patent Claim Element 1[c]: “a first layer of a first alloy that is less noble than the substrate or the mandrel, the first alloy comprising;”**

**and**

**’613 Patent Claim Element 1[c]: “A) a first layer of a first alloy that is less noble than the substrate or the mandrel, the first alloy comprising”**

The Parties’ dispute and reasoning whether the DI Fastener practices claim element 1[c] of the Asserted Patents is substantively the same as for infringement of claim element 1[c] of the Asserted Patents. (CBr. at 75–76; RRBr. at 56.).

During the Hearing, Modumetal and Respondents disputed the meaning of the claim term “noble,” specifically whether “noble” means “non-reactivity” as Modumetal proposed or means “corrosion potential” as Respondents proposed. (*Id.*). For the reasons provided in Section VIII.B.3, it is a finding of this ID that the meaning of the claim term “noble” is “non-reactivity,” and further that the type of “non-reactivity” that is relevant to the Asserted Patents can be assessed by measuring corrosion resistance or corrosion potential. In other words, the “plain and

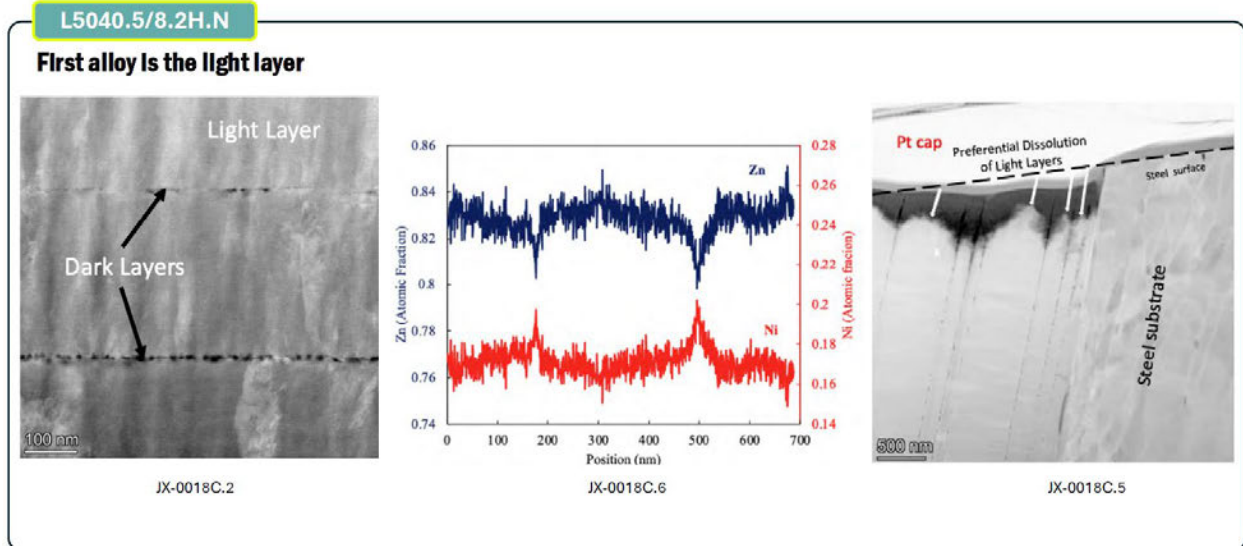
ordinary” meaning of “nobility” can encompass both concepts. (*See* Section VIII.B.3.).

With respect to the claimed “first layer of a first alloy,” Dr. Kelly testified that EDS line scan data of the DI Fastener as applied to STEM-HAADF images of the DI Fastener, which are reproduced in Figure 26 below (STEM-HAADF on the left and EDS line scan data in the center), depict light colored bands that he identified as the claimed “first layer of a first alloy.”

With respect to the requirement that the “first layer of a first alloy” be “less noble than the substrate or mandrel,” Dr. Kelly testified that the optical imaging of the etched samples of the DI Fastener (on the right in Figure 26 below) proves that the first layer is less noble (more reactive) than the substrate. (Tr. (Kelly) at 486:23–487:24; CDX-0001C.0147, .0148; JX-0018C.0002 (STEM-HAADF for the DI Fastener); JX-0018C.0006 (EDS line scan graph for the DI Fastener); JX-0018C.0005 (optical image of etched sample of DI Fastener).). According to Dr. Kelly, reduced nobility should show up in the optical images, such as the one on the right of Figure 26 below, when the dark region extends further down because that means the etchant dissolved away more of the coating. (*Id.*).

Dr. Kelly’s demonstrative, reproduced in Figure 26 below, depicts all three (3) images: the STEM-HAADF image is on the left, the EDS line scan graph is in the center, while the optical image is on the right. The left STEM-HAADF image allegedly depicts alternating layers (light and dark layers as demarcated by the black arrows). The center EDS line scan allegedly depicts the concentration (atomic fraction) of zinc in blue and the concentration (atomic fraction) of nickel in red, both as a function of depth in the coating. The optical image on the right allegedly shows preferential dissolution of less noble layers (the “dark layers” in the image). (*Id.*).

**Figure 26: STEM-HAADF Image, EDS Line Scan Graph, and Optical Image of Etched Sample of the DI Fastener from Dr. Kelly’s Demonstrative**



(Tr. (Kelly) at 486:23–487:24; CDX-0001C.0147, .0148; JX-0018C.0002 (STEM-HAADF for the DI Fastener); JX-0018C.0006 (EDS line scan graph for the DI Fastener); JX-0018C.0005 (optical image of etched sample of DI Fastener).).

Respondents argued that, regardless of which construction is adopted for the term “nobility,” Modumetal’s etching testing (which Modumetal also referred to as “accelerated corrosion testing”) is not the appropriate test to prove the relative nobility requirements of the Asserted Claims. (RRBr. at 28–31; Tr. (Frankel) at 921:12–925:24; *see also* Section VIII.C.3.).

Among other problems, Dr. Frankel explained that etching testing causes generalized corrosion that occurs independently of any layer structure or any difference(s) in nobility among individual layers. (*Id.*). Moreover, according to Dr. Frankel, the conditions of Exponent’s etching testing of the Di Fastener in a laboratory do not match the conditions to which a coated metal part could be subject in an outside environment (heat, wind, cold, and other conditions), and therefore etching test results are not relevant. (*Id.*).

Neither Modumetal nor Dr. Kelly rebutted Dr. Frankel’s testimony. Modumetal’s only counterargument is that its former director of research and development, Dr. Li, testified that

Modumetal developed its etching technique to have a standardized way to reveal the layers of their NanoGalv<sup>®</sup> product. Modumetal argued that the same etching technique can be used to assess relative nobility. (CBr. at 44–45; Tr. (Li) at 287:22–290:23, 295:16–22; CX-0097 (work instruction for laminate verification in NanoGalv-coated fasteners) at .0006; JX-0045.0004 (etching standard operating procedure).). Notably, Dr. Li did not testify (nor did any other witness) that Modumetal used etching to assess relative nobility or that anyone else in the field of corrosion testing uses etching to assess relative nobility. (See Section VIII.C.3.). Therefore, it is a finding of this ID that Dr. Li’s testimony, without more, does not prove that Modumetal’s etching testing methodology is an accepted or recognized method for determining nobility of a metal/alloy.

In the absence of a rebuttal from Modumetal or Dr. Kelly, Respondents’ arguments and evidence in support thereof are more credible.

For these reasons, and the reasons given for why Modumetal failed to prove infringement of claim element 1[c], Modumetal has failed to prove by a preponderance of evidence that the DI Fastener practices claim element 1[c] of the ’419 patent and claim element 1[c] of the ’613 patent.

4. **’419 Patent Claim Element 1[d]: “i) a first metal in a first concentration that is at least about 1 wt. %, the first metal selected from Co, Fe, Ni, and Zn; and”**  
**and**  
**’613 Patent Claim Element 1[d]: “i) a first metal in a first concentration that is at least about 1 wt. %, the first metal selected from Co, Fe, Ni, and Zn; and”**

The Parties agreed that the DI Fastener practices claim element 1[d] of the ’419 patent and claim element 1[d] of the ’613 patent. (JSUF at 3–5.).

During the Hearing, Modumetal introduced undisputed evidence that the DI Fastener

coating has the claimed “first metal” in the claimed “first concentration” that is “at least about 1 wt. %,” where the first metal is selected from Co, Fe, Ni, and Zn., i.e., Cobalt, Iron, Nickel, or Zinc, respectively. (Tr. (Kelly) at 487:25–488:16; CDX-0001C.0150.).

For the foregoing reasons, Modumetal has proven by a preponderance of the evidence that the DI Fastener practices claim element 1[d] of the ’419 patent and claim element 1[d] of the ’613 patent.

**5. ’419 Patent Claim Element 1[e]: “i) a second metal in a second concentration that is at least about 1 wt.%; and”**

**and**

**’613 Patent Claim Element 1[e]: “i) a second metal in a second concentration that is at least about 1 wt.%; and”**

The Parties agreed that the Accused Products practice claim element 1[e] of the ’419 patent and claim element 1[e] of the ’613 patent. (JSUF at 3–5.).

During the Hearing, Modumetal introduced undisputed evidence that the DI Fastener has the claimed “second metal” (nickel) in the claimed “second concentration” (16%) that is “at least about 1 wt. %.” (Tr. (Kelly) at 488:17–24; CDX-0001C.0151.).

For the foregoing reasons, Modumetal has proven by a preponderance of the evidence that the DI Fastener practices claim element 1[e] of the ’419 patent and claim element 1[e] of the ’613 patent.

**6. ’419 Patent Claim Element 1[f]: “B) a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel, the second alloy comprising”**

**and**

**’613 Patent Claim Element 1[f]: “B) a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel, the second alloy comprising”**

The Parties’ dispute with respect to claim element 1[f] of the ’419 patent and claim

element 1[f] of the '613 patent is, as for claim element 1[c], about their competing interpretations of the claim term “noble.” The dispute is substantively the same as the dispute over infringement for claim element 1[f]. (CBr. at 78–79 (citing Tr. (Kelly) at 488:25–490:14; CDX-0001C.0153, .0154; JX-0018C.0002; JX-0018C.0006; JX-0018C.0005); RRB. at 47–48; *see also*, Section VIII.B.3, for discussion of “nobility” and the accepted interpretation).).

For substantively the same reasons as already given for why Modumetal failed to prove infringement of claim element 1[f], Modumetal has also failed to prove by a preponderance of evidence that the DI Fastener practices claim element 1[f] of the '419 patent and claim element 1[f] of the '613 patent.

**7. '419 Patent Claim element 1[g]: “i) the first metal in a third concentration that is at least about 1 wt.%; and”**

**and**

**'613 Patent Claim Element 1[g]: “i) the first metal in a third concentration that is at least about 1 wt.%; and”**

The Parties' dispute is substantively the same as their dispute over infringement of claim element 1[g]. (CBr. at 79–80; RRB. at 48–49.).

The *Markman* Order construed claim element 1[g] and claim element 1[d] such that the claimed “first concentration” of the claimed “first metal” must be “different” than the claimed “third concentration” of the claimed “first metal.” (*Markman* Order at 25–41.).

Dr. Kelly testified that, according to EDS line scan data, the claimed “third concentration” of the tested DI Fastener is 83 wt.% zinc, which is “different” from the claimed “first concentration,” of the DI Fastener which is 84 wt.% zinc. (Tr. (Kelly) at 490:15–491:4; CDX-0001C.0156.).

In Section VIII.C.7 of this ID, with respect to infringement of claim element 1[g], it was a finding of this ID that Modumetal's EDS line scan data as applied to the light and dark bands

(accused first and second layers) of Modumetal's STEM-HAADF images did not prove that the concentration of zinc in the first layer of the Accused Products was different from the concentration of zinc in the second layer of the Accused Products. (*See* Section VIII.C.7.).

Briefly, Respondents and Dr. Frankel identified anomalies in Modumetal's EDS data as applied to its STEM-HAADF images that, if accepted as true, would have placed the highest concentration of zinc within a dark band of the STEM-HAADF image, i.e., the exact opposite of what the result should have been. (RRBr. at 19–23; Tr. (Frankel) at 913:9–916:4 (testifying that, according to Modumetal's STEM-HAADF and EDS line scan data, the 10BL-S product and the 4 BTX-S product exhibit higher nickel content within a light-colored layer); RDX-0003C.0029; JX-0015.0002, .0007 (10BL-S); JX-0105.0010–.0011 (4 BTX-S)). Neither Modumetal nor Dr. Kelly provided any rebuttal or explanation to Respondents' and Dr. Frankel's criticisms.

In the absence of an explanation or rebuttal for the specific anomalies in the specific test results Respondents identified, it is a finding of this ID that the issues with Modumetal's testing methodology that led to those anomalies are presumably present in all of Modumetal's test results, including its test results on the DI Fastener.

For these reasons, Modumetal has not proven by a preponderance of evidence that the DI Fastener practices claim element 1[g] of the '419 patent and claim element 1[g] of the '613 patent.

**8. '419 Patent Claim Element 1[h]: “ii) the second metal in a fourth concentration that is at least about 1 wt. %.”**

**and**

**'613 Patent Claim Element 1[h]: “ii) the second metal in a fourth concentration that is at least about 1 wt. %.”**

There is no dispute with respect to claim element 1[h] of the '419 patent and claim element 1[h] of the '613 patent. (CBr. at 80–81; RPBr. at 60–65 (failing to contest technical

domestic industry for claim element 1[h]); RRBr. at 46–47 (failing to contest technical domestic industry for claim element 1[h])).).

During the Hearing, Modumetal introduced undisputed evidence that the DI Fastener has the claimed “second metal” (nickel) in the claimed “fourth concentration” (17%) that is “at least about 1 wt. %.” (Tr. (Kelly) at 491:5–12; CDX-0001C.0157.). By not contesting this claim limitation, Respondents waived, abandoned or withdrew any appeal on this issue pursuant to Ground Rule 7.2.

For these reasons, Modumetal has proven by a preponderance of evidence that the DI Fastener practices claim element 1[h] of the ’419 patent and claim element 1[h] of the ’613 patent.

**9. ’419 Patent Claim Element 1[i]: “the coating or cladding having a thickness from 5 microns to 50 microns.”**

The Parties agreed that the DI Fastener practices claim element 1[i] of the ’419 patent. (JSUF at 3–5.).

During the Hearing, Modumetal introduced un rebutted, uncontroverted evidence that the DI Fastener has a “coating or cladding having a thickness from 5 microns to 50 microns.” (Tr. (Kelly) at 491:13–24; CX-0764.0001.).

For these reasons, Modumetal has proven by a preponderance of evidence that the DI Fastener practices claim element 1[i] of the ’419 patent.

**E. The DI Fastener Practices Claims 2, 3, 5, and 7 of the '419 Patent**

**1. '419 Patent Claim 2: “the coating or cladding of claim 1, wherein the first metal is Ni or Zn.”**

**and**

**'613 Patent Claim 2: “the method of claim 1, wherein the first metal is Ni or Zn.”**

Respondents did not articulate a basis for their argument that the DI Fastener does not practice the additional language of claim 2 of the '419 patent and claim 2 of the '613 patent. (RPBr. at 65; RRB. at 49–50 (arguing only the reasons discussed for claim 1)). Respondents waived, withdrew, and abandoned any argument that the DI Fastener does not practice the additional language of claim 2 pursuant to Ground Rule 7.2.

During the Hearing, Modumetal introduced un rebutted evidence that the DI Fastener practices the additional language of claim 2. (Tr. (Kelly) at 492:5–24; CDX-0001C.0161.).

However, because Modumetal did not prove by a preponderance of evidence that the DI Fastener practices claim 1, Modumetal also did not prove by a preponderance of evidence that the DI Fastener practices claim 2. *Muniauction*, 532 F.3d at 1328–29, n.5; *Monsanto Co.*, 503 F.3d at 1359.

**2. '419 Patent Claim 3: “the coating or cladding of claim 1, wherein each layer of the series of alternating layers is discrete.”**

**and**

**'613 Patent Claim 3: “the method of claim 1, wherein each layer of the series of layers is discrete.”**

Respondents argued that the DI Fastener does not practice claim 3 of the '419 patent and claim 3 of the '613 patent because Modumetal's STEM-HADDF testing images of the DI Fastener coating depicts “clear paths directly through the supposed dark layers,” i.e., the layers are not “discrete” as required by claim 3. (RPBr. at 65; RRB. at 49.).

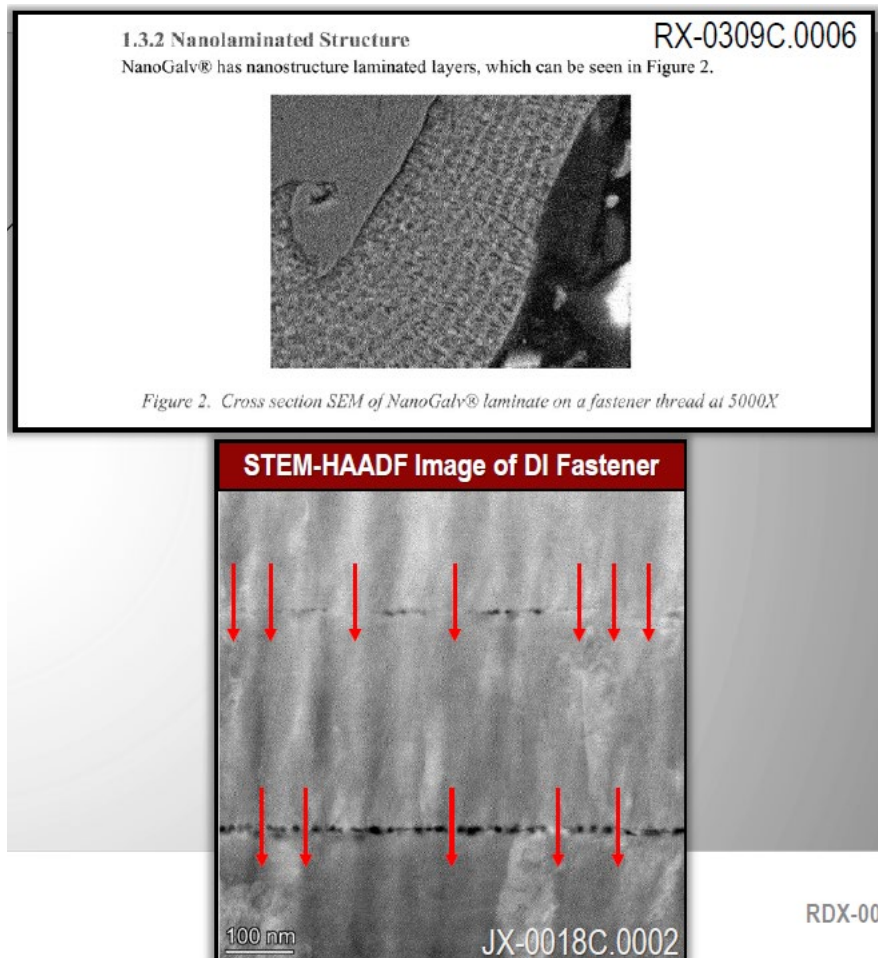
Dr. Kelly, Modumetal's expert, testified that the light and dark bands in the STEM-HAADF images of the DI Fastener coating, shown in Figure 27 below, constitute a series of layers wherein each layer of the series is discrete, as required by claim 3. (Tr. (Kelly) at 492:25–493:8 (“this shows the dark and light layers are discrete. They are horizontal relative to the screen”); CDX-0001C.0164; JX-0018C.0002 (STEM-HAADF image of DI Fastener coating).). Dr. Kelly gave no reason why the light and dark layers in the image are discrete. Dr. Kelly's testimony is too conclusory and unsupported to satisfy Modumetal's burden of proof. *Trs. of Columbia Univ. in City of New York v. Gen Digital Inc.*, 169 F.4th 1320, 1335 (Fed. Cir. 2026) (unsupported conclusory testimony is the kind of testimony the Federal Circuit has “consistently held should be afforded no weight”).

In contrast Dr. Frankel, Respondents' expert, testified that the dark bands in Modumetal's STEM-HAADF image (the alleged “second layer” in exhibit JX-0018C.0002 reproduced in Figure 27 below) have discontinuities that interrupt the nanolaminated microstructure of Modumetal's NanoGalv<sup>®</sup> coating, and therefore the alleged “second layer” is not “discrete.” (Tr. (Frankel) at 942:22–944:2; RDX-0003C.0056.).

Dr. Frankel illustrated this point in his demonstrative which is reproduced in Figure 27 below. In Figure 27 below, there are red arrows extending through what he called “discontinuities” in the dark bands of Modumetal's STEM-HAADF image of the DI Fastener. Above the STEM-HAADF image in Dr. Frankel's demonstrative reproduced in Figure 27 below, there is an excerpt from Modumetal's NanoGalv<sup>®</sup> product specification that depicts the nanolaminated structure of Modumetal's NanoGalv<sup>®</sup> coating (RX-0309C.0006). Dr. Frankel gave a reason for his opinion, i.e., that there are gaps and discontinuities depicted in Figure 27. This reasoning from Dr. Frankel, in contrast with the lack of any reason given by Dr. Kelly,

renders Dr. Frankel's opinion more supported than Dr. Kelly's. Weighing the evidence, it is a finding of this ID that Dr. Frankel's testimony is more supported by the documentary evidence and therefore, it is more credible.

**Figure 27: Dr. Frankel's Demonstrative Identifying With Red Arrows Alleged Discontinuities in the "Second Layer" of Modumetal's DI Fastener Coating**



(Tr. (Frankel) at 942:22–944:2; RDX-0003C.0056; JX-0018C.0002.).

For these reasons, Modumetal has not proven by a preponderance of evidence that the DI Fastener practices the additional language claim 3 of the '419 patent and claim 3 of the '613 patent.

3. **'419 Patent Claim 5: “the coating or cladding of claim 1, wherein the second metal is selected from Co, Fe, Ni, and Zn, the second metal being different than the first metal.”**

**and**

**'613 Patent Claim 5: “the method of claim 1, wherein the second metal is selected from Co, Fe, Ni, and Zn, the second metal being different than the first metal.”**

Respondents did not articulate a basis for their argument that the DI Fastener does not practice the additional language of claim 5 of the '419 patent and claim 5 of the '613 patent. (RPBr. at 65; RRBBr. at 49–50 (arguing only the reasons discussed for claim 1)). Respondents waived, withdrew, and abandoned any argument that the DI Fastener does not practice the additional language of claim 5 pursuant to Ground Rule 7.2.

During the Hearing, Modumetal introduced un rebutted evidence that the DI Fastener practices the additional language of claim 5. (Tr. (Kelly) at 493:9–21; CDX-0001C.0164.).

However, because Modumetal did not prove by a preponderance of evidence that the DI Fastener practices claim 1, Modumetal also did not prove by a preponderance of evidence that the DI Fastener practices claim 5. *Muniauction*, 532 F.3d at 1328–29, n.5; *Monsanto Co.*, 503 F.3d at 1359.

4. **'419 Patent Claim 7: “the coating or cladding of claim 1, wherein the first concentration, the second concentration, the third concentration, and the fourth concentration are independently at least about 5 wt.%.”**

Respondents did not articulate a basis for their argument that the DI Fastener does not practice claim 7 of the '419 patent. (RPBr. at 66; RRBBr. at 49–50 (arguing only the reasons discussed for claim 1)). Respondents waived, withdrew, and abandoned any argument that the DI Fastener does not practice the additional language of claim 7 of the '419 patent pursuant to Ground Rule 7.2.

During the Hearing, Modumetal introduced un rebutted evidence that the DI Fastener practices the additional language of claim 7 of the '419 patent. (Tr. (Kelly) at 493:22–495:11, 500:22–501:7; CDX-0001C.0161.).

However, because Modumetal did not prove by a preponderance of evidence that the DI Fastener practices claim 1 of the '419 patent, Modumetal also did not prove by a preponderance of evidence that the DI Fastener practices claim 7 of the '419 patent. *Muniauction*, 532 F.3d at 1328–29, n.5; *Monsanto Co.*, 503 F.3d at 1359.

## **X. INVALIDITY**

### **A. Legal Standards**

#### **1. Anticipation**

A determination that a patent is invalid as being anticipated under 35 U.S.C. § 102 requires a finding, based upon clear and convincing evidence, that each and every limitation is found either expressly or inherently in a single prior art reference. *See Celeritas Techs. Inc. v. Rockwell Int'l Corp.*, 150 F.3d 1354, 1361 (Fed. Cir. 1998). Anticipation is a question of fact, including whether a limitation, or element, is inherent in the prior art. *In re Gleave*, 560 F.3d 1331, 1334–35 (Fed. Cir. 2009). The limitations must be arranged or combined the same way as in the claimed invention, although an identity of terminology is not required. *Id.* at 1334 (“the reference need not satisfy an *ipsissimis verbis* test”); MPEP at § 2131.

