

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

POSCO CO., LTD.,
Petitioner,

v.

ARCELORMITTAL,
Patent Owner.

IPR2025-00370
Patent 10,961,602 B2

Before BARRY L. GROSSMAN, BRIAN D. RANGE, and
DEBRA L. DENNETT, *Administrative Patent Judges*.

RANGE, *Administrative Patent Judge*.

DECISION
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

POSCO Co., Ltd. (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1–30 of U.S. Patent No. 10,961,602 B2 (Ex. 1001, “the ’602 patent”). Paper 3 (“Pet.”). ArcelorMittal (“Patent Owner”) did not file a Preliminary Response regarding the merits of the Petition. On July 23, 2025, the panel instituted *inter partes* review of the challenged claims on all asserted grounds. Paper 11 (“Dec.”).

After institution, Patent Owner filed a Patent Owner Response (Paper 23, “PO Resp.”), Petitioner filed a Reply (Paper 26, “Pet. Reply”), and Patent Owner filed a Sur-Reply (Paper 31, “PO Sur-Reply”). An oral hearing was held on April 22, 2026, and a transcript of the hearing is included in the record (Paper 35, “Tr.”). We have jurisdiction under 35 U.S.C. § 6. This decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–30 of the ’602 patent are unpatentable.

II. BACKGROUND

A. *Real Parties in Interest*

Petitioner identifies itself, as well as VinFast Auto, LLC, VinFast Auto Ltd., VinFast USA Distribution, LLC, Vingroup USA, LLC, and VinFast Trading and Production JSC, as the real parties in interest. Pet. 89. Patent Owner identifies itself as the real party in interest. Paper 4, 1.

B. *Related Matters*

The parties identify the following matters as related to this proceeding:

Certain High-Strength Aluminum or Aluminum Alloy-Coated Steel, and Automotive Products and Automobiles Containing Same, Inv. No. 337-TA-1402 (ITC) (filed Apr. 17, 2024);

ArcelorMittal v. VinFast Auto, LLC et al, No. 2:24-cv-03128
(C.D. Cal.) (filed