In addition, the prior art reference’s disclosure must enable one of ordinary skill in the art to practice the claimed invention “without undue experimentation.” *Gleave*, 560 F.3d at 1334–35. A prior art reference that allegedly anticipates the claims of a patent is presumed enabled; however, a patentee may present evidence of non-enablement to overcome this presumption. *Impax Labs., Inc. v. Aventis Pharmaceuticals Inc.*, 468 F.3d 1366, 1382 (Fed. Cir. 2006). “[W]hether a prior art reference is enabling is a question of law based upon underlying factual

findings.” *Gleave*, 560 F.3d at 1335.

## **2. Obviousness**

Under 35 U.S.C. § 103(a), a patent is valid unless “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made” to a person having ordinary skill in the art. 35 U.S.C. § 103(a). The ultimate question of obviousness is a question of law, but “it is well understood that there are factual issues underlying the ultimate obviousness decision.”

*Richardson-Vicks*, 122 F.3d 1476, 1479 (Fed. Cir. 1997) (citing *Graham v. John Deere Co. of Kansas City* (“*Graham*”), 383 U.S. 1, 17 (1966)).

After claim construction, “[t]he second step in an obviousness inquiry is to determine whether the claimed invention would have been obvious as a legal matter, based on underlying factual inquiries including: (1) the scope and content of the prior art, (2) the level of ordinary skill in the art, (3) the differences between the claimed invention and the prior art, and (4) secondary considerations of non-obviousness.” *Smiths Indus. Med. Sys., Inc. v. Vital Signs, Inc.*, 183 F.3d 1347, 1354 (Fed. Cir. 1999) (citing *Graham*, 383 U.S. at 17). The existence of secondary considerations of non-obviousness does not control the obviousness determination; a court must consider “the totality of the evidence” before reaching a decision on obviousness.

*Richardson-Vicks*, 122 F.3d at 1483.

The Supreme Court clarified the obviousness inquiry in *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 389 (2007). The Supreme Court said:

When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. *Sakraida* and *Anderson’s-Black Rock*

are illustrative—a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions.

Following these principles may be more difficult in other cases than it is here because the claimed subject matter may involve more than the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement. Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicit.

\* \* \*

The obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation, or by overemphasis on the importance of published articles and the explicit content of issued patents. The diversity of inventive pursuits and of modern technology counsels against limiting the analysis in this way. In many fields it may be that there is little discussion of obvious techniques or combinations, and it often may be the case that market demand, rather than scientific literature, will drive design trends. Granting patent protection to advances that would occur in the ordinary course without real innovation retards progress and may, in the case of patents combining previously known elements, deprive prior inventions of their value or utility.

*KSR*, 550 U.S. at 417–19.

The Federal Circuit has since held that when a patent challenger contends that a patent is invalid for obviousness based on a combination of several prior art references, “the burden falls on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device, or carry out the claimed process, and would have had a reasonable expectation of success in doing so.”

*PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007) (citations omitted).

The TSM<sup>46</sup> test, flexibly applied, merely assures that the obviousness test proceeds on the basis of evidence--teachings, suggestions (a tellingly broad term), or

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<sup>46</sup> TSM is an acronym that stands for teaching, suggestion, motivation.

motivations (an equally broad term)--that arise before the time of invention as the statute requires. As *KSR* requires, those teachings, suggestions, or motivations need not always be written references but may be found within the knowledge and creativity of ordinarily skilled artisans.

*Ortho-McNeil Pharm.*, 520 F.3d at 1365.

### **3. Secondary Considerations of Non-Obviousness**

The Supreme Court has explained that certain factors, known as “secondary considerations” or “objective indicia of non-obviousness,” may “serve to ‘guard against slipping into use of hindsight,’” and help “resist the temptation to read into the prior art the teachings of the invention in issue.” *Graham*, 383 U.S. at 36, 86 S.Ct. 684. “Indeed, evidence of secondary considerations may often be the most probative and cogent evidence in the record. Evidence may often establish that an invention appearing to have been obvious in light of the prior art was not. It is to be considered as part of all the evidence, not just when the decisionmaker remains in doubt after reviewing the art.” *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1052 (Fed. Cir. 2016) (en banc) (“*Apple Inc.*”) (quoting *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538–39 (Fed. Cir. 1983)). However, the existence of secondary considerations of non-obviousness does not control the obviousness determination; a court must consider “the totality of the evidence” before reaching a decision on obviousness. *Richardson-Vicks Inc. v. Upjohn Co.*, 122 F.3d 1476, 1483 (Fed. Cir. 1997).

“For objective evidence of secondary considerations to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the *claimed invention*.” *In re Huai-Hung Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011) (emphasis in original) (quoting *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010)). There must be ‘a legally and factually sufficient connection’ between the evidence and the patented invention.” *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019) (quoting *Demaco Corp. v. F. Von*

*Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988) (“*Demaco*”).

A nexus is presumed to exist when “the asserted objective evidence is tied to a specific product and that product ‘is the invention disclosed and claimed in the patent.’” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1329 (Fed. Cir. 2016) (“*WBIP*”). In other words, a presumption of nexus requires “that the product embodies the invention and is coextensive with it.” *Volvo Penta of the Americas, LLC v. Brunswick Corp.*, 81 F.4th 1202, 1211 (Fed. Cir. 2023). The coextensiveness requirement is not satisfied just because the patent claims “broadly cover the product that is the subject of the secondary considerations.” *Teva Pharms. Int’l GmbH v. Eli Lilly & Co.*, 8 F.4th 1349, 1360–61 (Fed. Cir. 2021).

Although the patentee need not prove “perfect or near perfect correspondence” between the product and the claimed invention, the patentee must prove that “the product is essentially the claimed invention.” (*Id.*). If the product has unclaimed features, the presumption of nexus still applies if those unclaimed features “amount to nothing more than additional insignificant features.” (*Id.*). On the other hand, there is no presumption of nexus if a product has one or more unclaimed features, if the unclaimed features is “critical” and “materially impacts the product’s functionality.” (*Id.*). In other words, nexus cannot be presumed where “the patented invention is only a component of a commercially successful machine or process.” *Demaco*, at 1392.

Finally, evidence of secondary considerations of non-obviousness “cannot properly be considered in reaching a conclusion on obviousness/nonobviousness unless the decision maker first determines that these secondary considerations are relevant to the subject matter as claimed.” *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 305 n.42 (Fed. Cir. 1985) (pointing out that, if the district court had done this analysis and found that the

products that were the subject of the secondary considerations were not covered by the asserted patents, “then the secondary considerations would not have had any relevance to the obviousness/nonobviousness determination”).

#### **4. Enablement**

Section 112 provides the statutory basis for the enablement requirement:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains . . . to make and use the same.

35 U.S.C. § 112, ¶ 1 (Pre-AIA).

The enablement requirement ensures that “any person skilled in the art” can “make and use” the invention upon reading the patent. The standard for enablement is whether a person skilled in the art can “make and use” the invention “without undue experimentation.” *In re Wands*, 858 F.2d 731, 736–37 (Fed. Cir. 1988) (finding enablement where the disclosure provided considerable direction and guidance, working examples, in combination with a high level of skill and that methods to practice the invention were well-known).

The Federal Circuit interprets 35 U.S.C. 112, first paragraph, as providing a written description requirement that is separate from the enablement requirement. *Ariad*, 595 F.3d at 1344, 1351 (citing *Vas-Cath*, 935 F.2d at 1562–63). Unlike the written description requirement, which is a question of fact, the enablement requirement is a question of law. *Ariad*, 595 F.3d at 1351; *Amgen Inc. v. Sanofi, Aventisub LLC*, 987 F.3d 1080, 1084 (Fed. Cir. 2021) (“*Amgen*”), *cert. granted in part sub nom. Amgen Inc. v. Sanofi*, 143 S. Ct. 399 (2022) (denying certiorari as to whether enablement is a question of law; granting certiorari as to whether the full scope of the claimed embodiments must be enabled).

“Sufficiently routine” experimentation that would be reasonable to the skilled artisan to

carry out does not preclude a finding of enablement. *Amgen*, 987 F.3d at 1085. Lack of enablement requires finding “undue” experimentation to make and use the invention. Factual considerations, now known as the *Wands* factors, guide the inquiry as to whether a person skilled in the art would require “undue” experimentation to make and use the invention. *Amgen*, 987 F.3d at 1084. “Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations.” *Wands*, 858 F.2d at 737.

The *Wands* factors are:

- (1) the quantity of experimentation necessary,
- (2) the amount of direction or guidance presented,
- (3) the presence or absence of working examples,
- (4) the nature of the invention,
- (5) the state of the prior art,
- (6) the relative skill of those in the art,
- (7) the predictability or unpredictability of the art, and
- (8) the breadth of the claims.

*Id.*

The *Wands* factors “are illustrative, not mandatory” and there is no requirement to consider all the *Wands* factors. *Streck, Inc. v. Research & Diagnostic Sys., Inc.*, 665 F.3d 1269, 1288 (Fed. Cir. 2012) (“*Streck*”) (quoting *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1213 (Fed. Cir. 1991)). In *Streck*, true reticulocytes and analogs worked in the same way and were virtually indistinguishable, and so experimentation was not undue to make and use the invention. *Id.* at 1290–91. A *Wands* analysis usually considers identification of embodiments

that are asserted to not be enabled “so that breadth is shown concretely and not just as an abstract possibility, and how much experimentation a skilled artisan would have to undertake to make and use those products or processes.” *McRO, Inc. v. Bandai Namco Games Am. Inc.*, 959 F.3d 1091, 1100 (Fed. Cir. 2020) (“*McRO I*”) (citations omitted). In *McRO II*, the novel aspect of the invention was related to a set of rules to output mouth shapes. *Id.* at 1102. Lack of enablement required a finding that the challenger “identify specifics that are or may be within the claim but are not enabled.” *Id.* at 1104.

A patent is presumed to be valid. 35 U.S.C. § 282. Therefore, lack of enablement requires clear and convincing evidence. *Strech*, 665 F.3d at 1288. “Enablement is determined from the viewpoint of persons of skill in the field of the invention at the time the patent application was filed.” *Ajinomoto Co., Inc. v. Archer-Daniels-Midland Co.*, 228 F.3d 1338, 1345 (Fed. Cir. 2000) (finding enablement of claims to bacterial strains where methods to practice the invention were conventional and used well-known genetic engineering techniques). A specification does not need to “describe how to make and use every possible variant of the claimed invention,” but “when a range is claimed, there must be reasonable enablement of the scope of the range.” *Amgen*, 987 F.3d at 1084–85 (quoting *McRO II*, 959 F.3d at 1100).

While the written description requirement and enablement requirement may rise and fall together, they need not always do so. *Ariad*, 598 F.3d at 1352. Unlike written description, which is an objective inquiry into what the specification describes, the enablement analysis may rely on the knowledge of a person skilled in the art. For example, claims may be present that do not require undue experimentation, but an invention that has not yet been invented, cannot be described. *Id.* (citing *In re DiLeone*, 436 F.2d 1404, 1405 (C.C.P.A Feb. 11, 1971) (“*DiLeone*”). The Federal Circuit explained in *DiLeone* that an invention may be enabled as

broadly claimed, but not describe the invention. *DiLeone*, 436 F.2d at 1405. As an example, “consider the case where the specification discusses only compound A and contains no broadening language of any kind. This might very well enable one skilled in the art to make and use compounds B and C; yet the class consisting of A, B and C has not been described.” *Id.* at n.1.

“It is the specification, not the knowledge of one skilled in the art, that must supply the novel aspects of an invention in order to constitute adequate enablement.” *Idenix Pharm. LLC v. Gilead Scis., Inc.*, 941 F.3d 1149, 1159 (Fed. Cir. 2019) (“*Idenix*”) (finding non-enablement where the need to screen thousands of molecules for HCV efficacy required a large quantity of experimentation and rejecting that a POSA’s knowledge would guide testing to a predictable group of compounds).

## **B. Invalidity Overview**

In Parker Hannifin and LCSYW’s Response to the Complaint, (EDIS Doc. ID No. 843687), Parker Hannifin and LCSYW each asserted invalidity defenses of anticipation pursuant to 35 U.S.C. § 102, and obviousness pursuant to 35 U.S.C. § 103, based on, *inter alia*, the “Kirilova 1998” reference, the “Bahrololoom” reference, the “Chawa” reference, the “Fei” reference, and the “Chatterjee” reference. (Resp. at 29–30, 35–38.). Parker Hannifin and LCSYW also asserted lack of written description and enablement invalidity defenses pursuant to 35 U.S.C. § 112(a).<sup>47</sup> (*Id.* at 32, 39.).

Specifically, in their Pre-Hearing and Initial Post-Hearing Briefs, Respondents asserted

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<sup>47</sup> In their Pre-Hearing Brief, Respondents did not advance any argument with regard to invalidity based on lack of written description for either asserted patent. (*See generally* RPBr. at 65-106, 113-117.). Thus, any argument on this issue is deemed abandoned or withdrawn under Ground Rule 7.2. (Order No. 2, Att. A at 30.).

invalidity of claims 1, 2, and 5 of the '419 patent, and claims 1, 2, and 5 of the '613 patent, based upon anticipation by the Kirilova 1998 reference. (RPBr. at 65–70, 113–114; RBr. at 17-25, 62-63.). Respondents also asserted invalidity of claims 3, 5, and 7 of the '419 patent, and claims 3 and 5 of the '613 patent, based on obviousness over Kirilova 1998 alone or in view of Bahrololoom. (RPBr. at 71–74, 114; RBr. at 25-27, 64.).

In their Pre-Hearing and Initial Post-Hearing Briefs, Respondents also asserted invalidity of claims 1–3, 5, and 7 of the '419 patent, and claims 1–3 and 5 of the '613 patent, based on obviousness over the Chawa reference. (RPBr. at 74–81, 114; RBr. at 28-42, 64-65.).

Additionally, in their Pre-Hearing and Initial Post-Hearing Briefs, Respondents asserted invalidity of claims 1–3, 5, and 7 of the '419 patent, and claims 1–3, and 5 of the '613 patent, based on obviousness over the Fei reference alone or in view of the Chatterjee reference. (RPBr. at 87–93, 115–116; RBr. at 42–51, 66–67.). Respondents also argued that Modumetal had shown no secondary considerations of non-obviousness. (RPBr. at 93–100; RBr. at 51-57, 67-68.).

Finally, in their Pre-Hearing and Initial Post-Hearing Briefs, Respondents argued that the Asserted Claims are not enabled under 35 U.S.C. § 112(a) because the breadth of metals, alloy combinations, and concentrations encompassed by the Asserted Claims is nearly “infinite,” and thus would require undue experimentation to practice. (RPBr. at 100–106, 116; RBr. at 57-62, 68.).

Although Respondents also pursued an obviousness invalidity defense based on the “Ivanov” reference (JX-0005) in their Pre-Hearing Brief, that defense was not asserted during the Hearing. (RPBr. at 81–87, 115.). Respondents also did not address Ivanov in its Initial Post-Hearing Brief. Thus, any argument with respect to Ivanov is deemed waived under Ground Rule

10.1.

In its Pre-Hearing Brief, Modumetal counterargued that Respondents failed to prove any of their grounds of invalidity by clear and convincing evidence based on attorney argument and the expected expert testimony of Dr. Dana Medlin.<sup>48</sup> (CPBr. at 47–103.).

Notwithstanding Modumetal’s initial arguments, on the last day of the Hearing, Modumetal elected not to put on a rebuttal case on any issue including invalidity. (Tr. at 1104:2–1106:23.). In other words, Modumetal elected to waive its rebuttal because, according to Modumetal, Respondents and Dr. Frankel failed to prove the relative nobility requirements of the claims are disclosed or obvious over the asserted prior art.<sup>49</sup> (*Id.* at 1103:21–1106:22.).

Therefore, the only issue is whether Respondents have satisfied their burden to prove, by clear and convincing evidence, that the Asserted Claims are invalid according to Respondents’ theories and proof of invalidity, without more. For the reasons discussed below, Respondents failed to meet their burden of demonstrating by clear and convincing evidence that the Asserted Claims are invalid.

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<sup>48</sup> Modumetal identified Dr. Dana Medlin as an expert witness who was expected to testify about patent validity, including anticipation, obviousness, enablement, and secondary indicia of nonobviousness. (CPSt. at 4.). However, because Modumetal dropped its rebuttal case, Dr. Medlin did not testify during the Hearing.

<sup>49</sup> As discussed above in Section VIII.B.3 with respect to infringement, neither party raised the term “nobility” during the *Markman* proceedings and was thus, not construed. During the first day of the Hearing, applying *Phillips* and its progeny, “nobility” was given its plain and ordinary meaning. (Tr. at 11:12-15.). In its Reply Post-Hearing Brief, Modumetal contended that because Respondents’ expert, Dr. Frankel, “did not offer any invalidity opinions on the ’419 Patent or the ’613 Patent based on a construction of ‘noble’ in terms of reactivity[,]” “all of Dr. Frankel’s invalidity opinions involving prior art used a construction of ‘noble’ that is contradicted by the intrinsic teachings of the Asserted Patents, in direct contravention of the Federal Circuit’s guidance in *Phillips*[.]” and should be rejected. (CRBr. at 4.). Modumetal asserted that based on the disclosures of the Asserted Patents, the plain and ordinary meaning of “nobility” must be construed in terms of reactivity. (*Id.*).

**C. The Asserted Prior Art**

**1. Kirilova 1998 (JX-0114)**

Kirilova 1998 is a technical article published in 1998 in the peer-reviewed *Journal of Applied Electrochemistry*, titled “Anodic Behaviour of Composition Modulated Zn-Co Multilayers Electrodeposited from Single and Dual Baths.” (JX-0114.0001.). The Parties agreed that Kirilova 1998 is statutory prior art to the Asserted Patents. (JSUF at 5, 7; Tr. (Frankel) at 992:1–993:1.).

Kirilova 1998 describes multilayered coatings “composed of two sublayers of different metals or alloys.” (JX-0114.0001.). Kirilova 1998 reports creating multilayer coatings from single baths containing both zinc and cobalt ions, wherein the sublayers are composed of alloys of zinc and cobalt with at least 1.0% zinc and cobalt content, and wherein the sublayers are 3 microns (3,000 nm) thick:

Composition modulated Zn-Co multilayers of alternate alloy sublayers with low (1.0%) and high (6.5%) cobalt content were obtained galvanostatically. Alloy coatings containing 1% cobalt (Zn-Co1%) and 6.5% cobalt (Zn-Co6.5%) were deposited at 0.2 and 2 A dm<sup>-2</sup>, respectively. The 3.0 µm thick Zn-Co1% sublayers were deposited for 7 min, and 0.3µm thick Zn-Co6.5% for 45 s. The 3.0 µm thick Zn-Co1% sublayers were deposited for 1 h and 3.0 µm Zn-Co6.5% for 7 min.

(*Id.* at .0003.).

**2. Bahrololoom (JX-0120)**

Bahrololoom is a technical article published in 2003 in the *Journal of the Electrochemical Society*, titled “Development of a Bath for Electrodeposition.” (JX-0120.0001.). The Parties agreed that Bahrololoom is statutory prior art to the Asserted Patents. (JSUF at 5, 7; Tr. (Frankel) at 1018:15–1019:8.).

Bahrololoom reports on the creation of multilayered Zn-Co coatings with Zn and Co content greater than 1% and wherein the layers are about 1 micron (1,000 nm) thick on average.

(JX-0120.0007 (Figure 16 and accompanying text)).

**3. Chawa (JX-0116)**

Chawa is a thesis, titled “The Electrodeposition of Compositionally Modulated Multilayer Coatings for Enhanced Corrosion Resistance,” that was submitted to the Loughborough University of Technology, London, which bears on its face the date January 1996. (JX-0116.). Respondents asserted that Chawa is a prior art printed publication under 35 U.S.C. § 102(b) (pre-AIA) such that the printed publication bar would apply. (RBr. at 28.). The Parties disputed whether Chawa was publicly available before the earliest priority date to which the Asserted Patents are entitled. (RBr. at 28–35; CRBr. at 8–14.).

Chawa investigates electrodeposited alternating multilayer coatings and provides detail on how to electrodeposit Zn-Ni alloys with varying nickel concentrations. (JX-0116.0122, 0144–0191; Tr. (Frankel) at 958:14–17.). Specifically, Chawa teaches Zn-Ni multilayer coatings with 12 layers comprising alternating layers of Zn-13% Ni and Zn-2% Ni alloys. (JX-0116.0197; Tr. (Frankel) at 958:18–959:4.).

**4. Fei (JX-0118)**

Fei is a technical article published in 2005 in the *Chinese Journal of Chemical Engineering*, titled “Electrodeposition of Compositionally Modulated Zinc-cobalt Alloy Multilayer Coatings.” (JX-0118.). The Parties agreed that Fei is statutory prior art to the Asserted Patents. (JSUF at 5, 7; Tr. (Frankel) at 1034:23–1035:11.).

Fei describes making multilayered Zn-Co alloy coatings, wherein the Zn and Co content are both above 1%, and wherein at least some Zn-Co layers are 1 micron (1,000 nm) thick. (JX-0118.0005 (sample (d) in Figure 8 and accompanying text)).

**5. Chatterjee (RX-0267)**

Chatterjee is a technical publication published in 2005 in *Jahrbuch Oberflächen Techniq*,

titled “Zinc Alloy Plating – General Considerations.” (RX-0267.). The Parties agreed that Chatterjee is statutory prior art to the Asserted Patents. (JSUF at 5, 8; Tr. (Frankel) at 1037:2–12.).

Chatterjee is a review article that describes the history of development of zinc alloy plating for the purpose of improving performance in the automobile, aerospace, and fastener industries in corrosive atmosphere. (RX-0267.0001.). Chatterjee says:

In some environments, the corrosion resistance of pure zinc coating as a barrier, is not sufficient to provide long term protection. This problem was overcome by alloying zinc with relatively noble metals, such as cobalt, nickel, iron, manganese, chromium and tin.

(RX-0267.0006.).

**D. Respondents’ Asserted Prior Art Grounds of Invalidity Do Not Render the Asserted Claims Invalid**

**1. Kirilova 1998 Does Not Anticipate Claims 1, 2, and 5 of the ’419 Patent and Claims 1, 2, and 5 of the ’613 Patent**

Respondents argued that Kirilova 1998 anticipates claims 1, 2, and 5 of the ’419 patent and claims 1, 2, and 5 of the ’613 patent.<sup>50</sup> (RBr. at 17–26, 62–64.). For the following reasons, Respondents have not proven by clear and convincing evidence that Kirilova 1998 anticipates these claims.

As an initial matter, the Parties agreed that Kirilova 1998 discloses claim limitations 1[a], 1[b], 1[d], 1[e], 1[g], 1[h], and 1[i] of the ’419 patent and claim limitations 1[a], 1[b], 1[d], 1[e], 1[g], 1[h], and 1[i] of the ’613 patent. (JSUF at 4, 7.). Additionally, Modumetal did not dispute Respondents’ contention that Kirilova 1998 discloses the additional limitations recited in claims 2 and 5 of the ’419 patent and claims 2 and 5 of the ’613 patent. (CRBr. at 5–8.).

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<sup>50</sup> Claims 1, 2, and 5 of the ’613 patent are corresponding method claims of apparatus claims 1, 2, and 5 of the ’419 patent. (JX-0001 at cls. 1, 2, 5; JX-0002 at cls. 1, 2, 5.).

Thus, the only dispute for claim 1 relates to the relative nobility requirements of claim limitations 1[c] and 1[f] of the '419 and '613 patents, which recite “a first layer of a first alloy that is less noble than the substrate or the mandrel” and “a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel,” respectively. (JX-0001 at cl. 1; JX-0002 at cl. 1.). Respondents pointed out that Modumetal disputed, but did *not* rebut, Dr. Frankel’s testimony with respect to these claim limitations. (RBr. at 19–21, 22–23.). While this may be the case, “[a]t *all* times, the burden is on the *defendant* to establish by clear and convincing evidence that the patent is obvious.” *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1360 (Fed. Cir. 2012) (emphases added).

For claim limitation 1[c] of the '419 and '613 patents, Respondents argued that a Zn-6.5% Co layer disclosed in Kirilova 1998 is the claimed “first layer” because it is an alloy. (RBr. at 19 (citing Tr. (Frankel) at 998:12–20; JX-0114.0004; RDX-0003C.0113).). For claim limitation 1[f], Respondents pointed to a Zn-1% Co layer as the claimed “second layer.” (*Id.* at 22 (citing JX-0114.0004; RDX-0003C.0122).).

Acknowledging that Kirilova 1998 does not expressly disclose the relative corrosion potentials of either layer, Dr. Frankel relied on a companion paper, Kirilova 1999, which reports corrosion potential measurements for zinc-cobalt layers containing 6.5% cobalt (“Zn-6.5%Co”) and 1% cobalt (“Zn-1%Co”). (Tr. (Frankel) at 999:9-1000:7; JX-0115.). However, as Modumetal noted, Dr. Frankel assumed that these layers are the same layers reported in Kirilova 1998. (*Id.* at 1000:1–7.). Moreover, Kirilova 1999 does not provide any corrosion potential values for copper, the substrate upon which the Zn-6.5%Co and Zn-1%Co are deposited in Kirilova 1998. (*Id.* at 1001:13–15, 1005:13–17.). Thus, as Modumetal asserted, the combination of Kirilova 1998 and Kirilova 1999 does not show that Kirilova 1998 discloses “a first layer of a

first alloy that is less noble than the substrate or the mandrel,” as required by claim 1[c], or “a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel,” as required by claim 1[f]. (CRBr. at 6.).

To address this deficiency, Dr. Frankel relied on a “transitive analysis” (or analysis of the text to figure out meaning) to offer his opinion that Kirilova 1998 inherently discloses the nobility of the copper substrate. (Tr. (Frankel) at 1006:6–1007:5; RDX-0003C.0119.). Specifically, he based his analysis on two (2) data points: (i) corrosion potential data reported in Kirilova 1999 for the Zn-6.5%Co and Zn-1%Co layers and for a pure cobalt layer that show that the Zn-6.5%Co and Zn-1%Co layers are less noble than the cobalt; and (ii) corrosion potential data for cobalt and copper reported in an unrelated paper by Zhang (RX-0271) and recorded under different conditions that show that cobalt is less noble than copper.<sup>51</sup> (Tr. (Frankel) at 1002:4–1004:9).

Applying the transitive property analysis here, Dr. Frankel offered his opinion that because the Zn-6.5%Co and Zn-1%Co layers are less noble than cobalt (according to Kirilova 1998) and cobalt is less noble than copper (according to Zhang), the Zn-6.5%Co and Zn-1%Co layers are less noble than copper. (*Id.* at 1006:6–1007:5, 1012:25–1013:18.).

However, Dr. Frankel’s testimony that corrosion potential is a measure of nobility “in a specific environment” and that the “corrosion potential could change from environment to environment” undermines his “transitive analysis.”

Q. I think you mentioned earlier that corrosion potential is a measure of a material’s nobility in a specific environment.

---

<sup>51</sup> RX-0271, titled “Role of 1,2,4-Triazole in Co/Cu Removal Rate Selectivity and Galvanic Corrosion during Barrier CMP,” is a paper from the *Journal of Solid State Science and Technology*, authored by Zhang et al. and published in 2017.

Do you remember that?

A. I do.

Q. What do you mean “in a specific environment”?

A. Yes, so the corrosion potential could change from environment to environment.

Q. Is the corrosion potential of a material in a specific environment an inherent characteristic of that material?

A. So in a specific environment, yes, the corrosion potential is an inherent property of a material.

(Tr. (Frankel) at 998:21–999:8.).

With respect to Kirilova 1999, Dr. Frankel noted that the corrosion potential measurements for the Zn-6.5%Co, Zn-1%Co, and pure cobalt layers were performed in a chemical environment that is “a mixture of sodium chloride and sodium sulfate.” (*Id.* at 1000:1–17.). Testifying about Figure A of Zhang, Dr. Frankel pointed out that the copper and cobalt corrosion potential measurements were done in “deionized water at pH10.” (*Id.* at 1003:23–1004:2; RDX-0003C.0117.). Not only does his own testimony about “a specific environment” fail to support comparing corrosion potential values recorded under different chemical conditions, but also, Dr. Frankel did not sufficiently explain or offer evidence that would justify making such a comparison. He compared the results of a few unrelated corrosion potential measurements in Zhang to the corrosion potentials in Kirilova 1999 and concluded, *ipse dixit*, that “it would have been well-understood by a POSA that in simple environments that relationship would hold.” (*Id.* at 1009:2–13.).

For the foregoing reasons, even if “noble” is construed in terms of corrosion potential,<sup>52</sup> Respondents did not meet their burden to prove by clear and convincing evidence that Kirilova

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<sup>52</sup> See Section VIII.B.3, *supra* (discussion of the plain and ordinary meaning of “nobility”).

1998 discloses claim limitations 1[c] and 1[f] of the '419 and '613 patents.

Accordingly, it is a finding of this ID that Kirilova 1998 does not anticipate claims 1, 2, and 5 of the '419 and '613 patents.

**2. Kirilova 1998 Alone or in Combination with Bahrololoom Does Not Render Obvious Claims 3 and 7 of the '419 Patent and Claim 3 of the '613 Patent**

Respondents argued that Kirilova, alone or in combination with Bahrololoom, renders obvious claims 3 and 7 of the '419 patent and claim 3 of the '613 patent. (RBr. at 25–26, 64.). Claims 3 and 7 of the '419 patent depend from claim 1 of the '419 patent. (JX-0001 at cls. 3, 7.). Likewise, claim 3 of the '613 patent depends from claim 1 of the '613 patent. (JX-0002 at cl. 3.). Claim 3 of both patents recite layers that are “discrete.” (JX-0001 at cl. 3; JX-0002 at cl. 3.). Claim 7 of the '419 patent requires a first, second, third, and fourth concentration that are “independently at least about 5 wt. %.” (JX-0001 at cl. 7.).

In its Reply Post-Hearing Brief, Modumetal relied solely on its validity arguments with respect to claim 1 of the '419 and '613 patents. (CRBr. at 8.). As Respondents pointed out, Modumetal did not separately dispute Kirilova 1998 alone would have rendered obvious claims 3 and 7 of the '419 patent and claim 3 of the '613 patent. (RBr. at 25, 26, 64.).

With respect to Kirilova 1998 combined with Bahrololoom, Respondents argued that Modumetal disputed, but did *not* rebut, Dr. Frankel’s testimony with respect to claim 3 of the '419 and '613 patents. (*Id.* at 25, 64). While this may be the case, as noted above in Section X.D.1, “[a]t *all* times, the burden is on the *defendant* to establish by clear and convincing evidence that the patent is obvious.” *Kinetic Concepts*, 688 F.3d at 1360 (emphases added).

In order to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Because these claims depend from claim 1, they require the nobility

limitations of claims 1[c] and 1[f]. As discussed above in Section X.D.1, Kirilova 1998 does not teach these claim limitations, regardless of whether “noble” is construed in terms of reactivity, as Modumetal contended, or corrosion potential, as Respondents alleged, or as both concepts of reactivity and corrosion potential can be harmonized, as is an interpretation given in this ID. Moreover, Dr. Frankel’s reliance on Bahrololoom is solely for a purported disclosure of “discrete layers” (for claim 3 of the ’419 and ’613 patents) and metal concentrations “at least about 5 wt. %” (for claim 7 of the ’419 patent). (Tr. (Frankel) at 1024:15-20, 1026:15-19.). Dr. Frankel did not provide any opinion or testimony that Bahrololoom teaches the nobility limitations of claim 1[c] and 1[f].

For these reasons, Respondents did not meet their burden to prove by clear and convincing evidence that Kirilova 1998 alone or in combination with Bahrololoom renders obvious claims 3 and 7 of the ’419 patent and claim 3 of the ’613 patent.

Accordingly, it is a finding of this ID that Kirilova 1998 alone or in combination with Bahrololoom does not render obvious claims 3 and 7 of the ’419 patent and claim 3 of the ’613 patent.

**3. Chawa Does Not Render Obvious Claims 1–3, 5, and 7 of the ’419 Patent and Claims 1–3 and 5 of the ’613 Patent**

Respondents argued that Chawa renders obvious claims 1–3, 5, and 7 of the ’419 patent and claims 1–3 and 5 of the ’613 patent. (RBr. at 28–42, 64–66.). Specifically, Respondents contended that Chawa is a prior-art printed publication under 35 U.S.C. § 102(b) (pre-AIA) because “Chawa was publicly accessible before the critical date because a POSA could, with reasonable diligence, locate it in the Loughborough University Library.”<sup>53</sup> (*Id.* at 29 (citing Tr.

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<sup>53</sup> The critical date is June 8, 2009.

(Frankel) at 988:3–991:19; RDX-0003C.0101–02).).

As an initial matter, the Parties agreed that Chawa discloses claim limitations 1[a], 1[d], 1[e], 1[g], 1[h], and 1[i] of the '419 patent and claim limitations 1[a], 1[d], 1[e], 1[g], and 1[h] of the '613 patent. (JSUF at 4, 7.). As discussed in Section X.B, during the Hearing, Modumetal did not advance *any* rebuttal arguments to counter Respondents' invalidity arguments. In its Reply Post-Hearing Brief, Modumetal only disputed limitation 1[b] of the '419 patent and limitation 1[b] of the '613 patent. (CRBr. at 15, 32.). In its Initial Post-Hearing Brief, Respondents pointed out that limitation 1[b] of both patents was disputed but not *rebutted*. While this may be the case, "[a]t *all* times, the burden is on the *defendant* to establish by clear and convincing evidence that the patent is obvious." *Kinetic Concepts*, 688 F.3d at 1360 (emphases added).

For the following reasons, Chawa does not qualify as a printed publication under 35 U.S.C. 35 U.S.C. § 102(b) (pre-AIA) and, therefore, does not render obvious claims 1–3, 5, and 7 of the '419 patent and claims 1-3 and 5 of the '613 patent.

In the event the Commission finds that Chawa is a printed publication and prior art to the Asserted Claims, as discussed below, Chawa renders obvious claims 1–3, 5, and 7 of the '419 patent and claims 1–3 and 5 of the '613 patent.

**a) Respondents Failed to Demonstrate that Chawa Is Prior Art Because Respondents Did Not Establish that Chawa Was Available**

The "printed publication" bar is found in 35 U.S.C. 35 U.S.C. § 102(b) (pre-AIA):<sup>54</sup>

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<sup>54</sup> In the America Invents Act ("AIA"), the "printed publication" bar can be found at 35 U.S.C. § 102(a)(1): "A person shall be entitled to a patent unless—(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention . . . ."

**Public Version**

A person shall be entitled to a patent unless—

\* \* \*

(b) the invention was patented or described in a printed publication in this or a foreign country . . . more than one year prior to the date of the application for patent in the United States . . . .

35 U.S.C. 35 U.S.C. § 102(b) (pre-AIA).

Whether a given reference qualifies as a prior art “printed publication,” the key inquiry is whether the reference was made “sufficiently accessible to the public interested in the art” before the critical date. *In re Cronyn*, 890 F.2d 1158, 1160 (Fed. Cir. 1989). “The test for public accessibility is not ‘has the reference been indexed?’” – but “whether the reference was ‘available to the extent that persons interested and ordinarily skilled in the subject matter or art[,] exercising reasonable diligence, can locate it.’” *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 774 (Fed. Cir. 2018) (quoting *Voter Verified, Inc. v. Premier Election Sols., Inc.*, 698 F.3d 1374, 1380 (Fed. Cir. 2012)). A “printed publication,” if indexed, cataloged, and shelved in a meaningful way before the critical date, can be prior art. *Cronyn*, 890 F.2d at 1160–61. Public accessibility requires more than “technical accessibility,” and a reference may be unavailable “despite some indexing and search functionality.” *Acceleration Bay*, 908 F.3d 773. Respondents bear the burden of proving public accessibility. *See In re Hall*, 781 F.2d 897, 899 (Fed. Cir. 1986) (“The proponent of the publication bar must show that prior to the critical date the reference was sufficiently accessible.”).

As Modumetal pointed out correctly, the record is “scant.” (CRBr. at 9.). It is not clear what exactly happened to Chawa between January 1996 and May 2018, when it was uploaded to the internet, apparently from Loughborough University of Technology, and the original copy was subsequently destroyed. (See CX-0826.0009 (“The link to the full-text from the catalogue entry states that the thesis was posted electronically on 2018-05-21.”), .0008 (“The thesis was scanned

in 2018 and the physical copy was destroyed as part of the process. . . . It is therefore possible that the item was viewed 1996-2018 but we have no records or proof that this occurred.”).).

Mr. David Campling, Open Research Manager at Loughborough University, informed counsel for Respondents that between 1996 and 2018, Chawa would have been in “***locked*** rolling shelving, only available upon ***request***.” (*Id.* at .0008 (emphases added).). Mr. Campling stated that “[t]here would ***not*** have been any of the content electronically available until it was scanned in 2018” and that “[u]sers would have to ***come into the Library*** to access the content.” (*Id.* at .0007 (emphases added).). He also clarified that even if requested, Chawa “could ***not*** be borrowed” but could only “be viewed.” (*Id.* at .0008 (emphasis added).). Thus, a skilled artisan would first need to know that Chawa existed, and second, its relevance to ask for it to gain access to its contents. These facts weigh against a finding that Chawa was “sufficiently accessible to the public” to qualify as prior art before the critical date. *In re Cronyn*, 890 F.2d at 1160.

Additionally, in an email exchange among Mr. Campling, Ms. Aileen McLaughlin, a Library Services Manager at Respondents’ counsel’s law firm, and Matthew Johnson, a partner at that Respondents’ counsel’s law firm, Mr. Campling appeared to be reluctant to attest to, let alone state, without qualifying his statement as only “to the best of his knowledge,” that Chawa “would have been on the Loughborough University Library computer catalogue from the date of accession (May 1996), searchable by author and title.” (CX-0826.0001–.0002.). This also undermines the evidentiary value of Mr. Campling’s statement. Relevant portions of the email exchange between Mr. Campling and Jones Day, i.e., Respondents’ law firm, are copied below in Figure 28.

**Figure 28: Correspondence Between Loughborough University Staff and Respondents' Counsel**

---

**From:** David Campling <D.D.Campling@lboro.ac.uk>  
**Sent:** 19 February 2025 11:27  
**To:** McLaughlin, Aileen J. <amclaughlin@jonesday.com>  
**Cc:** Gareth Cole <G.J.Cole@lboro.ac.uk>; Emma Walton <E.Walton@lboro.ac.uk>  
**Subject:** FW: Public availability date for 1996 thesis lodged at Loughborough University of Technology

Hello Aileen

We can send you a statement to the effect of:

*To the best of my knowledge the thesis would have been on the Loughborough University Library computer catalogue from the date of accession (May 1996), searchable by author and title- this catalogue was available on the internet.*

Is that wording sufficient? Do you need this in writing or will this email suffice? If you need it in writing we will get the Librarian to sign it off for you- then could you give us the postal address or would a scan be sufficient? We could have that scanned or posted to you today.

David

\* \* \*

---

**From:** McLaughlin, Aileen J. <amclaughlin@jonesday.com>  
**Sent:** 18 February 2025 11:23  
**To:** David Campling <D.D.Campling@lboro.ac.uk>  
**Cc:** Gareth Cole <G.J.Cole@lboro.ac.uk>  
**Subject:** RE: Public availability date for 1996 thesis lodged at Loughborough University of Technology

**\*\* THIS MESSAGE ORIGINATED OUTSIDE LOUGHBOROUGH UNIVERSITY \*\***

**\*\* Be wary of links or attachments, especially if the email is unsolicited or you don't recognise the sender's email address. \*\***

Thank you David. If Gareth does have anything to add, that would be great. We are just trying to establish with as much written proof as possible that the Chawa thesis existed in the University of Loughborough search engine prior to 8 June 2008.

I presume you would not be prepared to write a signed declaration as suggested by the lawyer in the US below:-

Another option is to get a declaration from someone at the library stating that according to library policies "*The thesis would have been on the computer catalogue from the date of accession (May 1996), searchable by author and title- this catalogue was available on the internet.*" (From David Campling.)

Regards  
Aileen

**Public Version**

Aileen McLaughlin  
Library Services Manager  
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London EC4Y 0DJ  
Office +44.20.7039.5466  
Cell +44.7872.808918

\* \* \*

---

**From:** McLaughlin, Aileen J.  
**Sent:** 13 February 2025 16:39  
**To:** David Campling <D.D.Campling@lboro.ac.uk>  
**Subject:** RE: Public availability date for 1996 thesis lodged at Loughborough University of Technology

Hello David

I am afraid that I am back again. I have copied below the latest request for further detail from the lawyer in our Pittsburgh office who is desperate to get as much information as possible. I am very conscious that you have already gone above and beyond what would usually be expected, but as you can see, the information is critical to a case our firm is working on.

As well as the copied request from the lawyer below, scroll down and you will see my latest response to his question from this morning in answer to your reply this morning. I thought I had provided him with the catalogue link that showed as much information as there is available.

The URL link at the bottom of the catalogue entry does not work. I wonder if this would provide the link to the associated record that Matthew in his email seems to think would be available?

**url** <https://hdl.handle.net/2134/33058>

- does not work

If you can comprehensively answer the latest questions put by Matthew Johnson, I hope it will finish this enquiry once and for all.

As before, I am very grateful for any further assistance you can provide.

Thank you very much  
Aileen

Thanks, Aileen.

What we need here is as much proof as we can get that a record existed in their search engine prior to June 8, 2008.

The "Staff View" of the first web page that you sent (see screenshot below) has a "publishDate" of 1996, which is helpful, but probably not enough on its own for us to feel comfortable going into court.

I know when Maria looks things up in certain databases here, she is able to find a field that shows when the associated record was created. Can we push back on the library to see whether they have something like that?

Another option is to get a declaration from someone at the library stating that according to library policies "*The thesis would have been on the computer catalogue from the date of accession (May 1996), searchable by author and title- this catalogue was available on the internet.*" (From David Campling.)

**Public Version**

**Matt**

Matthew Johnson  
Partner  
JONES DAY® - One Firm Worldwide<sup>SM</sup>  
One Mellon Center  
500 Grant Street  
Pittsburgh, PA 15219-2502

(CX-0826.0001–.0003, .0005–.0006.).

Moreover, there is no evidence that Chawa was indexed or catalogued such that a skilled artisan, exercising reasonable diligence, could have located it. *Acceleration Bay*, 908 F.3d at 774. Both Mr. Campling and Ms. Emma Watson, the Director of Library Services and University Librarian, stated that “[t]o the best of [their] knowledge,” Chawa “would have been on the Loughborough University Library computer catalogue from the date of accession (May 1996), searchable by author and title[.]” (CX-0826.0002; RX-0266.0001.). Neither Mr. Campling nor Ms. Watson could definitively state they had knowledge that Chawa was in the Loughborough University catalogue prior to 2018. Their statements were qualified, at best, and certainly equivocal.

Additionally, the Federal Circuit has found that indexing “only by title and author’s name” is not enough for public availability. In *Blue Calypso, LLC v. Groupon, Inc.*, the Federal Circuit clarified its prior holding in *In re Cronyn*, 890 F.2d 1158 (Fed. Cir. 1989):

[I]n *Cronyn*, we found that the references were not publicly accessible, despite the use of indexing, because the references were indexed only by title and author’s name, rather than by subject. 890 F.2d at 1161. Indexing only by title and author’s name did not amount to the references being “either cataloged or indexed in a meaningful way.” *Id.* Indexing by subject offers meaningful assurance that an ordinarily skilled artisan, exercising reasonable diligence, will be able to locate a particular reference among the many volumes stored in a library.

*Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1348–49 (Fed. Cir. 2016) (citing *In re Cronyn*, 890 F.2d 1158, 1161 (Fed. Cir. 1989)).

Here, as Modumetal noted, it is unclear “what the Loughborough University staff meant

by ‘searchable,’ for instance, whether the title search operated by keyword (e.g., whether the search would have returned all documents with the word ‘corrosion’ in the title) or a more basic search where the search term would need to match the title (e.g., the search would have to begin ‘the electrodeposition of...’).” (CRBr. at 11.). Thus, Respondents did not adequately demonstrate that Chawa could have been located by searching through an index.

To establish the indexing and cataloging capabilities of the Loughborough University around the time Chawa was submitted, Respondents relied on the following three (3) sets of documents: (i) two “Wayback” machine printouts showing the functionality of the University’s computerized catalogue known as OPAC (Online Public Access Catalogue) as of October 7, 1997 and July 14, 2001, respectively (RX-0267; RX-0270); (ii) a document referred to as the Linton thesis,<sup>55</sup> which purports to describe the search functionality at the Loughborough University’s library in September 1996 (CX-0103); and (iii) the “Walton Signed Statement” (RX-0266). The documents are problematic for the following reasons.

First, with respect to the two (2) “Wayback” machine printouts, which are copied below in Figure 29, the Loughborough University’s Pilkington Library had a computerized catalogue that could be accessed from Loughborough University network terminals no later than October 7, 1997, and that by July 14, 2001, the catalogue could be searched using advanced features such as “Keyword,” “Subject,” and “Classmark.”

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<sup>55</sup> The Linton thesis, titled “The Impact of Z39.50 on Library Catalogues: OPACs on the World-Wide Web,” was submitted to the Loughborough University by Tracy Maria Linton in September 1996. (CX-0103.0005.).

Figure 29: Two “Wayback” Machine Printouts

4/14/25, 5:18 PM

Pilkington Library catalogue (OPAC)

The Wayback Machine - <https://web.archive.org/web/19971007171523/http://www.lboro.ac.uk:80/library/opa...>

## Library catalogue (OPAC)

The Library has a computerised catalogue known as OPAC (Online Public Access Catalogue), which can be accessed from PCs situated on each floor of the Library and from any workstation connected to the campus network. OPAC is available at all times from a networked workstation. A backup catalogue is provided on microfiche, although it is considerably less up-to-date than OPAC.

- [Web OPAC](#)
- [Text based OPAC\\*](#) (via telnet)

**Note:** Certain areas of the OPAC (e.g. borrower services) require a PIN (Personal Identification Number). This can be obtained from the Library Issue Desk.

\* After connecting to the text based OPAC you are presented with a short menu of terminal types, if in doubt choose option 1 (VT220 with Escape Based Function keys.) An information guide entitled "How to use OPAC" is available from the Library.

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[\[ Home \]](#) | [\[ Library index \]](#)

---

[J.J.Brown@lboro.ac.uk](mailto:J.J.Brown@lboro.ac.uk) , July 1996.

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4/14/25, 5:15 PM

Pilkington Library OPAC

The Wayback Machine - <https://web.archive.org/web/20010714100015/http://libb.lboro.ac.uk:8008/www-bin/...>



## Pilkington Library OPAC

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*Welcome to the Loughborough University Pilkington Library TalisWeb Online Public Access Catalogue. The catalogue enables you to find material held by the Library and reserve on-loan copies. A page offering [help and advice](#) on searching the OPAC is available.*

**Select the search you require:**

|                           |                                  |                                 |
|---------------------------|----------------------------------|---------------------------------|
| <a href="#">▼ Author</a>  | <a href="#">▼ Author/Title</a>   | <a href="#">▼ Subject</a>       |
| <a href="#">▼ Title</a>   | <a href="#">▼ Author/Keyword</a> | <a href="#">▼ Classmark</a>     |
| <a href="#">▼ Keyword</a> | <a href="#">▼ Number</a>         | <a href="#">▼ Reading Lists</a> |

Information and services available to registered users of the Library can be found via [Borrower Services](#).

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[Comment on TalisWeb OPAC](#)

(RX-0269 (1997 printout); RX-0270 (2001 printout)).

However, as Modumetal noted, there is no evidence that Chawa was retrievable by the

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catalogues shown in RX-0269 and RX-0270. (CRBr. at 12.). As discussed above, the evidence indicates that Chawa was treated ***differently*** from the Loughborough University's regular library collection. For example, Mr. Campling noted that the thesis was located in "***locked*** rolling shelving," available only upon request, and "could ***not*** be borrowed." (See CX-0826.0008; (emphases added).). Thus, there is no evidence to support, or a sufficient basis to assume, that Chawa was added to the Loughborough University's OPAC system as a matter of course.

Second, Respondents relied upon the Linton thesis as allegedly describing the library's 1996-era search functionality. (CX-0103.). Respondents contended this document demonstrates that "searches utilizing the Loughborough database in 1996 resulted in numerous hits for exact subject, subject keyword, exact title, and title keyword." (RBr. at 30 (citing CX-0103.0035).). However, that the library had "some indexing and search functionality" for some titles is not sufficient to establish that Chawa was sufficiently publicly accessible. *Acceleration Bay*, 908 F.3d at 773. As Modumetal pointed out, the Linton thesis described that searching the Loughborough University's catalogue for "Russian plays," for example, returned no hits, not because the library contained no books about Russian plays, but because "this term did ***not appear in the subject index*** that Loughborough University uses for retrieval." (CX-0103.0040 (emphasis added), .0045 ("The web system, gave no results, as the term did not appear in the libraires['] index system.")). The Linton thesis concluded that "[i]n general the searches only gave a ***minimal*** amount of information regarding an item, very few notes or cataloguing records." (*Id.* at .0041 (emphasis added).).

The description of the difficulty of the searches, as well as the limited information they could provide, also weighs against a finding the Chawa was publicly accessible. Accordingly, there is insufficient evidence to find that the search functionality at Loughborough University

was better than the system considered in *Acceleration Bay*, where the Federal Circuit found a lack of public accessibility. *Acceleration Bay*, 908 F.3d at 773 (finding that there was no public accessibility where the library’s “advanced search form was deficient” because “while the advanced search form appeared to allow a user to search keywords for author, title, and abstract fields, evidence demonstrated that functionality was ***not reliable***”) (emphasis added).

Third, the “Walton Signed Statement” upon which Respondents relied, and discussed briefly above, is a statement from a library employee, Emma Walton, which states only that: “[t]o the best of [her] knowledge,” the Chawa thesis “would have been on the Loughborough University Library computer catalogue” as of May 1996 and “searchable by author and title.” (RX-0266.0001.). The Walton Signed Statement, in its entirety, is copied below in Figure 30.

**Figure 30: Walton Signed Statement**

Dear A McLaughlin

Thank you for your email dated 18<sup>th</sup> February 2025.

To the best of my knowledge the thesis ‘The electrodeposition of compositionally modulated multilayer coatings for enhanced corrosion resistance’ would have been on the Loughborough University Library computer catalogue from the date of accession (May 1996), searchable by author and title- this catalogue was available on the internet.

Yours sincerely

A handwritten signature in cursive script that reads "Emma Walton".

Emma Walton  
Director of Library Services and University Librarian

(RX-0266.0001.).

The “Walton Signed Statement” lacks oath or affirmation. Respondents characterized Ms. Walton as a “30(b)(6) witness” who “educate[d] herself” and concluded that Chawa would

have been on the University's search catalogue in May of 1996. (RBr. at 32.). However, as Modumetal noted, Respondents did not present her during the Hearing. (CRBr. at 14.). Ms. Walton was not deposed. Additionally, there is no evidence that Ms. Walton spoke with any Loughborough University library employee, other than Mr. Campling, or that she reached any conclusions about the actual availability of Chawa.

For the foregoing reasons, Chawa is not a prior-art printed publication under 35 U.S.C. § 102(b) (pre-AIA). Accordingly, it is a finding of this ID that the Asserted Claims of the Asserted Patents are not subject to the § 102(b) "printed publication" bar by Chawa.

**b) If Chawa Is Found to be Prior Art to the Asserted Claims, Respondents Demonstrated that Chawa Renders Obvious the Asserted Claims of the Asserted Patents**

As noted above in Subsection (a), the Parties agreed that Chawa discloses claim limitations 1[a], 1[d], 1[e], 1[g], 1[h], and 1[i]<sup>56</sup> of the '419 patent and claim limitations 1[a], 1[d], 1[e], 1[g], and 1[h] of the '613 patent. (JSUF at 4, 7.). Accordingly, only claim limitations 1[b], 1[c], and 1[f] of each of the '419 and '613 patents, which Modumetal disputed, but did not rebut during the Hearing, are discussed below.

Additionally, although Modumetal did not dispute in its Pre-Hearing or Reply Post-Hearing Brief that Chawa renders obvious the additional limitations recited in dependent claims 2, 3, 5, and 7 of the '419 patent, and dependent claims 2, 3, and 5 of the '613 patent, these dependent claims were not included in their Joint Statement of Undisputed Facts, i.e., not agreed upon. Thus, these dependent claims are also addressed below.

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<sup>56</sup> Claim limitation 1[i] of the '419 patent recites "the coating or cladding having a thickness from 5 microns to 50 microns." (JX-0001 at cl. 1.). This claim limitation is included in claim limitation 1[b] of the '613 patent. (JX-0002 at cl. 1.).

- i. Limitation 1[b] of the '419 and '613 patents: “a series of alternating layers on a substrate or mandrel, each layer of the series of alternating layers having a thickness from about 5 nanometers to about 1,000 nanometers” / “forming a coating on a substrate or mandrel, the coating having a thickness from 5 microns to 50 microns and comprising a series of layers arranged in a repeating pattern, each layer of the series of layers having a thickness from about 5 nanometers to about 1,000 nanometers”

Chawa renders obvious limitation 1[b] of the Asserted Patents and limitation 1[i] of the '613 patent. (Tr. (Frankel) at 959:21–960:4, 960:18–961:4, 961:24–962:2, 962:13–19, 980:2–21; RDX-0003C.0097.). Dr. Frankel testified that Chawa discloses a series of “alternating layers” because Chawa discloses “compositionally modulated Zn-Ni alloy multilayer coatings with a repetitive layered structure” on a mild steel substrate. (JX-0116.0191; Tr. (Frankel) at 959:21–960:4, 960:18–961:4 (explaining that Chawa produces repetitive layers of two different compositions, such that the layers are different from each other), 962:13–19, 980:18-21; RDX-0003C.0076–.0079, .0097.). Specifically, as Dr. Frankel opined, Chawa discloses a coating with 12 layers. (Tr. (Frankel) at 960:9–14; RDX-0003C.0076.).

Dr. Frankel testified that it would have been obvious to a person of ordinary skill reading Chawa to create layers that have a thickness from about 5 nanometers to about 1,000 nanometers because Chawa discloses an embodiment with 12 layers of a “repetitive . . . structure” with an overall nominal thickness of 8 microns, which would have resulted in repeating layers that are each 667 nanometers thick. (Tr. (Frankel) at 962:4–12 (“[I]t’s my opinion that it would have been obvious for Chawa to use these sublayers of equal thickness.”); JX-0116.0191; RDX-0003C.0080.). As noted, Chawa discloses that the layers are of a “*repetitive* layered structure,” which provides further support that one of ordinary skill would understand the layers to have repetitive, (i.e., the same) thicknesses. (JX-0116.0191 (emphasis added).).

In its Pre-Hearing and Reply Post-Hearing Briefs, Modumetal presented only attorney argument to contend that Dr. Frankel’s “arithmetic calculation fundamentally lacks empirical substantiation” and that “actual microscopy data reported in Chawa undermines Dr. Frankel’s assumptions.” (CPBr. at 64–65; *see also* CRBr. at 15.). However, Modumetal did not offer *any* expert rebuttal why a skilled artisan would not understand a “*repetitive* layered structure” to consist of layers with the same thicknesses. With respect to the SEM micrograph for the 12-layer structure (Figure 123 of Chawa), although Chawa acknowledged that “[t]he 8 and 12 layer coating structures seemed to be *more* difficult to identify,” Dr. Frankel testified that he took “that as meaning that [Chawa] was able to identify, just a little more difficult.” (Tr. (Frankel) at 976:8–16.). Modumetal’s unsupported attorney argument does not sufficiently rebut Dr. Frankel’s opinions and testimony.

For these reasons, Respondents have met their burden and proven by clear and convincing evidence that Chawa renders obvious limitation 1[b] of the Asserted Patents and limitation 1[i] of the ’613 patent. Accordingly, it is a finding of this ID that Chawa renders obvious limitation 1[b] of the Asserted Patents and limitation 1[i] of the ’613 patent.

- ii. Limitation 1[c] of the ’419 and ’613 patents: “first layer of a first alloy that is less noble than the substrate or the mandrel”

Chawa discloses limitation 1[c] of the Asserted Patents. (Tr. (Frankel) at 965:25–966:4.). Dr. Frankel testified that Chawa discloses the first layer of a first alloy is Zn-13% Ni, which is a binary alloy consisting of 13% nickel and 87% zinc by weight. (*Id.* at 962:22–963:11; RDX-0003C.0081.). As shown below in Figure 31, which is a copy of Table 50 of Chawa, the corrosion potential of the Zn-13% Ni layers is -1075 mV vs. SCE.<sup>57</sup>

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<sup>57</sup> SCE is an acronym for “Saturated Calomel Electrode.” (*See, e.g.*, JX-0116.0007.). Dr. Frankel

**Figure 31: Table 50 of Chawa Showing Corrosion Potentials****Table (50) Corrosion data and operating conditions for different types of Zn/Ni multilayer alloy coatings and their comparison with single Zn-Ni alloy layers**

| Type of CMM Coatings | Number of Layers | Cathode Current Density A/dm <sup>2</sup> | RPM | E <sub>corr</sub> mV vs.SCE | I <sub>corr</sub> A/dm <sup>2</sup> (Tafel) | Hours to red rust | % Red Rust after 300 Hours |
|----------------------|------------------|-------------------------------------------|-----|-----------------------------|---------------------------------------------|-------------------|----------------------------|
| Zn-13%Ni             | 1                | 66.3                                      | 150 | -1075                       | 1.3×10 <sup>-2</sup>                        | 240               | 15                         |
| Zn-2%Ni              | 1                | 5.1                                       | 150 | -1170                       | 0.98×10 <sup>-1</sup>                       | 192               | 80                         |
| Zn-2%Ni/<br>Zn-13%Ni | 2                | 5.1 / 66.3                                | 150 | -1110                       | 1.11×10 <sup>-2</sup>                       | 262               | 25                         |
| Zn-13%Ni/<br>Zn-2%Ni | 2                | 66.3 / 5.1                                | 150 | -1140                       | 0.633×10 <sup>-1</sup>                      | 250               | 25                         |
| Zn-2%Ni/<br>Zn-13%Ni | 4                | 5.1 / 66.3                                | 150 | -1080                       | 0.84×10 <sup>-2</sup>                       | -                 | 0                          |
| Zn-13%Ni/<br>Zn-2%Ni | 4                | 66.3 / 5.1                                | 150 | -1110                       | 1.6×10 <sup>-2</sup>                        | 266               | 30                         |
| Zn-2%Ni/<br>Zn-13%Ni | 8                | 5.1 / 66.3                                | 150 | -1040                       | 0.52×10 <sup>-2</sup>                       | -                 | 0                          |
| Zn-13%Ni/<br>Zn-2%Ni | 8                | 66.3 / 5.1                                | 150 | -1080                       | 0.42×10 <sup>-2</sup>                       | 260               | 25                         |
| Zn-2%Ni/<br>Zn-13%Ni | 12               | 5.1 / 66.3                                | 150 | -1040                       | 0.52×10 <sup>-2</sup>                       | -                 | 0                          |
| Zn-13%Ni/<br>Zn-2%Ni | 12               | 66.3 / 5.1                                | 150 | -1100                       | 0.65×10 <sup>-3</sup>                       | 290               | 5                          |

(JX-0116.0197 (Table 50);<sup>58</sup> see also Tr. (Frankel) at 964:23–965:13; RDX-0003C.0081–.0082.).

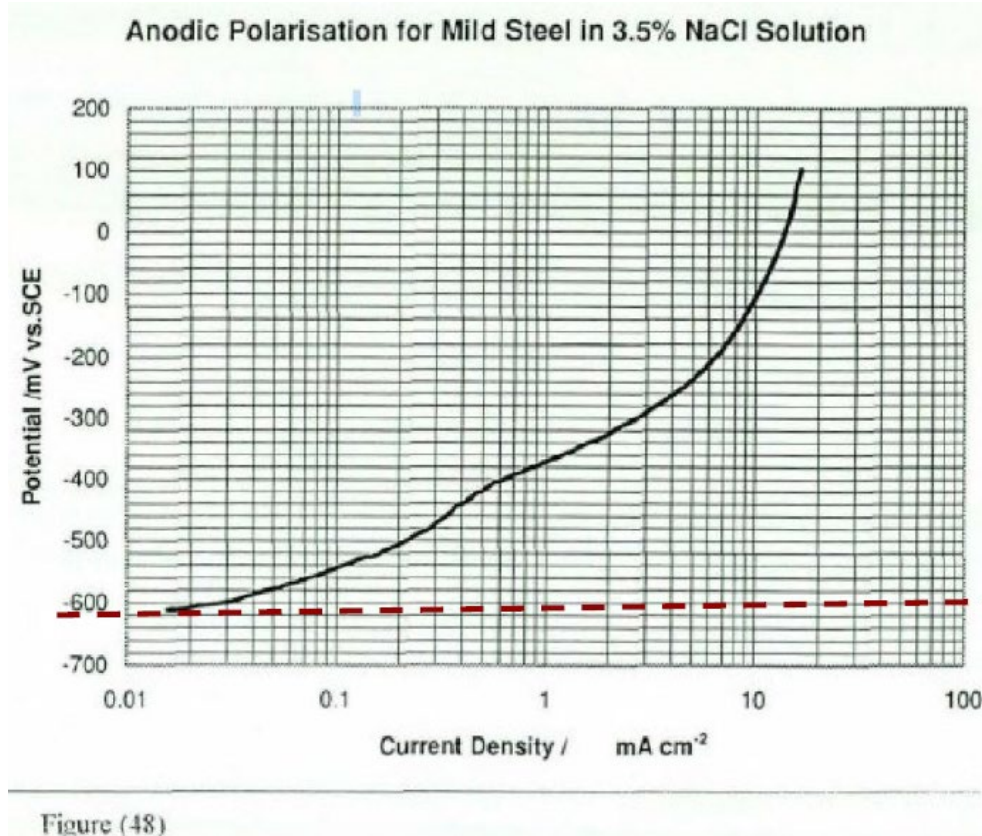
Dr. Frankel also testified that Chawa discloses a polarization curve of mild steel, as shown below in Figure 32. Figure 32 is a copy of Figure 48 of Chawa that discloses that the corrosion potential of mild steel, the substrate, is around -620 mV vs. SCE.

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described SCE as a “reference electrode” needed “to measure potential.” (Tr. (Frankel) at 964:15-16.).

<sup>58</sup> E<sub>corr</sub> is corrosion potential. (JX-0116.0007.).

Figure 32: Frankel Demonstrative Annotating Figure 48 of Chawa



(RDX-0003C.0082; *see also* Tr. (Frankel) at 964:7–22 (describing how to read a polarization curve to determine the corrosion potential and providing the corrosion potential of mild steel); JX-0116.0122.).

As addressed above in Section VIII.B.3 with respect to the discussion on infringement, corrosion potential is one measure of nobility, where materials with lower corrosion potentials are less noble than those with higher corrosion potentials. Because the corrosion potential of the Zn-13% Ni layer (-1075 mV vs. SCE) is lower than the corrosion potential of mild steel (-620 mV vs. SCE), Zn-13% Ni is less noble than mild steel. (Tr. (Frankel) at 965:6–20.).

In its Pre-Hearing Brief, Modumetal argued that Chawa does not teach or suggest this limitation (i.e., the claimed nobility limitations). (CPBr. at 66–70.). However, Modumetal did not raise these arguments in its Reply Post-Hearing Brief. Thus, any argument on this issue is deemed waived, abandoned or withdrawn under Ground Rule 10.1.

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For the foregoing reasons, Respondents have proved by clear and convincing evidence that Chawa discloses limitation 1[c] of the Asserted Patents. Accordingly, it is a finding of this ID that Chawa discloses limitation 1[c] of the Asserted Patents.

- iii. Limitation 1[f] of the '419 and '613 patents: “a second layer of a second alloy that is less noble than the first alloy and less noble than the substrate or the mandrel”

Chawa discloses limitation 1[f] of the '419 and '613 patents. (Tr. (Frankel) at 969:10–11.). Dr. Frankel testified that Chawa discloses a second layer of a second alloy because it discloses a second layer, Zn-2% Ni, as shown in the last row of Table 50 of Chawa (Figure 31, above). (*Id.* at 967:13–21; JX-0116.0197; RDX-0003C.0085.). Table 50 of Chawa discloses that the corrosion potential of Zn-2% Ni is –1170 mV vs. SCE. (Tr. (Frankel) at 968:16–22; JX-0116.0197; RDX-0003C.0086.).

The corrosion potentials of Zn-13% Ni and mild steel are –1075 mV vs. SCE and –620 mV vs. SCE, respectively. (RDX-0003C.0086.). Because the corrosion potential of Zn-2% Ni is lower than the corrosion potentials of Zn-13% Ni and mild steel, Zn-2% Ni is less noble than Zn-13% Ni and mild steel. (Tr. (Frankel) at 968:16–969:3.).

Like limitation 1[c], in its Pre-Hearing Brief, Modumetal argued that Chawa does not teach or suggest this limitation, (i.e., the claimed nobility limitations). (CPBr. at 66–70.).

However, Modumetal did not raise these arguments in its Reply Post-Hearing Brief. Thus, any argument on this issue is deemed waived, abandoned or withdrawn under Ground Rule 10.1.

For the reasons discussed above, Chawa discloses limitation 1[f] of the Asserted Patents. Accordingly, it is a finding of this ID that Chawa discloses limitation 1[f] of the Asserted Patents.

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- iv. Claim 2 of the '419 and '613 patents: “the first metal is Ni or Zn”

Chawa discloses the additional limitation recited in claim 2 of the Asserted Patents, which Modumetal did not separately contest. (Tr. (Frankel) at 975:15–17; CPBr. at 70; CRBr. at 15.). Chawa discloses that the first metal in its Zn-13% Ni / Zn-2% Ni coatings is zinc. (Tr. (Frankel) at 975:19–21; JX-0116.0197; RDX-0003C.0092.).

For these reasons, Chawa renders obvious the additional limitation recited in claim 2 of the Asserted Patents. Accordingly, it is a finding of this ID that Chawa discloses the additional limitation recited in claim 2 of the Asserted Patents.

- v. Claim 3 of the '419 and '613 patents: “each layer of the series of alternating layers is discrete”

Chawa discloses the additional limitation recited in claim 3 of the Asserted Patents, which Modumetal did not separately dispute. (Tr. (Frankel) at 976:3–5, 976:19–21; CPBr. at 70; CRBr. at 15.). Chawa discloses that “layered structures could be identified easily,” including in its 12-layer embodiment. (JX-0116.0192, .0194 (Fig. 123); Tr. (Frankel) at 976:3–18 (noting that while Chawa acknowledges that the 12-layer coatings were more difficult to identify, Chawa was still able to identify the layers); RDX-0003C.0093.).

For these reasons, Chawa renders obvious the additional limitation recited in claim 3 of the Asserted Patents. Accordingly, it is a finding of this ID that Chawa discloses the additional limitation recited in claim 3 of the Asserted Patents.

- vi. Claim 5 of the '419 and '613 patents: “the second metal is selected from Co, Fe, Ni, and Zn, the second metal being different than the first metal”

Chawa discloses the additional limitation recited in claim 5 of the Asserted Patents, which Modumetal did not separately dispute. (Tr. (Frankel) at 976:24–977:7; CPBr. at 70; CRBr. at 15.). Chawa discloses zinc-nickel compositionally modulated coatings where the

second metal is nickel, which is one of the four metals listed in the claim limitation, and nickel is different from the first metal (zinc). (Tr. (Frankel) at 977:1–7; JX-0116.0197; RDX-0003C.0094.).

For the foregoing reasons, Chawa renders obvious the additional limitation recited in claim 5 of the Asserted Patents. Accordingly, it is a finding of this ID that Chawa discloses the additional limitation recited in claim 5 of the Asserted Patents.

- vii. Claim 7 of the '419 patent: “the first concentration, the second concentration, the third concentration, and the fourth concentration are independently at least about 5 wt. %”

Chawa renders obvious the additional limitation recited in claim 7 of the '419 patent, which Modumetal did not separately contest. (Tr. (Frankel) at 977:13–16; CPBr. at 70; CRBr. at 15.). As Dr. Frankel explained, Chawa discloses a first metal (zinc) in a first concentration (87%), a second metal (nickel) in a second concentration (13%), the first metal (zinc) in a third concentration (98%), and the second metal (nickel) in a fourth concentration (2%). (Tr. (Frankel) at 977:15–24; RDX-0003C.0095; JX-0116.0197.).

Dr. Frankel noted that the fourth concentration of nickel is 2 wt. %, which is not at least about 5 wt. % as required by the claims. (Tr. (Frankel) at 977:21–24.). Nonetheless, he offered his opinion that based on Chawa’s teachings, it would have been obvious to one of ordinary skill to increase the nickel concentration. (*Id.* at 977:25–978:13.). Dr. Frankel explained that Chawa provides testing parameters and corrosion data for Zn-Ni alloy coatings with a range of concentrations from 2–17% and explains that Zn-Ni alloys with 5–15% nickel have beneficial properties, such as good ductility and good sacrificial protection to steel. (*Id.*; JX-0116.0036–.0037, 0174; RDX-0003C.0095.). He testified that a skilled artisan reading Chawa as a whole would have been motivated to increase the weight percentage nickel to between 5–15%, which is

at least about 5 wt. %, to attain those benefits. (Tr. (Frankel) at 978:14–17.).

Additionally, Dr. Frankel explained that a person of ordinary skill would have had a reasonable expectation of success without undue experimentation in increasing the fourth concentration of nickel because Chawa provides the necessary parameters (including bath chemistry and current densities) to create Zn-Ni alloys with different percentages of nickel. (*Id.* at 978:23–979:3; JX-0116.0144–.0191 (providing data on effects of rotation speed, characteristics, and corrosion potentials of single layer Zn-Ni alloys as well as the electroplating solution)).

For the reasons discussed above, obvious the additional limitation recited in claim 7 of the '419 patent. Accordingly, it is a finding of this ID that Chawa discloses the additional limitation recited in claim 7 of the '419 patent.

**c)      Fei Alone or in Combination with Chatterjee Does Not Render Obvious claims 1–3, 5, and 7 of the '419 patent and Claims 1–3 and 5 of the '613 patent**

Respondents argued that Fei, alone or in combination with Chatterjee, renders obvious all of the Asserted Claims. (RBr. at 42–51, 66–67.).

The Parties agreed that Fei discloses claim limitations 1[a], 1[d], 1[e], 1[g], 1[h], and 1[i] of the '419 patent and claim limitations 1[a], 1[d], 1[e], 1[g], and 1[h] of the '613 patent. (JSUF at 5, 7-8.). Respondents pointed out that Modumetal disputed, but did not rebut, claim limitation 1[b] of the '419 and '613 patents. (RBr. at 43, 66.). Modumetal did not include any argument regarding limitations 1[b] and 1[c] of both patents in its Reply Post-Hearing Brief. (CRBr. at 15-16.). Additionally, Modumetal did not dispute Respondents' contention that Fei discloses the additional elements of claims 2, 3, and 5 of the '419 patent and the '613 patent and claim 7 of the '419 patent. (*Id.*).

Thus, the only dispute relates to claim element 1[f] of the '419 and '613 patents. (CRBr.

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at 15-16; RBr. at 45, 47.). Claim 1[f] of the '419 and '613 patents recites “a second layer of a second alloy that is less noble than the **first** alloy and less noble than the substrate or the mandrel.” (JX-0001 at cl. 1 (emphasis added); JX-0002 at cl. 1 (emphasis added)).

Respondents contended that Fei discloses a second layer, Zn-17% Co, applied to the same steel substrate as the first layer. (RBr. at 47 (citing JX-0118.0005; Tr. (Frankel) at 1049:11–14; RDX-0003C.0170)). As Modumetal pointed out, Dr. Frankel only testified about the second alloy being less noble than the **substrate**. (CRBr. at 16.). He failed to address the relative nobility of the “second alloy” to the “**first** alloy.”

Q. Let's turn to the other nobility limitation in claim 1 of the '419 patent, which is 1[f], and turn to slide 170.

Does Fei disclose a second layer of a second alloy?

A. Yes, it does. The second layer is this zinc cobalt (L), so called, with 17 percent cobalt.

Q. And the excerpts on the right side of slide 170 of RDX-3 are on the top, JX -- both are from JX-117, page 5.

We just discussed your opinion that Fei alone or in view of Chatterjee would have rendered obvious limitation 1[c] of the '419 patent.

Does that analysis inform your opinions with respect to limitation 1[f] of the '419 patent?

A. Yes. It's the same issues of finding this balance between the protection, self corrosion rate, and the relative nobility.

Q. Would your views with respect to limitation 1[c] inform your opinions with respect to the portion of 1[f] that says that the second layer of a second alloy is less noble than the substrate?

A. Yes. Again, that's -- Chatterjee teaches that the, you know, the goal to keep the layers less noble than the substrate.

(Tr. (Frankel) at 1049:8–1050:7.).

Relying on Dr. Frankel's testimony shown below regarding the **first** layer, which he identified as Zn-51% Co, Respondents argued that “[b]ecause the second Zn-17% Co layer has a

higher zinc content than the first Zn-51% Co layer, a POSA would have understood that the second Zn-17% Co layer is less noble than the first Zn-51% Co layer and less noble than the mild steel *substrate*.” (RBr. at 47 (citing Tr. (Frankel) at 1044:12–14).).

Q. . . . Is it your expectation that this layer in Fei would be more or less noble than the steel *substrate*?

A. It’s my expectation that the high concentration of zinc would render this alloy less noble than the mild steel *substrate*.

(Tr. (Frankel) at 1044:10-14 (emphases added).).

However, as shown above, Dr. Frankel did not provide any testimony comparing the relative nobility of the second Zn-17% Co layer to the first Zn-51% Co layer. He also confirmed that Fei does not explicitly “disclose anything about the nobilities of its layers.” (*Id.* at 1046:16–18; *see also id.* at 1044:19-24.). Additionally, Dr. Frankel’s reliance on the Chatterjee reference does not alleviate the failure to consider the relative nobilities of the “first alloy” and “second alloy” layers because Chatterjee does not discuss multilayer structures. (*Id.* at 1045:3–4 (“Chatterjee, if you recall, didn’t discuss multilayers . . .”).).

For the reasons discussed above, Respondents did not meet their burden to prove by clear and convincing evidence that Fei alone or in combination with Chatterjee renders obvious claims 1–3, 5, and 7 of the ’419 patent and claims 1–3 and 5 of the ’613 patent. Accordingly, it is a finding of this ID that Fei alone or in combination with Chatterjee does not render obvious claims 1–3, 5, and 7 of the ’419 patent and claims 1–3 and 5 of the ’613 patent.

#### **4. Secondary Considerations of Non-Obviousness**

##### **a) Modumetal Did Not Waive the Presumption of Nexus**

Modumetal’s only explicit reference to nexus in its Pre-Hearing Brief is as follows:

A nexus between objective indicia and the claimed invention is presumed to exist “when the patentee shows the asserted objective evidence is tied to a specific product and that product is the invention disclosed and claimed in the patent.”

*WBIP, LLC v. Kohler Co*, 829 F.3d 1317, 1329 (Fed. Cir. 2016).  
(CPBr. at 87.).

Post-hearing, Modumetal argued specifically that because the NanoGalv® coating is coextensive with the scope of the claims rather than incorporating the claimed invention into a larger system, the presumption of nexus applies. (CRBr. at 25; *see also* (JX-0001.0010 (“A coating or cladding comprising...”)); *see Certain Powered Cover Plates*, Inv. No. 337-TA-1124, Initial Determination at 63 (Aug. 12, 2019) (“Because the DI products have been found to practice the [claimed] invention . . . there is a rebuttable presumption that a nexus exists”) (citing *WBIP*, 829 F.3d at 1329.)).

In contrast, Respondents argued that Modumetal waived the issue of nexus under Ground Rule 7.2 by not including it in its Pre-Hearing Brief. (RBr. at 51.).<sup>59</sup> Modumetal counterargued that it preserved the issue of nexus because Modumetal cited and quoted Federal Circuit precedent which establishes that a nexus is presumed to exist when the product “is the invention disclosed and claimed in the patent.” (CRBr. at 25 n.1 (citing CPBr. at 87 (citing *WBIP*, 829 F.3d at 1329))).

If the statement quoted above were the only statement that Modumetal made in its Pre-Hearing Brief, then Respondents would be correct that it would be insufficient as a matter of law to constitute a contention or theory of nexus. It is at best a statement of the law of nexus.

Admittedly, there is no specific, explicit assertion in Modumetal’s Pre-Hearing Brief that NanoGalv® is coextensive with the Asserted Claims, which is the legal requirement to be entitled

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<sup>59</sup> Ground Rule 7.2 states: “The brief shall set forth **with particularity** the authoring party’s theories of the case and contentions on each of the proposed issues, including citations to legal authorities in support thereof . . . any contentions and theories of the case not set forth in detail as required herein shall be deemed abandoned or withdrawn, except for contentions of which a party is not aware and could not be aware in the exercise of reasonable diligence at the time of filing the pre-hearing brief.” (Order No. 2, Att. A at 30 (emphasis added)).

to a presumption of nexus. There is also no explicit argument that NanoGalv<sup>®</sup> embodies the claimed invention and has either no unclaimed features, or the only unclaimed features “amount to nothing more than additional insignificant features.” *Teva Pharms. Int’l GmbH*, 8 F.4th at 1360–61.

Additionally, Modumetal did not explicitly identify what evidence it contended would prove that there are either no unclaimed features or that the unclaimed features are insignificant.

Failure to adequately raise an argument in the Pre-Hearing Brief is sufficient grounds to deem it waived because it is “unfair and inappropriate” to force a party to rebut an argument for which it had no opportunity to seek evidence or expert testimony about. *In the Matter of Certain Elec. Devices, Including Mobile Phones & Tablet Computers, & Components Thereof*, USITC Inv. No. 337-TA-847, 2013 WL 5822559, at \*103 (Sept. 23, 2013).

However, giving some latitude even if exact words were not used, Modumetal explained at some length in its Pre-Hearing Brief that its NanoGalv<sup>®</sup> product was “transformative” in preventing corrosion. (CPBr. at 88–89.). To that end and apparently relying on its arguments that the DI Fastener practiced the claims of the Asserted Patents, Modumetal also claimed that “NanoGalv<sup>®</sup> introduces a fundamentally new class of metallic laminates characterized by enhanced mechanical strength, reduced weight, superior corrosion resistance, and substantially greater durability compared to traditional coating technologies.” (CPBr. at 88.). Then, Modumetal argued that each of the indicia of non-obviousness applies, as discussed below.

In other words, Modumetal’s presumption of nexus argument is at least impliedly present in its Pre-Hearing Brief. Moreover, Respondents had a fair opportunity at the Hearing to address Modumetal’s arguments for nexus. Therefore, it is finding of this ID that Modumetal did not waive its argument that a presumption of nexus exists under Ground Rule 7.2.

**b) Modumetal Did Not Prove It Is Entitled to a Presumption of Nexus**

It is also a finding of this ID that, ultimately, Modumetal failed to *prove* that it is entitled to a presumption of nexus. When the evidence of secondary considerations of non-obviousness is not coextensive with the patent claims, any presumption of nexus is lost. *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1376–78 (Fed. Cir. 2019) (vacating the PTAB’s decision because the PTAB erroneously presumed nexus when the product that was the subject of secondary considerations was not coextensive with the patent claims).

As described and explained in Section IX.D., Modumetal failed to prove that its NanoGalv<sup>®</sup> products and processes practice the Asserted Claims, and thus, it failed to prove that NanoGalv<sup>®</sup> is coextensive with the Asserted Claims. Therefore, Modumetal is not entitled to the presumption of nexus. *Fox Factory*, 944 F.3d at 1376–78.

Although Modumetal failed to prove that it is entitled to a presumption of nexus, Modumetal did indeed offer evidence that NanoGalv<sup>®</sup> is the subject of secondary considerations of non-obviousness in its Pre-Hearing Brief (CPBr. at 88–92), in its Post-Hearing Brief (CBr. at 16–22), and during the Hearing, as discussed below.

Even if the Commission were to find that Modumetal provided the necessary evidence that NanoGalv<sup>®</sup> is the subject of secondary considerations of non-obviousness, there is still a fundamental flaw in Modumetal’s arguments. The weight of Modumetal’s evidence that might have supported the indicia of non-obviousness could not overcome the problems with Modumetal’s deficient evidence that the DI Fastener, and by extension all its NanoGalv<sup>®</sup> products, practice the Asserted Patents. In other words, if the Commission were to uphold the finding that Modumetal has not satisfied the technical prong of the domestic industry requirement, then evidence of secondary considerations of non-obviousness, including copying,

cannot substitute for the requirement that a complainant must establish the technical prong of the domestic industry requirement in order to have a Section 337 violation. *See Certain Infotainment Systems, Components Thereof, and Automobiles Containing Same* (“*Infotainment Systems*”), Inv. No. 337-TA-1119 (May 28, 2020) (Federal Circuit affirmed the Commission’s finding that Broadcom had failed to show that there existed an actual domestic industry article that practiced a claim of the asserted patents.).

Because Modumetal did not establish the requisite nexus, as evidenced, *inter alia*, by Modumetal’s failure to establish technical domestic industry, none of its asserted secondary considerations weighs in favor of a finding of non-obviousness.

**c) Long-Felt Need**

“Evidence of a long-felt but unresolved need can weigh in favor of the non-obviousness of an invention because it is reasonable to infer the need would not have persisted had the solution been obvious.” *Apple Inc.*, 839 F.3d at 1056.

Modumetal argued that long-felt need supports its claims of non-obviousness. (CRBr. at 24.). Modumetal cited the testimony given during the Hearing given by its CEO, Mr. Creech:

Q. Okay. What are some of the benefits of NanoGalv?

A. NanoGalv has a number of benefits. Obviously the performance where we kind of blow away traditional coatings. And having worked in the energy industry for 38 years and been offshore more times than I can count, things rust within about a week. And we have been offshore for over seven years with no rust. It’s a game changer.

So just that is the huge selling point, but that being said, we’re also a faster process. So we lay down the coating in about 30 percent faster.

And it’s got significant environmental improvements as well. We have less waste, and then the benefit to the country is that the infrastructure is protected longer. And believe me, the energy industry does not want to spill a drop of oil in the Gulf or anywhere. They would rather sell it, obviously. But that’s critical.

So this went through some significant testing to be approved.

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(Tr. (Creech) at 96:20–97:12.).

The excerpt of Mr. Creech's testimony suggests that there was a problem in the industry with rust and corrosion of metals that Modumetal's NanoGalv<sup>®</sup> coating attempted to address. Mr. Creech's testimony suggests that there was some evidence that NanoGalv<sup>®</sup> met a long-felt need in the industry for a more corrosion-resistant coating.

However, Mr. Creech also testified as follows:

Q. You testified during direct about NanoGalv and all the alleged benefits it has, right?

A. Correct.

Q. You understand that worldwide corrosion is a \$2.2 trillion problem?

A. I do.

Q. And you agree that Modumetal has not eliminated the vast majority of that problem through its development and sale of NanoGalv to date, correct?

A. Not yet.

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Q. Now, you're aware that Modumetal is asserting that the B1025 and 24 standard is an ASTM international standard that was created to expedite the certification of Modumetal technologies in the oil and gas industry?

A. Correct.

Q. You testified about that on direct?

A. Yes, sir.

Q. That standard, it's not a standard that says, hey, industry, you have to use the technology that's disclosed in Modumetal's patents, right?

A. That's correct.

Q. That standard doesn't mention Modumetal by name, does it?

A. That's correct.

Q. And it doesn't mention NanoGalv by name either, right?

A. That's correct.

(Tr. (Creech) at 238:6–15, 239:12–240:3.).

Mr. Creech's less supportive testimony also suggested that while NanoGalv<sup>®</sup> exhibited certain improvements, it has not been adopted in the industry at a rate that would eliminate the "vast majority" of the corrosion problem in the industry. That tends to undercut Modumetal's argument that it met the long-felt need through NanoGalv<sup>®</sup>. Moreover, neither Modumetal nor Mr. Creech produced documentary evidence to corroborate Mr. Creech's testimony. Therefore, it is a finding of this ID that, even if Modumetal had proven a nexus between NanoGalv<sup>®</sup> and the claimed invention, long-felt need would not weigh in favor of a finding of non-obviousness.

**d) Industry Praise**

"Evidence that the industry praised a claimed invention or a product that embodies the patent claims weighs against an assertion that the same claimed invention would have been obvious. Industry participants, especially competitors, are not likely to praise an obvious advance over the known art. Thus, if there is evidence of industry praise of the claimed invention in the record, it weighs in favor of the non-obviousness of the claimed invention." *Apple Inc.*, 839 F.3d at 1053–54, 61.

Modumetal introduced evidence of industry praise for NanoGalv<sup>®</sup> by identifying many of the awards it received specifically for NanoGalv<sup>®</sup>, including from Parker Hannifin. (CRBr. at 23–24.).

Modumetal's Co-founder, Ms. Lomasney, testified that the awards Modumetal received specifically for its NanoGalv<sup>®</sup> technology included: i) the 2015 New Horizon Idea Award at the World Oil Award Conference, (JX-0059C (Lomasney Dep. Tr.) at 200:12–203:11; CX-0616.0001 (press release announcing award); and ii) gold award at the 2017 Edison Awards in the "metal production" category for its "nanolaminated alloys," (JX-0059C (Lomasney Dep. Tr.)

at 209:6–9, 11–12; CX-0617.0001.). Modumetal also introduced an industry article published in The Economist in December 2015 which stated that Modumetal’s coatings “are more durable than conventional treatments, lasting up to eight times longer.” (CX-0618.0003.). Modumetal has not received any awards since 2020. (Tr. (Creech) at 243:11–15.).

Modumetal also introduced evidence that Parker Hannifin praised NanoGalv<sup>®</sup>. The exhibit, CX-0278C, replicated below in Figure 33, is an undated Parker Hannifin presentation titled [REDACTED] (Tr. (Smerdel) at 771:2–773:3; CX-0278C.0001, .0005.). The exhibit, CX-0278C, contains a comparison of Parker Hannifin’s [REDACTED] to Modumetal’s NanoGalv<sup>®</sup> after those products were subjected to salt spray testing, a method used to detect how long a coating may withstand corrosion.

The exhibit, [REDACTED] [REDACTED] [REDACTED] (See Tr. (Smerdel) at 771:2–773:3; CX-0278C.0005.). Parker Hannifin’s comparison between [REDACTED] and Modumetal’s NanoGalv<sup>®</sup> is reproduced in Figure 33 below.

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<sup>60</sup> Exhibit CX-0278C.0005 and other internal Parker Hannifin documents refer to the unsuccessful collaboration between Modumetal and Parker Hannifin known as “Project Ohm.” Apparently, it involved hoped-for more advanced technology that even outstripped NanoGalv<sup>®</sup>. The collaboration was not finalized, even by agreement.

**Figure 33: Parker Hannifin's**



(Tr. (Smerdel) at 771:2–773:3; CX-0278C.0005.).

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Dr. Yingdong Ge, Parker Hannifin's principal engineer in charge of new products, also testified that Parker Hannifin's internal testing and assessment [REDACTED]

[REDACTED] (Tr. (Yingdong

Ge)<sup>61</sup> at 353:6–14.).

Parker Hannifin also described [REDACTED]

[REDACTED] even though ultimately Parker Hannifin did not [REDACTED]

[REDACTED] (JX-0043C.0001.).

It is a finding of this ID that Modumetal produced sufficient evidence of industry praise that, if Modumetal had proven a nexus between NanoGalv<sup>®</sup> and the invention of the Asserted Claims, then industry praise would weigh in favor of a finding of non-obviousness. However, because Modumetal did not prove the requisite nexus, it is a finding of this ID that industry praise does not weigh in favor of a finding of non-obviousness.

**e) Copying**

Modumetal argued that Parker Hannifin learned about, and ultimately copied, Modumetal's NanoGalv<sup>®</sup> technology through a failed collaboration between the Parties that started in 2015 and ended in 2016. (CRBr. at 17–22.). Modumetal claimed that Parker Hannifin learned enough information about how Modumetal created NanoGalv<sup>®</sup> through their short, but failed, collaboration that Parker Hannifin then relied on what it could replicate of NanoGalv<sup>®</sup> to develop its new ToughShield<sup>®</sup> Plus product. (*Id.*). In other words, Modumetal argued from the inception of the Investigation that Parker Hannifin copied Modumetal's NanoGalv<sup>®</sup> coating, an

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<sup>61</sup> At the time of the Hearing, Dr. Yingdong Ge had been an employee of Parker Hannifin for 13 years with various job titles, culminating with his most recent title “principal engineer.” (Tr. (Ge) at 345:6–346:16.). As principal engineer at Parker Hannifin, Dr. Ge was responsible for new product development. (*Id.*). Modumetal identified and then called Dr. Ye as an adverse fact witness who was testified about: 1. early interactions between Modumetal and Parker Hannifin; 2) Modumetal and Parker Hannifin's collaboration pursuant to the parties' 2016 Collaboration Agreement; 3) knowledge sharing between Modumetal and Parker Hannifin, including any retention of confidential information following the termination of the collaboration agreement; and 4) Parker Hannifin's development of the Accused Products. (CPst. at 3.). During Project Ohm, Dr. Ge was responsible for communicating with Modumetal, coordinating testing plans, and conducting testing of NanoGalv<sup>®</sup> on Parker Hannifin's tube fittings. (Tr. (Ge) at 351:15–20.).

allegation that Parker Hannifin hotly contested. (CPBr at 94–99; CRBr. at 17–22; RPBr at 99–102; RBr. at 53–57.).

Evidence that the claimed invention has been copied is “strong evidence of nonobviousness.” *Volvo Penta of the Americas, LLC v. Brunswick Corp.*, 81 F.4th 1202, 1213 (Fed. Cir. 2023). The mere existence of an infringing product, however, is not itself evidence of copying. *Liqwd, Inc. v. L’Oreal USA, Inc.*, 941 F.3d 1133, 1137 (Fed. Cir. 2019) (“*Liqwd*”) (“Copying requires duplication of features of the patentee’s work based on access to that work, lest all infringement be mistakenly treated as copying”). “Similarities between an issued patent and an accused product do not, on their own, establish copying.” *Id.* However, circumstantial evidence can be relied on to prove copying, including evidence that the accused infringer: (i) had access to an issued patent with circumstantial evidence of the accused infringer’s changes in designs; and (ii) had access to, and adopted, a patented method. *Id.* at 1138.

Here, there is evidence that Parker Hannifin knew of Modumetal’s patents and, after learning about Modumetal’s patents, changed their coating methods and products. Before Parker Hannifin and Modumetal started their failed collaboration, Parker Hannifin was selling two (2) anti-corrosion coatings: (i) ToughShield® 1000, a pure zinc coating that was rated for only 720 hours of corrosion protection; and (ii) XTR, a zinc/nickel monolayer coating that was rated for 1,000 hours of corrosion protection. (Tr. (Ge) 347:2–25, 348:25–349:5.). There is no dispute that, before their failed collaboration (and after), Parker Hannifin was trying to obtain a new and better anti-corrosion coating to remain competitive in the anti-corrosion coating industry. (*See, e.g.*, Tr. (Smerdel) at 751:10–20, 778:16–23, 779:2–7, 780:3–10.). At the same time, salt spray testing conducted in connection with their failed collaboration revealed that NanoGalv® could withstand at least 3,000 hours of exposure without corrosion. (Tr. (Smerdel) at 771:2–773:3;

CX-0278C.0005.).

According to Mr. Creech, in 2015 Parker Hannifin contacted Modumetal to see if they could work out a mutually beneficial collaboration because Parker Hannifin knew of the strength of NanoGalv<sup>®</sup> anti-corrosion protection, knew it was rated for 3000 hours, and was “intrigued by the technology and obviously the results.” (Tr. (Creech) at 177:8–14; *see also* Tr. (Smerdel) at 769:7–8.). On November 1, 2016, Modumetal and Parker Hannifin executed an initial collaboration agreement. (Tr. (Creech) at 176:3–14; CX-0623C (“Collaboration Agreement”).).

According to provision A of Section VI of the Collaboration Agreement, the Collaboration Agreement would [REDACTED]

[REDACTED] (Tr. (Creech) at 177:15–178:1; CX-0623C.0007–.0008.).

The purpose of the Collaboration Agreement was to [REDACTED]

[REDACTED] (CX-0523C.0001.). During their collaboration, Parker Hannifin had access to certain of Modumetal’s confidential information. (CRBr. at 19 (citing CX-0244C, and describing CX-0244C as “detailing Parker employee’s access to Modumetal confidential documents”).).<sup>62</sup> However, the weight of the evidence establishes that Parker Hannifin received

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<sup>62</sup> No witness testified about exhibit CX-0244C, the specific exhibit that describes Modumetal documents to which Parker Hannifin had access as part of Project OHM and the Modumetal/Parker Hannifin collaboration. On its face, exhibit CX-0244C appears to be a table or spreadsheet that lists the titles of various documents that Parker Hannifin’s downloaded, the date they were downloaded, and the identity of the person that downloaded the document. (CX-0244C.). Parker Hannifin did not dispute the authenticity of the exhibit or whether it is what Modumetal purports it to be. However, the exhibit is given little weight because it is not clear, and there is no testimony that the content of any of the documents that Parker Hannifin staff downloaded relate to Modumetal’s confidential information that is necessary to produce NanoGalv<sup>®</sup>.

[REDACTED] (Tr. (Wagener) at 798:11–803:5.). In other words,

Parker Hannifin was expected to simply [REDACTED]

[REDACTED] (*Id.*).

Modumetal’s CEO, Mr. Creech, explained during cross-examination that, during the short-lived collaboration between Parker Hannifin and Modumetal, Modumetal put protections in place to prevent Parker Hannifin from accessing Modumetal’s confidential information that essentially were Modumetal’s trade secrets. (Tr. (Creech) at 247:5–13.). Mr. Creech and Ms. Lomasney, Modumetal fact witnesses, both testified that [REDACTED]

[REDACTED] (Tr. (Creech) at 93:4–7; JX-0059C (Lomasney Dep. Tr.) at 298:14–299:1.).

Two (2) other Parker Hannifin fact witnesses who worked with Modumetal on the OHM project, Dr. Ge and Dr. Wagener, corroborated each other’s testimony that as employees of Parker Hannifin, they did not have the information necessary to replicate [REDACTED]

[REDACTED] to create NanoGalv<sup>®</sup>. (Tr. (Ge) at 377:2–5, 378:25–379:2; Tr. (Wagener) at 801:3–802:22.). Mr. Creech testified that Modumetal’s refusal to provide Parker Hannifin with access to Modumetal’s “secret sauce,” i.e., [REDACTED]

[REDACTED] is one of the reasons their collaboration ended. (Tr. (Creech) at 179:15–180:12.). Because Parker Hannifin undisputedly [REDACTED]

[REDACTED], i.e., Modumetal’s trade secrets, Modumetal’s

copying claims lack evidentiary support.

There is also no dispute that, during their collaboration, Parker Hannifin learned that Modumetal's NanoGalv<sup>®</sup> offered better corrosion resistance than either [REDACTED] [REDACTED] (Tr. (Smerdel) at 771:2–773:3; CX-0278C.0001, .0005 (Parker Hannifin presentation titled [REDACTED]

[REDACTED] Dr. Ge, Parker Hannifin's principal engineer in charge of new products, also testified that Parker Hannifin's internal testing and assessment showed that NanoGalv<sup>®</sup> was [REDACTED] [REDACTED] (Tr. (Ge) at 353:6–14.).

By a letter dated November 15, 2017, Parker Hannifin notified Modumetal's then-CEO Ms. Lomasney that Parker Hannifin would not extend the Collaboration Agreement and ultimately would not continue working with Modumetal. In that letter, Parker Hannifin explained that it needed: [REDACTED] [REDACTED] [REDACTED] (Tr. (Creech) at 178:3–14; JX-0042C.0001.).

By another letter dated November 29, 2017, Parker Hannifin provided [REDACTED] [REDACTED] (Tr. (Creech) at 178:15–24; CX-0632C.0001.). According to Parker Hannifin's proposed [REDACTED]

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED] Ms. Lomasney, at least according to Mr. Creech, described Parker Hannifin's

[REDACTED] (Tr. (Creech) at 178:25–179:14; CX-0632C.0002.).

Parker Hannifin's proposed outline of terms also required [REDACTED]

[REDACTED] (Tr. (Creech) at 179:20–180:12; CX-0632C.0002.). Mr. Creech testified that the fees Parker Hannifin proposed [REDACTED]

[REDACTED] (Tr. (Creech) at 179:12–14.). Mr. Creech also testified that Parker Hannifin's proposal to convert to an [REDACTED] [REDACTED]

[REDACTED] because it would have [REDACTED]

[REDACTED] (*Id.* at 179:15–19.).

Finally, Parker Hannifin's proposal that Modumetal [REDACTED]  
[REDACTED]  
[REDACTED]

[REDACTED] (*Id.* at 179:20–180:12.). Mr. Creech described this [REDACTED] as including Modumetal's [REDACTED]  
[REDACTED]  
[REDACTED]

[REDACTED] (*Id.*). Modumetal rejected Parker Hannifin's outline of proposed terms. (*Id.*).

After terminating its collaboration with Modumetal, Parker Hannifin [REDACTED]  
[REDACTED]  
[REDACTED]

[REDACTED] (Tr. (Smerdel) at 780:3–7; CX-0256C.0005 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Parker Hannifin's [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] [REDACTED]

[REDACTED]

[REDACTED]

**Figure 34: Parker Hannifin’s Competitive Analysis in its Surface Protection Discussion Day Presentation**



Opportunity at Arconic due to 3D modeling package

(Tr. (Smerdel) at 780:3–7; CX-0256C.0005.).

Internal Parker Hannifin documents contain language that *suggests* that [REDACTED]

[REDACTED]

[REDACTED] (See, e.g., JX-

0043C (March 2019 [REDACTED] update) at .0002 (Modumetal’s technology [REDACTED]

[REDACTED]

JX-0044C ([REDACTED] “Introduction,” at .0002 (same).). However, the same

documents/exhibits also contain Parker Hannifin’s [REDACTED] (JX-

0043C.0003–.0004; JX-0044C.0002–.0003.). Parker Hannifin’s analysis of [REDACTED] is redacted. Moreover, those same documents expressly state that Parker Hannifin was [REDACTED] [REDACTED] (*Id.*).

Together, the documents suggest that Parker Hannifin was not merely seeking to replicate NanoGalv®; but also, that Parker Hannifin [REDACTED] [REDACTED] Parker Hannifin’s [REDACTED] [REDACTED] and the [REDACTED] [REDACTED] all strongly suggest that Parker Hannifin did not, and in fact, could not, copy NanoGalv®. Ultimately, there is not even a sufficient amount of circumstantial evidence to support a finding that Parker Hannifin copied NanoGalv®. *Liqwd*, at 1138.

Finally, Parker Hannifin presented a detailed and credible story of how it developed its own 4<sup>th</sup> generation coating product from publicly available information, specifically from a paper called the “Rashmi” paper, which is described in detail in Section VIII.C.2 on Infringement and therefore need not be repeated here. (Tr. (Wagener) at 805:23–807:7, 808:4–818:19; JX-0002 (“Rashmi”).). Moreover, Parker Hannifin [REDACTED] [REDACTED] [REDACTED]

Modumetal attempted to undercut Parker Hannifin’s claims that it independently developed its successor ToughShield® product coating by arguing that the Rashmi paper was based on Modumetal’s patents. (CRBr. at 21.). The basis for Modumetal’s argument is that a subset of the authors of the Rashmi paper are also authors on a previous paper that covered the same subject matter (multilayer coatings as an improvement over monolayer coatings for

preventing corrosion). According to Modumetal's attorney argument, there is a "striking similarity" between the figures of the Rashmi paper and the figures of the '419 patent. (*Id.*).

However, Modumetal's attorney argument has been given little weight. The figures in Rashmi and the '419 patent that Modumetal reference depict nothing more than a comparison between a generic monolayer (homogenous) coating and a generic multilayered coating. (CX-0137.0005 at Fig. 6; JX-0001 at Fig. 1.). Multilayered coatings for corrosion protection were not new at the time of the Asserted Patents. (JX-0001 at 2:14–23.). Therefore, a figure depicting a generic multilayered coating does not prove that the author of such a figure was working specifically from either Modumetal's patents or NanoGalv<sup>®</sup>. (*Id.*).

Ultimately, and as described above, the weight of the evidence supports a finding that Parker Hannifin did not have access to the information necessary to replicate NanoGalv<sup>®</sup> and did not in fact attempt to replicate NanoGalv<sup>®</sup>. Parker Hannifin's evidence proves that it developed its own ToughShield<sup>®</sup> Plus product starting from publicly available non-patent information that was not derived from Modumetal's patented technology. (*Id.*). Viewed in their totality, Parker Hannifin's testimony and documentary evidence undermine Modumetal's claims of copying.

For the foregoing reasons, it is a finding of this ID that Parker Hannifin did not copy Modumetal's technology. Therefore, copying does not support Modumetal's non-obviousness argument.

**f) Failure by Others**

Evidence that others tried but failed to develop a claimed invention may carry significant weight in an obviousness inquiry. While absolute certainty is not necessary to establish a reasonable expectation of success, there can be little better evidence negating an expectation of success than actual reports of failure. This is particularly true when the evidence indicates that others found development of the claimed invention difficult and failed to achieve any success. In such circumstances, evidence of failed attempts by others could be determinative on the issue of obviousness.

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*In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Pat. Litig.*, 676 F.3d 1063, 1081 (Fed. Cir. 2012) (internal citations and quotations omitted).

Modumetal introduced evidence of failure by others to achieve what it claimed for NanoGalv® through statements from Parker Hannifin. (CRBr. at 22.). Specifically, in a presentation titled [REDACTED] dated June 12, 2018, (CX-0256C), Parker Hannifin [REDACTED] [REDACTED] (Tr. (Smerdel) at 778:6–779:23, 781:13–782:23; CX-0256C.0005.). Parker Hannifin’s presentation also [REDACTED] [REDACTED] (Tr. (Smerdel) at 780:4–7, 781:13–782:23; CX-0256C.0005 [REDACTED]

Dr. Ge testified that, according to [REDACTED] [REDACTED] (Tr. (Ge) at 353:6–354:5.). In other words, [REDACTED] [REDACTED] However, in addition to its failed collaboration with Modumetal, and the facts that Modumetal did not allow Parker Hannifin access to its trade secrets to reproduce NanoGalv® [REDACTED] [REDACTED]

Mr. Smerdel, one of Parker Hannifin’s fact witnesses, testified that, in Parker Hannifin’s testing, the [REDACTED] [REDACTED] (Tr. (Smerdel) at 747:17–748:20.). [REDACTED] [REDACTED]

[REDACTED]  
[REDACTED]  
[REDACTED] (*Id.*). Dr. Wagener also testified that [REDACTED] [REDACTED]  
[REDACTED] (Tr.  
(Wagener) at 803:10–17.).

Therefore, it is a finding of this ID, that based on the weight of the evidence, there was a failure by others (competitors other than Modumetal) to produce coatings with corrosion resistance that met or exceeded 2,500 hours of corrosive testing. (Tr. (Smerdel) at 780:3–7; CX-0256C.0005.). Moreover, Modumetal’s NanoGalv<sup>®</sup> process/coating achieved greater than that level of corrosion resistance.

However, [REDACTED] [REDACTED]  
[REDACTED] [REDACTED]  
[REDACTED] [REDACTED]  
[REDACTED] [REDACTED]

[REDACTED] On balance, it is a finding of this ID that, if Modumetal had satisfied its burden of proof on nexus, then “failure of others” would weigh slightly in favor of non-obviousness because Modumetal did develop a 4<sup>th</sup> generation coating. However, while it was tested to offer the more than 2,500 hours<sup>64</sup> of corrosion protection that Parker Hannifin was looking for, [REDACTED]  
[REDACTED]  
[REDACTED]

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<sup>64</sup> Indeed, NanoGalv<sup>®</sup> offered at least 3,000 hours of corrosion protection according to some tests, (Tr. (Smerdel) at 771:2–773:3; CX-0278C.0005), and up to 6,000 hours of protection in other tests, (Tr. (Ge) at 353:6–354:5.).

**5. Claims 1–3, 5, and 7 of the '419 Patent and Claims 1–3 and 5 of the '613 Patent Are Not Invalid for Lack of Enablement**

Respondents did not meet their burden to prove by clear and convincing evidence that the Asserted Claims of the Asserted Patents are not enabled. During the Hearing, Respondents' expert, Dr. Frankel, testified, without any supporting analysis or evidence, that the Asserted Claims were not enabled because they cover "a countless number of alloys" and that it would require "undue experimentation" to "make and test countless possible combinations." The following is his testimony, in its entirety, on enablement.

Q. . . . Turning to slide 180, what's your understanding of the enablement requirement?

A. It's my understanding that to be enabled a specification of a patent teaches a POSA to make and use the invention.

Q. Now, focusing on the asserted claims of both patents we've been talking about all day today, if a POSA wanted to determine whether a particular combination of alloys falls within the scope of the asserted claims of the asserted patents, what would they have to do?

A. They would have to make it and test it.

Q. And how many different combinations of alloys and layers do the claims of the '419 and '613 patents encompass?

A. They encompass a countless number of alloys.

Q. In your opinion would it require undue experimentation for a POSA to make and test the countless possible combinations within the scope of the asserted claims of the asserted patents?

A. Yes.

(Tr. (Frankel) at 1059:22–1060:16.).

Dr. Frankel's conclusory testimony on non-enablement does not amount to clear and convincing evidence. *Koito Mfg. Co. v. Turn-Key-Tech, LLC*, 381 F.3d 1142, 1152 (Fed. Cir. 2004) ("General and conclusory testimony . . . does not suffice as substantial evidence of invalidity."). Dr. Frankel did not provide factual support for his conclusion that there would be

“a countless number of alloys.” (Tr. (Frankel) at 1059:22–1060:16.). He also failed to explain what experimentation would be required or why he considered such experimentation to be “undue.” (*Id.*). Thus, Dr. Frankel’s testimony does not establish lack of enablement. *See, e.g., Cephalon, Inc. v. Watson Pharmaceuticals, Inc.*, 707 F. 3d 1330, 1136 (Fed. Cir. 2013) (“Because we must presume a patent enabled, the challenger bears the burden, throughout the litigation, of proving lack of enablement by clear and convincing evidence.”) (citation omitted).

In contending that the Asserted Claims of the Asserted Patents are not enabled, Respondents attempted to equate this Investigation with *Brita LP v. Int’l Trade Comm’n*, No. 2024-1098, 2025 WL 2922550 (Fed. Cir. 2025). (RBr. at 57–58.). However, the facts of *Brita* are not on point here. The claims in *Brita* encompassed a genus of filter media that have a “Filter Rate and Performance Factor (FRAP)” within a range “of about 350 or less.” *Id.* at \*1329–30. There, “[t]he only type of filter disclosed in the [patent at issue] as meeting the claimed FRAP factor of 350 or less is carbon block. All of the figures of filters in the patent depict carbon blocks, not any other type of filter media.” *Id.* at \*1330. The Federal Circuit explained that:

[W]hile the specification may provide a listing of various types of filter media, including non-carbon-block media, and state that the FRAP factor criteria is “applicable” to filters using different types of media, *id.* at col. 13 ll. 30–34 and col. 26 ll. 30–37, this does nothing to show possession of non-carbon-block media that meets the claim's requirements of a FRAP factor of 350 or less.

Furthermore, the ’141 patent does not explain what common characteristics its carbon-block filters would share with non-carbon-block filters that might make them effective for meeting the claimed FRAP factor. Instead, the patent suggests the opposite, that “[t]he formulations of gravity fed carbon blocks disclosed are unique.” ’141 patent col. 26 ll. 63–65. As detailed above, the specification describes numerous advantageous characteristics for water filtration that are unique to carbon blocks and which are inapplicable to other media, like loose granular and mixed media.

*Id.* at \*1335.

Here, the '419 and '613 patents do not describe any inoperable embodiments that fall within the scope of the Asserted Claims. The Asserted Patents also explain that corrosion rates can be effectively controlled by adjusting the electronegativity or relative reactivity (or “nobility”) between adjacent layers. (*See, e.g.*, JX-0001 at 4:29–33 (“In another embodiment multilayer coating or cladding is provided for, in which the layers vary in electronegativity or in nobility, and in which the rate of corrosion can be controlled by controlling the difference in electronegativity or in the reactivity (or ‘nobility’) of adjacent layers.”)). No such common characteristic was present among the *Brita* carbon-block and non-carbon-block filter media.

Another basis for Respondents’ lack of enablement argument is that the Asserted Claims are “extremely broad,” “comprising billions—if not infinite—potential alloy combinations.” (RBr. at 58 (addressing *Wands* factor 8)). Respondents relied on Ms. Lomasney’s and Dr. Li’s general testimonies confirming that the claimed metal concentrations “can be anything between 1 and 99 [percent].” (JX-0059C (Lomasney Dep. Tr.) at 104:12–19; RX-0025C (Li Dep. Tr.) at 123:9–12 (“Q. . . . I could have any percentage of nickel from 1 to 99 percent; correct?” A. Yes.”)). However, Dr. Frankel did not present any evidence to corroborate the fact that, based on Ms. Lomasney’s and Dr. Li’s testimonies, the Asserted Claims are not enabled.

Additionally, Respondents pointed to testimony that Drs. Frankel, Kelly, and Li gave, which indicated that one would have to test a coating to know if it falls within the scope of the claims because “it cannot be predicted whether a particular coating practices the Asserted Claims.” (RBr. at 59 (addressing *Wands* factors 1, 6, and 7) (citing Tr. (Frankel) at 1060:3–16 (testifying that a person skilled in the art would have to “make it and test it”); Tr. (Kelly) at 569:4–570:12 (agreeing that a person skilled in the art “has to conduct tests on a coating to know if it practices the asserted claims”); RX-0025C (Li Dep. Tr.) at 116:14–120:12 (discussing

material property testing), 125:7–10 (agreeing testing is needed when there is a change in the metal or concentration)).).

However, as Modumetal noted, “the relevant question is not whether testing is required to determine *infringement*, but rather whether it would take *undue experimentation* to make and use a species that is covered by the claims.” (CRBr. at 29 (emphases added)). *See, e.g., Brita*, 2025 WL 2922550, at \*1337 (claims not enabled because it would take undue experimentation to make non-carbon-block filter media covered by the claims with the required FRAP values). Furthermore, absolute predictability is not required. “[W]hat is required is that the amount of experimentation not be ‘*unduly extensive*.’” *Cephalon*, 707 F.3d at 1338–39 (emphasis added) (quoting *Chiron Corp. v. Genetech, Inc.*, 363 F.3d 1247, 1253 (Fed. Cir. 2004)) (additional citation omitted).

Respondents also argued that because other variables such as “microstructure features,” or “crystal structure,” can affect whether a coating practices the Asserted Claims, “a POSA would have to engage in trial-and-error experimentation to determine which of the . . . claimed alloy combinations satisfy the nobility requirements and practice the Asserted Claims.” (RBr. at 59–60 (addressing *Wands* factors 2 and 3) (citing Tr. (Kelly) at 532:9–534:18, 569:4–570:21)). However, the portions of Dr. Kelly’s testimony Respondents cited entail his confirmation that such parameters can, for example, “affect an alloy’s resistance to corrosion” and “properties of the coating” such that tests would have to be performed. (Tr. (Kelly) at 532:9–534:18, 569:4–570:21.). He did not explain how those parameters result in *undue* experimentation. Moreover, during the Hearing, Dr. Frankel acknowledged that one of ordinary skill could determine the effect of parameters such as microstructure, temperature, stability, and composition by referring to a phase diagram.

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Q. This one is your rebuttal expert report. This is the one on noninfringement.

A. Noninfringement. Thank you, sir.

Q. Okay. Actually, I'm sorry, Mr. Roan, please go first to page 20, paragraph 43.

I'm going to read you the first sentence.

"Microstructures, including the grain size, of an alloy can impact the corrosion resistance of that alloy."

Did you write that?

A. Yes.

Q. Is that a true statement?

A. Yes.

Q. Okay. Let's go to page 18, paragraph 40.

I'll read you the first sentence.

"A tool for understanding and predicting the microstructure of alloys is the phase diagram."

Is that a true statement?

A. Yes, it is.

Q. The next sentence says, "Phase diagrams graphically represent the thermodynamic equilibrium of different phases under varying conditions of temperature, pH, pressure, and composition."

Is that a true statement?

A. Yes, it is.

Q. The next sentence says, "For alloys, temperature composition phase diagrams are particularly important, as they delineate the regions where specific phases are stable and indicate the boundaries where phase transformations occur."

Is that a true statement?

A. It is.

Q. The next sentence says, "By consulting a phase diagram, a POSA, person of skill in the art, can anticipate which phases will be present at a given temperature and composition, and how the microstructure will change during processes such as

heating, cooling, or mixing different elements.”

Is that a true statement?

A. Yes.

Q. Let’s go to paragraph 41 on page 19.

I’ll read you the first sentence.

“The microstructure of an alloy can be altered by how it is processed.”

Is that a true statement?

A. Absolutely is, yes.

Q. “For instance, rapid cooling from a high temperature can produce a fine grained microstructure, which typically enhances the alloy's strength but may reduce its ductility.”

Is that a true statement?

A. Yes.

Q. And it says, “In contrast, slow cooling allows for the growth of larger grains and can result in different phase distributions which might improve toughness or hardness depending on the specific alloy system.”

Is that a true statement?

A. Yes.

(Tr. (Frankel) at 1100:21–1103:2.).

Dr. Frankel’s testimony on the information phase diagrams provide strongly suggests that these effects, as well as how to control them, are well known, which undermines Respondents’ argument that “trial-and-error experimentation” is necessary.

Dr. Kelly also testified that there have been “substantial studies” in the literature of the effect of factors such as grain size, temperature, and composition on corrosion resistance.

Q. You were asked a number of questions last week about various factors that can affect corrosion resistance rate, factors like grain size, temperature, composition, et cetera.

Do you remember that line of questioning?

A. I do.

Q. To what extent have those factors been studied in the literature?

A. I would say there have been substantial studies of each of those factors.

Q. Can you elaborate?

A. So there are studies of effective grain size, effective crystal orientation. What were some of the others you --

Q. Composition.

A. Oh, there have been many, many, many studies of composition affects [sic] on corrosion rate.

Q. And for what types of systems would those studies cover?

A. For all kinds of systems, including the zinc nickel coatings.

(Tr. (Kelly) at 571:25–572:20).

Dr. Kelly's testimony, as recited immediately above, also undermines Respondents' "trial-and-error experimentation" argument.

Additionally, Respondents argued that the Asserted Patents do not provide "sufficient guidance or direction" to achieve the nobility limitations because "the only direction or guidance regarding electronegativity that the Asserted Patents provide is that '[i]n A-type metals, such as Fe, Ni, Cr and Zn, it is generally true that the higher the electronegativity, the greater the nobility,'" which is not accurate. (RBr. at 60 (addressing *Wands* factor 2)). For example, as noted above, the '419 patent discloses that "the layers vary in electronegativity or in nobility" and that "the rate of corrosion can be controlled by controlling the difference in electronegativity or in the reactivity (or "nobility") of adjacent layers." (JX-0001 at 4:29–33.). Thus, the "guidance and direction" in the Asserted Patents with respect to electronegativity is not limited to four (4) metals as Respondents contended.

Respondents argued that Modumetal’s observation that some of Respondents’ prior art are not enabled demonstrates that the Asserted Claims are not enabled because “[t]he Asserted Patents provide far less detail than the prior art.” (RBr. at 62.). However, Respondents did not produce evidence on this point.

For the foregoing reasons, Respondents failed to meet their burden to prove by clear and convincing evidence that the Asserted Claims of the Asserted Patents are not enabled. Thus, it is a finding of this ID that the Asserted Claims of the Asserted Patents are not invalid for lack of enablement.

## **XI. ECONOMIC PRONG OF THE DOMESTIC INDUSTRY REQUIREMENT**

### **A. Legal Standard**

The Commission may only find a violation of Section 337 “if an industry in the United States relating to the articles protected by the patent . . . exists or is in the process of being established.” 19 U.S.C. § 1337(a)(2) (emphases added). Typically, a complainant must show that a domestic industry existed at the time the complaint was filed. *See Motiva LLC v. Int’l Trade Comm’n*, 716 F.3d 596, 601 n.6 (Fed. Cir. 2013).

The domestic industry requirement consists of a “technical prong” and an “economic prong.” *See, e.g., Certain Elec. Devices, Including Wireless Commc’n Devices, Portable Music & Data Processing Devices, & Tablet Computs.*, Inv. No. 337-TA-794, Order No. 88, 2012 WL 2484219, at \*3 (June 6, 2012); *Certain Unified Commc’ns Sys., Prods. Used with Such Sys., and Components Thereof*, Inv. No. 337-TA-598, Order No. 9 at 2 (Sept. 5, 2007) (“*Communications Systems*”). A complainant satisfies the “technical prong” of the domestic industry requirement when it proves that its activities relate to an article “protected by the patent.” *See Communications Systems*, Order No. 9 at 2. A complainant satisfies the “economic prong” of the domestic industry requirement when it demonstrates that the economic activities set forth in

subsections (A), (B), and/or (C) of Section 337(a)(3) have taken place or are taking place with respect to the protected articles. 19 U.S.C. § 1337(a)(3)(A)-(C).

Section 337(a)(3) states that:

(3) For purposes of paragraph (2), and industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark, mask work, or design concerned –

- (A) significant investment in plant and equipment;
- (B) significant employment of labor, or capital; or
- (C) substantial investment in its exploitation, including engineering, research and development, or licensing.

19 U.S.C. § 1337(a)(3)(A), (B), or (C).

Because the criteria are listed in the disjunctive, satisfaction of any one of them will be sufficient to meet the economic prong of the domestic industry requirement. *Lashify, Inc. v. Int'l Trade Comm'n* (“*Lashify*”), 130 F.4th 948, 957 (Fed. Cir. 2025).

Establishment of the “economic prong” is not dependent on any “minimum monetary expenditure” and there is no need for a complainant “to define the industry itself in absolute mathematical terms.” *Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Comm’n Op. at 25–26 (May 16, 2008) (“*Stringed Instruments*”). However, a complainant must substantiate the nature and the significance of its activities with respect to the articles protected by the patent at issue. *Certain Printing and Imaging Devices and Components Thereof*, Inv. No. 337-TA-690, Comm’n Op. at 30 (Feb. 17, 2011) (“*Imaging Devices*”).

The Commission has interpreted Sections 337(a)(3)(A) and (B) to concern “investments in plant and equipment and labor and capital with respect to the **articles** protected by the patent.” *Certain Ground Fault Circuit Interrupters and Prods. Containing Same*, Inv. No. 337-TA-739, 2012 WL 2394435, at \*50, Comm’n Op. at 78 (June 8, 2012) (“*Circuit Interrupters*”) (emphasis in original) (quoting 19 U.S.C. §§ 1337(a)(3)(A), (B)).

When a complainant proceeds under Section 337(a)(3)(C), it is not sufficient for the “substantial investment” under subsection (C) to merely relate to articles protected by the Asserted Patents. Rather, “the complainant must establish that there is a nexus between the claimed investment and asserted patent regardless of whether the domestic-industry showing is based on licensing, engineering, research and development.” *Certain Integrated Circuit Chips & Prods. Containing*, Inv. No. 337-TA-845, FID, 2013 WL 3463385, at \*14 (June 7, 2013) (“*Certain Integrated Circuit Chips*”).

In addition, the Commission has definitively stated that investments in plant and equipment or labor and capital that relate to engineering and research and development (“R&D”) (that are expressly identified under subsection (C)), are properly considered under subsections (A) and (B):

The statutory text of section 337 does not limit sections 337(a)(3)(A) and (B) to investments related to manufacturing or any other type of industry. It only requires that the domestic investments in plant and equipment, and employment of labor or capital be “with respect to the articles protected by the patent.” 19 U.S.C. § 1337(a)(3). Moreover, even though subsection (C) expressly identifies “engineering” and “research and development” as exemplary investments in the “exploitation” of the patent, that language does not unambiguously narrow subsections (A) and (B) to exclude those same types of investments.

*Certain Solid State Storage Drives, Stacked Elecs. Components, and Prods. Containing Same*, Inv. No. 337-TA-1097, Comm’n Op. at 8 (June 29, 2018) (“*Storage Drives*”); *see also, e.g., Certain Marine Sonar Imaging Devices, Including Downscan and Sidescan Devices, Prods. Containing the Same, and Components Thereof*, Inv. No. 337-TA-921, Comm’n Op. at 57–64 (Jan. 6, 2016) (“*Sonar Imaging Devices*”).

There is no mathematical threshold test or a “rigid formula” for determining whether a domestic industry exists. *Certain Male Prophylactic Devices, Inc.*, Inv. No. 337-TA-292, Comm’n Op. at 39, USITC Pub. 2390 (June 1991) (“*Male Prophylactic Devices*”). However, to determine whether investments are “significant” or “substantial,” the actual amounts of a complainant’s investments or a quantitative analysis must be performed. *Lelo Inc. v. Int’l Trade*

*Comm’n*, 786 F.3d 879, 883–84 (Fed. Cir. 2015). Even after *Lelo*, which requires some quantification of a complainant’s investments, there is still no bright line as to a threshold amount that might satisfy the economic prong of the domestic industry requirement.

**B. Economic Prong Overview**

Modumetal asserted that its investments in plant and equipment and labor related to the DI Products [REDACTED] satisfy the economic prong of the domestic industry requirement under Section 337(a)(3)(A) and (B) (“subsections (A) and (B),” respectively). (CBr. at 86–96.). Modumetal’s economic expert, Mr. Ryan Herrington,<sup>65</sup> based his analyses on the premise that the domestic industry products include “*all* metal parts” coated with NanoGalv®. (Tr. (Herrington) at 658:4–659:6 (agreeing that “from an economic perspective,” the NanoGalv® DI products are “*all* metal parts coated with NanoGalv®”) (emphasis added).

As an initial matter, Modumetal failed to show that the DI Fastener practices any claim of the Asserted Patents. (*See* Section IX.B-D, *supra*). Thus, as a matter of law, Modumetal cannot prove that it has satisfied the domestic industry requirement based on the DI Fastener because the DI Fastener does not practice any claim of the Asserted Patents and, as such, the DI Fastener is not an article *protected by* the Asserted Patents. *See, e.g., Hyosung TNS Inc. v. Int’l Trade Comm’n*, 926 F.3d 1353, 1361 (Fed. Cir. 2019) (“The domestic industry requirement has two

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<sup>65</sup> When he testified during the Hearing, Mr. Ryan Herrington was a Senior Managing Director at FTI Consulting. (CPSt. at 5; *see also id.* at Ex. 4.). Modumetal identified Mr. Herrington as an expert to testify about the types of business records Modumetal keeps in the ordinary course of business and an explanation of those business records; the types of investments Modumetal performs in the United States related to the DI Products; Modumetal’s investments in the DI Products in the United States; the significance of Modumetal’s investments in the DI Products in the United States; and the bases for his opinions with respect to remedy and bond. (CPSt. at 5.). During the Hearing, Mr. Herrington was accepted, without objection, as an expert on the subjects for which he was called upon to testify. (Tr. at 585:14-20.).

prongs: ‘the “economic prong,” which requires that there be an industry in the United States, and the ‘technical prong,’ which requires that the *industry relate to articles protected by the patent.*’) (emphasis added).

Moreover, as Respondents pointed out, Modumetal’s arguments and Mr. Herrington’s opinions suffer from two additional separate and significant problems should the Commission find that the DI Fastener does practice one or more claims of the Asserted Patents: (1) Modumetal failed to prove representativeness of the DI Fastener; and (2) [REDACTED]

[REDACTED] and, therefore, are not “articles protected by the [Asserted] Patent[s]” as required under 19 U.S.C. § 1337(a)(3). (RRBr. at 57.).

For the additional reasons discussed below, Modumetal has failed to establish an economic domestic industry.

**C. Should the Commission Find that the DI Fastener Practices One or More Claims of the Asserted Patents, Modumetal’s DI Fastener Alone Does Not Establish a Domestic Industry**

**1. Modumetal Failed to Prove Representativeness of the DI Fastener**

In the event the Commission finds that the DI Fastener practices one or more claims of the Asserted Patents, for the reasons discussed below, Modumetal did not prove that the DI Fastener is representative of the DI Products that Modumetal identified.

As discussed above in Section IX.A with respect to the technical prong of the domestic industry requirement, it is Modumetal’s burden to demonstrate that it is practicing or exploiting the patents at issue. *See* 19 U.S.C. § 1337(a)(2) and (3); *Microsphere Adhesives*, Inv. No. 337-TA-366, Comm’n Op. at 8. Although Modumetal can rely on representative products to meet this burden, “it cannot simply *assume* that other products are the same as the representative products.” *Certain Replacement Automotive Lamps II*, Inv. No. 337-TA-1292, FID at 111-12

(Jan. 24, 2023) (“*Replacement Automotive Lamps II*”), *rev’d on other grounds*, Comm’n Op. at 12, 26, 46 (Mar. 22, 2024) (emphasis added); *see also Certain LED Lighting Devices, LED Power Supplies, & Components Thereof*, Inv. No. 337-TA-1081, Comm’n Op. at 10 (July 23, 2019); *Certain Television Sets, Television Receivers, Television Tuners, & Components Thereof*, Inv. No. 337-TA-910, Comm’n Op. at 23 (Oct. 30, 2015). “Instead, the complainant must show by a preponderance of the evidence that the representative products are, in fact, representative of the other products.” *Replacement Automotive Lamps II*, Inv. No. 337-TA-1292, FID at 112 (citations omitted). Here, Modumetal failed to show that the DI Fastener is representative of any NanoGalv® part produced by Modumetal or any of its licensees.

Modumetal argued that all investments in NanoGalv® are cognizable domestic industry expenditures because the DI Fastener is allegedly protected by the Asserted Patents. (*See, e.g.,* CBr. at 10, 48–59, 73–82.). Modumetal produced STEM-HAADF, EDS or line scan, etching or accelerated corrosion, and optical microscopy test results for the DI Fastener to support its contention. (*See generally* JX-0018C; *see also* Section VI, *supra* (Testing).). However, none of Modumetal’s witnesses—expert or fact—testified that the DI Fastener is **representative** of all parts coated with NanoGalv®.

Modumetal’s technical domestic industry expert, Dr. Kelly, analyzed Modumetal’s test results for the DI Fastener and concluded that the DI Fastener was protected by both Asserted Patents. (Tr. (Kelly) at 484:5–11.). As he acknowledged during the Hearing, the DI Fastener was the **only** part for which he had test results, and as a result, he did not form any opinions as to whether is representative of any other NanoGalv®-coated part. (*Id.* at 549:13–17.). Dr. Kelly also confirmed that he was not asked to test any other NanoGalv®-coated part, let alone analyze whether the DI Fastener was representative of them. (*Id.* at 549:18–21.). Additionally, Dr. Kelly

agreed that Modumetal's counsel instructed him to **assume** representativeness without independently verifying it, which is improper. (*Id.* at 549:22–25.). *See, e.g., Replacement Automotive Lamps II*, Inv. No. 337-TA-1292, FID at 111–12.

Q. You don't have any opinions on whether the DI Fastener is representative of any other NanoGalv®-coated parts because the only data you had was for the DI Fastener, right?

A. That is correct.

Q. You were not asked to analyze whether the DI Fastener is representative of other NanoGalv® products, right?

A. I was not.

Q. In fact, Modumetal's counsel instructed you to **assume** the DI Fastener was representative, and you didn't independently verify that, right?

A. That is correct.

(Tr. (Kelly) at 549:13–25 (emphasis added).).

Moreover, during the Hearing, Dr. Kelly confirmed that he had no opinions on the manufacturing process used to make the DI Fastener and, therefore, he did not opine that NanoGalv® coatings are applied with a uniform manufacturing process that results in a consistent coating. (*Id.* at 548:4–6.). Dr. Kelly also did not provide any opinion on [REDACTED]

[REDACTED]  
(*Id.* at 548:7–9, 548:19–549:3, 549:7–9.). Nor did he know whether the DI Fastener was made by barrel- or rack-plating or had any opinions regarding how the alleged layers within the DI Fastener were formed. (*Id.* at 571:3–9, 547:9–548:2.). In addition, Dr. Kelly did not offer an opinion that [REDACTED]

have the same layer and coating thickness, or have the same number of layers. (*Id.* at 550:1–10.). He also had no knowledge of whether all NanoGalv® products' layers have the same relative nobilities. He did not offer an opinion whether [REDACTED]

[REDACTED] (*Id.* at 550:11–13, 17–20.).

Notably, Dr. Kelly did not identify or describe any NanoGalv® specification to which the DI Fastener conforms. (*Id.* at 571:14–17.). In fact, he testified that [REDACTED] [REDACTED] (*Id.* at 571:10–13 [REDACTED] [REDACTED]; *see also* Tr. (Frankel) at 941:9–942:21 [REDACTED] [REDACTED] (RX-0309C)); RDX-0003C.0055-.0056.).

Furthermore, as Modumetal acknowledged, [REDACTED] [REDACTED] (CBr. at 98 (contending that [REDACTED] [REDACTED] does not prove that the DI Products fail to practice the Asserted Patents”).). Dr. Li and Mr. Creech, Complainant’s former Director of Research and Development and current Executive Chairman, respectively, confirmed that [REDACTED] [REDACTED] (Tr. (Li) at 298:3–5; Tr. (Creech) at 199:14–24; RX-0025C (Li Dep. Tr.) at 84:2–86:1.).

Specifically, Dr. Li testified that Modumetal [REDACTED] [REDACTED] (Tr. (Li) at 298:3–299:24.). Similarly, Mr. Creech testified that Modumetal [REDACTED] [REDACTED]

[REDACTED] (Tr. (Creech) at 201:19–202:24; RX-0021C (Creech Dep. Tr.) at 160:11–161:25.). Mr. Creech explained that [REDACTED]

[REDACTED] (Tr. (Creech) at 201:19–202:24, 204:9–12; RX-0021C (Creech Dep. Tr.) at 160:11–161:25.). He also agreed that as [REDACTED]

[REDACTED] (Tr. (Creech) at 205:2–6; RX-0021C (Creech Dep. Tr.) at 160:11–161:25.). Mr. Creech’s testimony during the Hearing that Modumetal does not [REDACTED] [REDACTED] is inconsistent with his deposition testimony where he explained, under oath, that [REDACTED]

[REDACTED] (RX-0021C (Creech Dep. Tr.) at 160:11–161:25; Tr. (Creech) at 201:19–204:2.). Thus, his Hearing testimony is given little, if any, weight.

According to Dr. Kelly, Modumetal’s expert, [REDACTED]

Q. [REDACTED]

A. Yes.

Q. [REDACTED]

A. Yes.

Q. [REDACTED]

A. Yes.

Q. [REDACTED]

A. Yes.

\* \* \*

Q. [REDACTED]

A. Yes.

\* \* \*

Q. [REDACTED]

A. Yes.

(Tr. (Kelly) at 569:8–14, 569:19–21, 570:1–3, 570:13–15.).

Dr. Kelly also confirmed that [REDACTED], testing was necessary to determine the coating's layer nobility, thickness, and composition.

Q. [REDACTED]

A. Yes.

\* \* \*

Q. [REDACTED]

A. Yes.

\* \* \*

Q. ... [REDACTED]

A. Yes.

(*Id.* at 569:15–18, 569:22–25, 570:9–12.).

Additionally, Dr. Kelly agreed that for each [REDACTED], the nobilities of the respective layers formed could not be predicted. (*Id.* at 570:4–8.).

Likewise, Dr. Li testified that for every single alloy and combination of alloy layers, testing is required to determine whether the coating and its layers meet the relative nobility requirements of the Asserted Patents. (RX-0025C (Li Dep. Tr.) at 116:14–117:6, 117:14–118:8,

118:12–119:2, 119:5–120:12, 121:14–122:18, 124:12–24, 125:7–10.).

As Modumetal’s counsel stated during the Hearing, it “[did] not launch[] this investigation based on *speculation* or *assumptions*,” but instead came “armed with results from a battery of *rigorous experimental methods*[.]” (Tr. at 40:7–15 (emphases added).). To the contrary, with respect to DI Products, Modumetal did not test any NanoGalv® aside from the DI Fastener, despite Dr. Kelly’s and Dr. Li’s knowledge, and repeated testimony, that testing is required [REDACTED]. (Tr. (Kelly) at 569:4–570:12; RX-0025C (Li Dep. Tr.) at 116:14–117:6, 117:14–118:8, 118:12–119:2, 119:5–120:12, 121:14–122:18, 124:12–24, 125:7–10.).

In sum, as explained above and addressed in Section IX.C with respect to the technical prong of the domestic industry requirement, Modumetal did not dispute that its expert, Dr. Kelly, tested only the DI Fastener, assumed it was representative without verification, and relied solely on those test results to form his technical prong opinions about the DI Fastener. (Tr. (Kelly) at 546:24–547:8, 549:13–25; *see also* EDIS Doc. ID No. 857015, Modumetal’s Responsive Statement of Material Facts in Opp’n to Respondents’ MSD, at 2–4 (July 16, 2025).). Moreover, Modumetal did not contest that [REDACTED] [REDACTED] (Tr. (Li) at 275:16–20, 298:3–299:24; Tr. (Kelly) at 571:6–9; Tr. (Creech) at 199:14–24; RX-0025C (Li Dep. Tr.) at 84:2–86:1; Modumetal’s Statement of Facts in Opp’n to Respondents’ MSD at 4–6.). Additionally, Modumetal’s expert and fact witnesses, Dr. Kelly and Dr. Li, respectively, testified that [REDACTED] [REDACTED], testing is required to assess whether a coating practices the Asserted Claims. (Tr. (Kelly) at 569:4–570:21; RX-0025C (Li) at 116:14–117:6, 117:14–118:8, 118:12–119:2, 119:5–120:12, 121:14–122:18,

124:12–24, 125:7–10; Modumetal’s Statement of Facts in Opp’n to Respondents’ MSD at 4, 6–8, 10.).

Because Modumetal has not demonstrated representativeness or provided any other evidence regarding the non-representative domestic industry products, Modumetal has not proven that the non-representative domestic industry products practice the Asserted Patents. “Consequently, [Modumetal] has failed to demonstrate that any investments related to the non-representative domestic industry products should be considered when evaluating whether there is a domestic industry.” *Replacement Auto. Lamps II*, Inv. No. 337-TA-1292, FID at 116.

**2. Modumetal Failed to Prove an Economic Domestic Industry for the DI Fastener**

Again, in the event the Commission finds that the DI Fastener practices one or more claims of the Asserted Patents, Modumetal only produced evidence that the DI Fastener is covered by the Asserted Patents. Thus, Modumetal was required to allocate its purported domestic industry economic investments to include **only** those products shown to be “covered by the asserted patents,” which, in this case, is only the **DI Fastener**. *Certain Comput. Forensic Devices and Prods. Containing the Same*, Inv. No. 337-TA-799, FID at 10 (Oct. 26, 2012) (“*Comput. Forensic Devices*”); *Replacement Auto. Lamps II*, Inv. No. 337-TA-1292, FID at 116 (excluding “investments related to the non-representative domestic industry products”). However, Modumetal’s economic expert, Mr. Herrington, failed to allocate Modumetal’s alleged domestic industry investments on a product-by-product basis. In other words, Mr. Herrington did not provide a separate analysis and opinion with respect to Modumetal’s DI investments on just the **DI Fastener alone**.

Q. But you did not look at Modumetal’s investments on an individual product-by-product basis, did you?

A. If you’re asking me did I break out each investment by each product, I don’t

believe that analysis is in my expert report.

Q. So let me ask you that again. You did not look at Modumetal's investments on an individual product-by-product basis, did you?

A. No. The sales information --

Q. Sir, that's a yes-or-no question. Thank you.

Cognizable investments that you calculated with respect to plant, equipment, and labor, those investments are attributed to ***all of the NanoGalv® DI products as a whole, just a single product***, right?

A. ***That is true.***

(Tr. (Herrington) at 696:4–18 (emphases added); *see also id.* at 658:4–22 (testifying that “[f]rom an economic perspective,” he understood the scope of the DI Products to “include ***all*** metal parts coated with NanoGalv®”) (emphasis added).).

Mr. Herrington considered all of Modumetal's NanoGalv®-coated products, improperly assuming all were protected by the Asserted Patents.

As Respondents correctly noted, Commission precedent precludes a finding that Mr. Herrington's analysis meets Commission standards. (RRBr. at 69.). Modumetal “is not permitted by the plain language of [Section 337(a)(3)]” to include investments in unprotected versions of a product “along with an allegedly protected version of the product for the purposes of establishing a domestic industry.” *Certain Subsea Telecommc'ns Sys. & Components Thereof*, Inv. No. 337-TA-1098, ID at 70 (Apr. 26, 2019) (“*Subsea Telecommc'ns Sys.*”), *aff'd*, Comm'n Op. at 70 (Oct. 21, 2019). “The Commission has found that complainants have not satisfied the domestic industry requirement where the complainant failed to allocate expenses to account for non-domestic industry products that do not practice the patent.” *Id.* at 41; *see, e.g., Comput. Forensic Devices*, Inv. No. 337-TA-799, FID at 10–11 (finding complainant's domestic industry “estimates are necessarily improper because they include expenses of non-domestic industry products,” contrary to Commission precedent, which “requires that expenses be

allocated to each of the products covered by the asserted patents”).

Mr. Herrington improperly based his economic prong opinions on investments in products that Modumetal failed to demonstrate are protected by the Asserted Patents, as discussed above in Section XI.C.1. *See Replacement Auto. Lamps II*, Inv. No. 337-TA-1292, FID at 116–17. Accordingly, because Modumetal and its expert did not apportion the investments and exclude investments in products that Modumetal did not prove are protected by the Asserted Patents, Modumetal has failed to satisfy the domestic industry requirement.

**D. Should the Commission Find that the DI Fastener Practices One or More Claims of the Asserted Patents, and that the DI Fastener Is Representative of Modumetal’s DI Products, Modumetal’s DI Products Taken as a Whole Satisfy the Economic Prong of the Domestic Industry Requirement**

In the event the Commission determines that Modumetal’s DI Fastener practices the Asserted Patents and is representative of all NanoGalv® DI Products, for the reasons discussed below, it is a finding of this ID that Modumetal has satisfied the economic prong of the domestic industry requirement based on its investments in plant and equipment, and labor.

**1. Modumetal’s Domestic Activities Related to the DI Products**

[REDACTED], Modumetal has supported NanoGalv® through investments in the United States related to engineering, research and development, manufacturing, sales, marketing, and operations. (CBr. at 83.). Modumetal has performed those activities at its headquarters in Snohomish, Washington, [REDACTED], from a manufacturing facility in Houston, Texas. (*Id.*).

Modumetal performs engineering, research, and development activities related to NanoGalv® in the United States. (Tr. (Creech) at 167:17–23.). For instance, Modumetal’s employees in the United States conduct engineering, research and development [REDACTED] [REDACTED]. (Tr. (Herrington) at 636:24–

637:6.).

Mr. Creech explained that [REDACTED]

[REDACTED] (Tr. (Creech) at 100:25–101:18, 101:8 [REDACTED] 103:5–16 [REDACTED]

[REDACTED], 111:2–3 [REDACTED]

Mr. Creech also

testified that [REDACTED]

[REDACTED] (Tr. (Creech) at 109:13–110:3.). He explained that [REDACTED]

[REDACTED] (*See id.* at 100:25–101:18, 104:9–16 [REDACTED]

Mr. Creech testified that at the time of the

Hearing, Modumetal [REDACTED]

[REDACTED] (*Id.* at 112:3–12.).

Additionally, Mr. Creech explained that at its Washington facility, Modumetal is

[REDACTED] (*Id.* at 121:5–17

(discussing [REDACTED] 92:13–14 (noting that [REDACTED]

[REDACTED], 108:13–19,

123:22–25.). He testified that Modumetal’s Washington facility includes [REDACTED]

[REDACTED] (*Id.* at

124:1–8; *see also* CX-0438C, CX-0459C (photographs of Complainant’s Washington facility)).

Mr. Creech described what Modumetal does at the Washington facility as follows:

Q. . . . And what does Modumetal do at its Snohomish facility?

A. [REDACTED]

[REDACTED]

[REDACTED]

(Tr. (Creech) at 123:16–25.).

Mr. Creech also explained that [REDACTED]

[REDACTED] (Tr. (Creech) at 125:10–13.).

With respect to whether Modumetal anticipates [REDACTED]

[REDACTED] Mr. Creech stated that [REDACTED]

[REDACTED]

[REDACTED] (*Id.* at 125:16–19.).

Moreover, Mr. Creech testified that Modumetal [REDACTED]

[REDACTED]

[REDACTED] (*Id.* at 126:2–19, 127:3–11.). He explained that Complainant [REDACTED]

[REDACTED]

[REDACTED] (*Id.* at 126:12–22, 127:25–128:8; JX-0026C [REDACTED]

## **2. Modumetal’s Investments in Plant and Equipment**

Mr. Herrington testified that Modumetal made significant domestic investments in plant and equipment related to the DI Products [REDACTED]. (Tr. (Herrington) at 586:10–13, 592:17–20 (noting time period analyzed), 593:7–12.). Mr. Herrington’s opinion is based on Modumetal’s investments in plant and equipment in the United States used to support engineering, research and development, and manufacturing of the DI

Products. (*Id.* at 591:23–592:4.). Mr. Herrington’s analysis is based solely on [REDACTED]  
[REDACTED] (*Id.* at 592:8–13.).

To determine Modumetal’s monetary investments in plant and equipment related to the DI Products during the relevant time period, Mr. Herrington took a three-step approach: (1) identifying cognizable plant and equipment expenditures related to engineering, research and development, and manufacturing; (2) allocating Modumetal’s plant investments to engineering, research and development, and manufacturing; and (3) allocating Modumetal’s plant and equipment investments in engineering, research and development, and manufacturing to the DI Products through a sales-based allocation. (Tr. (Herrington) at 593:17–594:5; CDX-0002C.0005).).

To perform the first step of identifying cognizable plant and equipment expenditures, Mr. Herrington identified line items from Modumetal’s profit and loss statement (CX-0313C) that correspond to investments in plant and equipment that support Modumetal’s engineering, research and development, and manufacturing activities. (Tr. (Herrington) at 593:17–594:23, 595:20–596:8.). Mr. Herrington explained that this included all of Modumetal’s rent and utility expenses for its Snohomish, Washington and pre-acquisition Houston, Texas facilities, certain research and development expenses, and certain manufacturing expenses. (*Id.* at 595:20–596:8.). He confirmed that he did not include any expenses associated with sales or marketing. (*Id.* at 596:13–17.). Mr. Herrington testified that [REDACTED] he calculated plant expenditures totaling [REDACTED], ER&D equipment expenditures totaling [REDACTED], and manufacturing equipment expenditures totaling [REDACTED], for an aggregated total of [REDACTED]. (*Id.* at 596:9–12; JX-0068C.0001; CDX-0002C.0006).).

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In the second step, Mr. Herrington reduced Modumetal's plant expenditures to account for the portions of its Snohomish, Washington and Houston, Texas facilities dedicated to purposes other than engineering, research and development, and manufacturing. (Tr. (Herrington) at 596:18–597:7.). Mr. Herrington explained that he first allocated Modumetal's total rent and utility expenses to its two facilities in proportion to their monthly rent contribution. (*Id.* at 596:25–597:7; CDX-0002C.0007 (under heading "Facility Expenses Allocated by Facility")). Mr. Herrington used Modumetal's lease agreements to determine each facility's monthly rent, which revealed that [REDACTED]

[REDACTED] (Tr. (Herrington) at 597:14–598:19; CDX-0002C.0007 (under heading [REDACTED])

Mr. Herrington then reduced the rent and utility expenses associated with Modumetal's Snohomish, Washington facility to account for [REDACTED] [REDACTED] (Tr. (Herrington) at 598:23–599:3; CDX-0002C.0007 (under heading [REDACTED])

[REDACTED] This step reduced Modumetal's qualifying plant expenditures in the period between [REDACTED]. (*Id.*).

In the third step, Mr. Herrington allocated Modumetal's cognizable plant and equipment investments in engineering, research and development, and manufacturing to the DI Products. (Tr. (Herrington) at 599:23–600:1.). Mr. Herrington utilized a sales-based allocation and determined that NanoGalv® products accounted for [REDACTED] [REDACTED] (*Id.* at 601:11–14; CDX-0002C.0008.). This was determined by using Modumetal's itemized sales records and identifying all line items associated with

NanoGalv® or its related NanoPro. (Tr. (Herrington) at 601:15–602:3; CX-0312C.). Mr. Herrington offered his opinion that a sales-based allocation is appropriate in this instance, for example, because [REDACTED]

(See Tr. (Herrington) at 600:2–17; Tr. (Creech) at 170:12–18.).

Applying the sales-based allocation on an annual basis to Modumetal’s total investments related to engineering, research and development, and manufacturing, Mr. Herrington determined that [REDACTED] in cognizable plant and equipment investments related to the DI Products [REDACTED] which is shown below in Figure 35.



(Tr. (Herrington) at 625:14–626:4; JX-0067C; CDX-0002C.0010).

As Mr. Herrington concluded, Modumetal’s domestic investments in plant and equipment are qualitatively and quantitatively significant. (Tr. (Herrington) at 635:10–25.). Modumetal’s domestic investments in plant and equipment are qualitatively significant to Modumetal.

Mr. Herrington testified that NanoGalv® is Modumetal’s “flagship” product and has

been [REDACTED] (*Id.* at 636:5–10.). Additionally, he testified that [REDACTED]

[REDACTED] (*Id.* at 636:11–13 [REDACTED]

[REDACTED] CDX-0002C.0008 [REDACTED]

[REDACTED] CDX-0002C.0009 [REDACTED]

[REDACTED]. *See Certain Solid State Storage Devices, Stacked Electronics Components, and Prods. Containing Same*, Inv. No. 337-TA-1097, Comm’n Op. at 30 (Jun. 29, 2018) (finding plant and equipment expenditures to be significant based on comparison of DI Product revenue and total revenue). As Mr. Creech noted, [REDACTED]

[REDACTED] (Tr. (Creech) at 167:24–168:4.).

Modumetal’s domestic investments in plant and equipment are also qualitatively significant to the DI Products themselves. [REDACTED] Modumetal’s engineering, research, and development activities related to NanoGalv® [REDACTED]

[REDACTED] are performed in the United States. (*See* Tr. (Creech) at 167:20–168:11; *see also id.* at 168:12–23 [REDACTED]

[REDACTED] **Complainant’s** plant and equipment expenditures occurred in the United States. (Tr. (Herrington) at 639:15–16 [REDACTED]

[REDACTED] As a result, Modumetal’s domestic investments in plant and equipment related to engineering, research and development are [REDACTED]

[REDACTED] (Tr. (Herrington) at 636:19–23.). This includes [REDACTED]

[REDACTED]

[REDACTED] (Tr. (Herrington) at 636:24–637:6.).

In terms of quantitative significance, [REDACTED]

[REDACTED] (Tr. (Herrington) at 637:16–638:4.). For instance, [REDACTED]

[REDACTED] Modumetal’s annual investments in plant and equipment related to the NanoGalv® DI Products [REDACTED]

[REDACTED] (*Id.*).

[REDACTED]

(CDX-0002C.0016 (showing calculations on an annual basis)).

[REDACTED] Modumetal’s total revenue dedicated to plant and equipment investments related to the DI Products demonstrate the quantitative significance of the investments. (Tr. (Herrington) at 638:14–16). *See Wuhan Healthgen Biotechnology Corp. v. Int’l Trade Comm’n*, 127 F.4th 1334, 1339 (Fed. Cir. 2025) (“The investment-to-revenue ratio can indicate whether an investment is significant and substantial.”).

Should the Commission determine that Modumetal’s DI Fastener practices the Asserted Patents and is representative of all NanoGalv® DI Products, for the foregoing reasons, Modumetal has demonstrated that its investments in plant and equipment with respect to all NanoGalv® DI Products are qualitatively and quantitatively significant. Accordingly, Modumetal has satisfied the economic prong of the domestic industry requirement under Section

337(a)(3)(A).

**3. Modumetal's Significant Employment of Labor**

Mr. Herrington testified that Modumetal also made significant domestic investments in labor related to the DI Products [REDACTED] (Tr. (Herrington) at 586:10–13, 592:17–20 (noting time period analyzed)). He based his opinion on Modumetal's investments in labor in the United States used to support engineering, research and development, manufacturing, and sales, marketing and operations of the DI Products. (*Id.* at 626:5–11.). Mr. Herrington also explained that his analysis is based solely on Modumetal's labor investments and does not include any capital expenditures made by Modumetal. (*Id.* at 626:15–20.).

To determine Modumetal's monetary investments in labor related to the DI Products during the relevant time period, Mr. Herrington took a simpler two-step approach than he employed for calculating investments in plant and equipment: (1) identifying cognizable labor expenditures related to engineering, research and development, manufacturing, and sales, marketing, and operations; and (2) allocating Modumetal's labor investments in engineering, research and development, manufacturing, and sales, marketing, and operations to the DI Products through a sales-based allocation. (Tr. (Herrington) at 626:21–627:9; CDX-0002C.0011.).

To perform the first step of identifying cognizable labor expenditures, Mr. Herrington used Modumetal's payroll data (CX-0319C) to identify employees associated with engineering, research and development, manufacturing, and sales, marketing, and operations. (Tr. (Herrington) at 627:10–25; *id.* at 628:9–13 (confirming reliance on Complainant's payroll document)). As Mr. Herrington explained, [REDACTED] [REDACTED] (*Id.* at 627:16–19.). Using CX-0319C and CDX-0005C, a demonstrative exhibit Mr. Creech prepared, Mr. Herrington matched employees to their

respective payroll data to calculate Modumetal's labor investments related to each of engineering, research and development, manufacturing, sales, marketing, and operations. (Tr. (Herrington) at 629:2–14; JX-0072C; CDX-0002C.0012.). To be conservative, Mr. Herrington's excluded certain employees, [REDACTED]

[REDACTED] (Tr. (Herrington) at 632:1–12.). Between [REDACTED] [REDACTED] Mr. Herrington calculated Modumetal's ER&D labor expenditures totaling [REDACTED], manufacturing labor expenditures totaling [REDACTED], and sales, marketing, and operations labor expenditures totaling [REDACTED], for an aggregated total of [REDACTED]. (*Id.* at 632:18–633:7; JX-0071C; CDX-0002C.0013.).

In the second step, Mr. Herrington allocated Modumetal's cognizable labor investments in engineering, research and development, manufacturing, sales, marketing, and operations to the DI Products. (Tr. (Herrington) at 633:8–11.). Mr. Herrington used the same sales-based allocation he applied to Modumetal's plant and equipment expenditures that that NanoGalv® products accounted for [REDACTED] of Modumetal's total revenue on a yearly basis. (CDX-0002C.0013 (under heading "DI Product Revenue as % of Total Direct Product Revenue")). Applying the sales-based allocation on an annual basis to Modumetal's total investments related to engineering, research and development, manufacturing, sales, marketing, and operations, Mr. Herrington determined that Modumetal incurred approximately [REDACTED] in cognizable labor investments related to the DI Products between [REDACTED] [REDACTED] which is shown below in Figure 37.

**Figure 37: Modumetal’s Labor Investments Allocated to DI Products**



(Tr. (Herrington) at 633:12–20; JX-0071C; CDX-0002C.0013.).

Mr. Herrington offered his opinion that Modumetal’s domestic investments in labor are qualitatively and quantitatively significant. (Tr. (Herrington) at 635:10–25.). As Mr. Herrington testified with respect to Modumetal’s investments in plant and equipment, NanoGalv® is Modumetal’s “flagship” product [REDACTED] (*Id.* at 636:5–10). Additionally, [REDACTED]

[REDACTED] (*Id.* at 636:11–13 [REDACTED]

[REDACTED]

[REDACTED]; CDX-0002C.0008 [REDACTED]

[REDACTED] CDX-0002C.0009

[REDACTED]

[REDACTED] As Mr. Creech noted,

Modumetal’s engineering, research and development activities directed to [REDACTED]

[REDACTED] (Tr. (Creech) at 167:24–168:4.).

Modumetal’s domestic labor investments are also qualitatively significant to the DI

Products. Mr. Creech testified that [REDACTED] engineering, research, and development activities related to NanoGalv® [REDACTED] [REDACTED] are performed in the United States. (*See* Tr. (Creech) at 167:20–168:11; *see also* Tr. (Herrington) at 632:1–4 (noting that [REDACTED] [REDACTED] Thus, Mr. Herrington concluded that Modumetal’s domestic labor investments related to engineering, research and development are [REDACTED] [REDACTED] (Tr. (Herrington) at 636:19–23.). This includes Modumetal’s [REDACTED] [REDACTED] (*Id.* at 636:24–637:6.).

In terms of quantitative significance, Modumetal’s annual investments in labor related to the NanoGalv® DI Products [REDACTED] For instance, between [REDACTED] Modumetal’s annual investments in labor related to the NanoGalv® DI Products [REDACTED] [REDACTED] Mr. Herrington’s calculations are shown below in [REDACTED]

[REDACTED]

(Tr. (Herrington) at 638:24–639:7; CDX-0002C.0017.).

Should the Commission determine that Modumetal's DI Fastener is representative of all NanoGalv® DI Products, for the reasons discussed above, Complainant has demonstrated that its investments in labor with respect to all NanoGalv® DI Products are qualitatively and quantitatively significant. Accordingly, Complainant has satisfied the economic prong of the domestic industry requirement under Section 337(a)(3)(B).

## **XII. RECOMMENDATION ON REMEDY AND BOND**

### **A. Legal Standard**

Pursuant to Commission Rule 210.42, an administrative law judge ("ALJ") must issue a recommended determination on: (i) an appropriate remedy if the Commission finds a violation of Section 337, and (ii) an amount, if any, of the bond to be posted. 19 C.F.R. § 210.42(a)(1)(ii). When a Section 337 violation has been found, "the Commission has the authority to enter an exclusion order, a cease and desist order, or both." *Certain Flash Memory Circuits and Prods. Containing the Same*, Inv. No. 337-TA-382, Comm'n Op. on the Issues Under Review and on Remedy, the Public Interest and Bonding, at 26 (June 9, 1997).

Upon a finding of infringement, 19 U.S.C. § 1337(d) provides for a Limited Exclusion Order ("LEO"), directed to the products of named respondents, excluding any articles that infringe one or more claims of the Asserted Patents. 19 U.S.C. § 1337(d).

A Cease and Desist Order ("CDO") is also appropriate where the evidence demonstrates the presence of commercially significant inventory in the United States. 19 U.S.C. § 1337(f); *see also Certain Crystalline Cefadroxil Monohydrate*, Inv. No. 337-TA-293, Comm'n Op., USITC Pub. No. 2391, 1991 WL 790061, at \*30–32 (June 1991).

Infringing articles may enter the United States upon the payment of a bond during the sixty-day Presidential Review Period. 19 U.S.C. § 1337(j)(3). The bond is to be set at a level sufficient to "offset any competitive advantage resulting from the unfair method of competition

or unfair act enjoyed by persons benefiting from the importation.” *Certain Dynamic Random Access Memories, Components Thereof and Prods. Containing Same*, Inv. No. 337- TA-242, Comm’n Op., 1987 WL 450856 at 37 (Sept. 21, 1987).

**B. A Limited Exclusion Order Is Warranted If the Commission Finds a Violation of Section 337**

**1. A Certification Provision Is Warranted**

In the event the Commission finds that there is a violation of Section, this ID recommends the issuance of a LEO directed to products manufactured or imported by or on behalf of Respondents, their subsidiaries, related companies, and agents, excluding from entry into the United States the Accused Products that infringe one or more claims of the Asserted Patents.

Because it is a standard Commission practice to include a certification provision, and because it will aid the U.S. Customs and Borders Protection (“CBP”) in its enforcement of the Commission’s remedial order, it is a recommendation of this ID that in the event of a finding of a Section 337 violation, the LEO include the Commission’s standard certification provision. *See, e.g., Certain Road Constr. Machs. & Components Thereof*, Inv. No. 337-TA-1088, Comm’n Op., 2019 WL 6003332, at \*27 (July 15, 2019); *Certain Composite Aerogel Insulation Materials & Methods for Mfg. the Same*, Inv. No. 337-TA-1003, Comm’n Op. at 62 (Feb. 22, 2018) (explaining complainant’s request to depart from standard certification provision was “contrary to the Commission’s standard practice for the past several years to include certification provisions in exclusion orders to aid CBP”).

Moreover, as Respondents pointed out, the Accused Products at issue here “must essentially be destroyed by cross-sectioning cuts to inspect the properties of any coating.” (RBr. at 68.). Accordingly, “CBP would have a difficult time assessing whether a particular [product]

would infringe” the Asserted Patents. *Certain Digital Video Receivers & Related Hardware & Software Components*, Inv. No. 337-TA-1103, FID at 314 (June 4, 2019) (“*Digital Video Receivers*”) (including carveout for redesigned software). “To assist CBP in making this assessment, the LEO should contain a provision allowing [Respondents] to certify that certain [products] are [noninfringing redesigns] and thus not subject to exclusion.” (*Id.*).

For the foregoing reasons, a LEO with a certification provision is warranted if a violation of Section 337 is found.

**2. A Carveout for Non-Infringing Replacement Products Is Warranted If a Violation of Section 337 Is Found**

The certification provision should carve out non-infringing redesigned products, including at least the Replacement Products, from any remedial order. The NOI defines the products accused of patent infringement as commensurate with products labeled with a particular trademark: “metal parts coated with Parker Hannifin’s ToughShield® Plus coating as well as bundles containing one or more parts with ToughShield® Plus coating.” (NOI at 2.). However, as Respondents noted, using Parker Hannifin’s ToughShield® Plus trademark does not determine whether a particular product infringes the Asserted Patents. (RBr. at 68.). Parker Hannifin’s ToughShield® Plus trademark may be used on products that are not infringing or relevant to the allegations in the Complaint. (*Id.*). For example, Complainant has not accused the Replacement Products of infringement, which are marked with Parker Hannifin’s ToughShield® Plus trademark. (Tr. (Kelly) at 524:19–22; Tr. at 1107:4–9.).

For these reasons, a carveout is necessary for any representative product category for which Complainant failed to establish infringement, including at least the Replacement Products. *Digital Video Receivers*, Inv. No. 337-TA-1103, FID at 314.

**3. An Adjustment Period Would Not Be Warranted**

A delay in the imposition of a remedial order may be appropriate in limited circumstances, for instance where a delay is necessary to mitigate a significant public interest concern. *See Certain Personal Data & Mobile Commc'n Devices & Related Software*, Inv. No. 337-TA-710, Comm'n. Op. at 79–83 (Dec. 29, 2011) (implementing 4-month delay where the President identified the Accused Products as one of several “vital infrastructure developments for the nation”).

Respondents failed to identify any public interest concerns or explain how an adjustment period would mitigate them. (*See* RPBr. at 133.). Moreover, as Modumetal pointed out, Respondents reported that they no longer manufacture the Accused Products, meaning that there is no “supply” of the Accused Products to disrupt. (*See* CBr. at 111 (citing RPBr. at 134 (“by the time any cease-and- order would issue, inventory of the Accused Products in the United States would be at or near zero...”)).).

Accordingly, a delay in the effective date of the remedial orders is not warranted.

**4. A Reporting Requirement Is Warranted**

Modumetal is required to provide quarterly reports establishing an ongoing domestic industry in view of its domestic industry allegations, [REDACTED]

[REDACTED]

[REDACTED] (Tr. (Creech) at 127:25–128:13 [REDACTED])

[REDACTED]

[REDACTED] 215:11–19, 215:24–

216:9, 216:23–217:2, 220:3–6 [REDACTED]

[REDACTED] Tr. (Herrington) at 697:17–699:22; *see also*

RX-0021C (Creech Dep. Tr.) at 96:2–97:21, 155:6–25 [REDACTED]

[REDACTED]; JX-0066C.0001 [REDACTED]

[REDACTED]

[REDACTED], JX-0070C.0001 [REDACTED]

[REDACTED]. *See*

*Certain Variable Speed Wind Turbines & Components Thereof*, Inv. No. 337-TA-376, Comm’n Op. at 26 (Sept. 6, 1996) (issuing a LEO with a quarterly reporting requirement to monitor complainant’s practice of the asserted patent); *Certain Semiconductor Integrated Circuits & Prods. Containing Same*, Inv. No. 337-TA-665, ID at 614–15 (Oct. 14, 2009) (recommending imposition of a quarterly reporting requirement as part of any remedy issued by the Commission).

**C. A Cease and Desist Order Is Not Warranted If the Commission Finds a Violation of Section 337**

“[T]he Commission generally issues CDOs when, with respect to the imported infringing products, respondents maintain commercially significant inventories in the United States or have significant domestic operations that could undercut the remedy provided by the exclusion order.” *Certain Blood Flow Restriction Devices with Rotatable Windlasses and Components Thereof* (“*Blood Flow Restriction Devices*”), Inv. No. 337-TA-1364, Comm’n Op. at 20 (U.S.I.T.C. Sept. 30, 2024). It is the complainant’s burden to prove that a CDO is necessary to address a violation so as not to undercut the relief provided by the exclusion order. *Id.* at 20–21.

In the event the Accused Replacement Products are found to be non-infringing, there would be no domestic inventory of the Accused Original Products left in the United States by the time a cease-and-desist order would issue, which Modumetal’s expert, Mr. Herrington, acknowledged. (Tr. (Herrington) at 712:15–713:18.). Mr. Herrington calculated the inventory retained by Parker Hannifin, as of December 31, 2024, to be approximately [REDACTED] worth of

Accused Products. (*Id.* at 644:5–646:4.). However, [REDACTED]

[REDACTED] (See, e.g., RX-0225C; JX-0041C; Tr. (Smerdel) at 762:20–763:24.). Therefore, by the time any cease-and-desist order issues, if one were considered, [REDACTED]

[REDACTED] (See Tr. (Herrington) at 712:15–713:18; RX-0225C.).

Accordingly, a CDO is not warranted.

**D. No Bond During the Presidential Review Period Is Warranted If the Commission Finds a Violation of Section 337**

The Commission frequently sets the bond based on the difference in sales prices between the patented domestic product and the infringing product. See, e.g., *Certain Microsphere Adhesives, Process for Making Same, and Prods. Containing Same, Including Self-Stick Repositionable Notes* (“*Microsphere Adhesives*”), Inv. No. 337-TA-366, USITC Pub. No. 3949, Comm’n Op. at 24 (Jan. 1996). In other instances where a direct comparison between a patentee’s product and the accused product is not possible, the Commission has set the bond at a reasonable royalty rate. See, e.g., *Certain Integrated Circuit Telecommunication Chips and Prods. Containing Same, Including Dialing Apparatus*, Inv. No. 337-TA-337, Comm. Op. at 41–43 (Aug. 3, 1993). Commission precedent allows for a 100 percent bond when it is not practical or possible to set the bond based on price differential. *Certain Voltage Regulators, Components Thereof and Prods. Containing Same*, Inv. No. 337-TA-564, Comm’n Op. at 79 (Public Version Oct. 19, 2007). The purpose of the bond is to protect the complainant from any injury caused by importation of infringing products during the Presidential Review Period (“PRP”). 19 U.S.C. § 1337(j)(3); 19 C.F.R. §§ 210.42(a)(1)(ii), 210.50(a)(3).

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Complainants bear the burden of establishing the need for a bond, including the amount of bond. *See, e.g., Certain Rubber Antidegradants, Components Thereof & Prods. Containing Same*, USITC Pub. No. 3975, Inv. No. 337-TA-533, Comm’n Op. at 40 (April 2008); *Certain Coenzyme Q10 Prods. and Methods of Making Same*, Inv. No. 337-TA-790, Initial and Recommended Determination (Sept. 27, 2012) (recommending Commission not impose a bond because complainant failed in its burden to demonstrate the appropriate bond amount); *Certain Mobile Telephones and Wireless Comm’n Devices Featuring Digital Cameras, and Components Thereof*, Inv. No. 337-TA-703, Recommended Determination (Jan. 24, 2011) (recommending no bond because complainant did not meet its burden of providing evidence on the necessity of a bond); *Certain Liquid Crystal Display Devices and Prods. Containing the Same*, Inv. No. 337-TA-631, Comm’n Op. at 27–28 (July 14, 2009) (setting zero bond because complainant “simply claimed that it was impossible to conduct a price differential analysis” and “should not benefit from a lack of any effort to identify” relevant pricing information, particularly that which is in its possession).

Here, a bond is not warranted because Modumetal failed to provide sufficient evidence of injury. [REDACTED]

[REDACTED]

[REDACTED] (Tr. (Creech) at 119:4–15.). Modumetal’s expert, Mr. Herrington, also agreed that Parker Hannifin operates on a “different level[] of commerce.” (Tr. (Herrington) at 699:18–700:4; *see also* CBr. at 114 (explaining that “Modumetal and Parker sell products at different levels of commerce” because [REDACTED] and “[c]omparatively, Parker’s business model is focused on selling the Accused Products directly to

customers”).). Thus, contrary to Modumetal’s assertion that a 100% bond is needed, there is no evidence that Modumetal will suffer injury during the Presidential review period. *See, e.g., Certain Elec. Devices, Including Wireless Commc’n Devices, Portable Music & Data Processing Devices, & Tablet Computs.*, Inv. No. 337-TA-794, Comm’n Op. at 118–19 (July 5, 2013).

Even assuming, *arguendo*, that Modumetal demonstrated the need for protection by bond, Modumetal failed to show that a price comparison is “impractical.” (CBr. at 114.). *See Certain Hydrodermabrasion Sys. and Components Thereof*, Inv. No. 337-TA-1408, Comm’n Op. at 19-20 (Mar. 23, 2026) (agreeing with and adopting RD of no bond because, *inter alia*, the complainant failed to “explain why a price comparison for this small group of directly competing products would, as it alleges, be impractical or impossible”). Modumetal’s expert, Mr. Herrington, concluded that a price comparison is “impractical” because Modumetal and Parker Hannifin are “selling at different levels of commerce” and because “Parker Hannifin[] and even Modumetal[] . . . have lots of different prices, because lots of different types of products get coated with these coatings.” (Tr. (Herrington) at 647:18–649:18.). However, as Parker Hannifin noted, this argument that a price comparison is not feasible because the Modumetal and Parker Hannifin operate on different levels of commerce undermines its assertion that an injury requiring a bond exists in the first place. (RRBr. at 78 (citing CBr. at 114).).

Moreover, as Respondents pointed out, “Herrington’s excuse that ‘Parker Hannifin didn’t produce any pricing information that [he] could use’ is misleading, given that Mr. Herrington *was* able to conclude that ‘Parker . . . [has] lots of different prices,’ and given that Parker’s pricing information is publicly available. (RRBr. at 78–79 (emphasis in original) (citing Tr. (Herrington) at 648:17–649:18; Compl. at Exs. 18–19, 21–22, 24–25 (listing the price for the 10BL-S part as \$4.88/part, the price for the 8 C5OLO-S as \$10.80/part, and the price for the 16-

12FBU-S part as \$31.74/part)).).

Because Modumetal failed to meet its burden of establishing the need for a bond, this RD recommends that a bond of 0% be set for Respondents if a violation is found. *See Certain Network Devices, Related Software and Components Thereof*, Inv. No. 337-TA-944, Comm’n Op. at 57–58 (Apr. 19, 2017) (“The Commission[] adopts the ALJ’s recommendation and sets the bond at zero percent. The burden in proving that a bond is necessary falls on [complainant].”); *Certain Rubber Antidegradants, Components Thereof, and Prods. Containing Same*, Inv. No. 337-TA-533, Comm’n Op., EDIS Doc. ID No. 259120, at 39–40 (Jul. 21, 2006) (setting zero bond where complainant failed to carry its burden to establish an amount of bond).

### **XIII. WAIVER OR WITHDRAWAL OF RESPONDENTS’ DEFENSES**

Respondents did not raise in its Pre-Hearing Brief or offer any evidence during the Hearing to support the following Affirmative Defenses identified in its Response to the Complaint: (i) “FIFTH AFFIRMATIVE DEFENSE Prosecution History Estoppel and/or Disclaimer,” (Resp. at 39–40); (ii) “SEVENTH AFFIRMATIVE DEFENSE No Unfair Act,” (Resp. at 41); (iii) “EIGHTH AFFIRMATIVE DEFENSE Requested Relief is not in the Public Interest,” (Resp. at 42); (iv) “NINTH AFFIRMATIVE DEFENSE Incorrect Inventorship,” (Resp. at 42); (v) “TENTH AFFIRMATIVE DEFENSE No Standing, (Resp. at 42); (vi) “ELEVENTH AFFIRMATIVE DEFENSE No Enforceability,” (Resp. at 42); and (vii) “TWELFTH AFFIRMATIVE DEFENSE Reservation,” (Resp. at 43).

Consequently, it is a finding of this decision that Respondents have waived, withdrawn and/or abandoned these Affirmative Defenses consistent with Ground Rules 7.2 and 10.1. *Kinik Co. v. Int’l Trade Comm’n*, 362 F.3d 1359, 1367 (Fed. Cir. 2004).

**XIV. CONCLUSIONS OF FACT OR LAW: THIS INITIAL DETERMINATION FINDS A SECTION 337 VIOLATION BASED UPON INFRINGEMENT OF U.S. PATENT NO. 11,865,287**

1. Statutory authority and standing requirements are satisfied.
2. Claims 1, 2, 3, 5, and 7 of the '419 patent have not been infringed.
3. Claims 1, 2, 3, and 5 of the '613 patent have not been infringed.
4. Modumetal's DI Fastener does not practice one or more claims of the '419 patent.
5. Modumetal's DI Fastener does not practice one or more claims of the '613 patent.
6. Respondents have not proven that any of the Asserted Claims invalid.
7. Modumetal's domestic activities with respect to their DI Products have not been found to satisfy the economic prong of the domestic industry requirement under 19 U.S.C. § 337(a)(3)(A) and (B).
8. If the Commission finds a violation, then a Limited Exclusion Order is recommended with a standard certification provision, carveout for redesigned products, and quarterly reporting requirements for Modumetal's domestic industry.
9. A Cease and Desist Order is not recommended.
10. A bond is not recommended.

The lack of discussion of any matter raised by the Parties, or any portion of the record, does not indicate that it has not been considered. Rather, any such matter(s) or portion(s) of the record has/have been determined to be irrelevant, immaterial or meritless. Arguments made on briefs, which were otherwise unsupported by record evidence or legal precedent, have not been given weight.

**XV. CONCLUSION AND ORDER**

This Initial Determination on Violation of Section 337 of the Tariff Act of 1930 is certified to the Commission. All orders and documents, filed with the Secretary, including the exhibit lists enumerating the exhibits received into evidence in this Investigation, that are part of the record, as defined in 19 C.F.R. § 210.38(a), are not certified, since they are already in the

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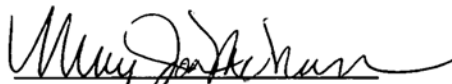
Commission's possession in accordance with Commission Rules. *See* 19 C.F.R. § 210.38(a). In accordance with 19 C.F.R. § 210.39(c), all material found to be confidential under 19 C.F.R. § 210.5 is to be given *in camera* treatment.

After the Parties have provided proposed redactions of confidential business information ("CBI") that have been evaluated and accepted, the Secretary shall serve a public version of this ID upon all parties of record. The Secretary shall serve a confidential version upon counsel who are signatories to the Protective Order (Order No. 1) issued in this Investigation.

Pursuant to 19 C.F.R. § 210.42(h), this Initial Determination shall become the determination of the Commission unless a party files a petition for review pursuant to 19 C.F.R. § 210.43(a) or the Commission, pursuant to 19 C.F.R. § 210.44, orders on its own motion a review of the Initial Determination or certain issues therein.

Within fourteen (14) days of the date of this document, each party shall submit to the Office of the Administrative Law Judges through McNamara337@usitc.gov a statement whether it seeks to have any confidential portion of this document redacted. That is the courtesy copy pursuant to Ground Rule 1.3.2. Any party seeking redactions to the public version must submit to this office through McNamara337@usitc.gov a copy of a proposed public version of this document pursuant to Ground Rule 1.10 with yellow highlighting that clearly indicates any portion asserted to contain confidential business information. If the parties dispute whether a word, phrase, paragraph or any portion thereof should be redacted, they should cite specifically to 19 C.F.R. § 201.6, and any case law that interprets the same.

**SO ORDERED.**

  
MaryJoan McNamara  
Administrative Law Judge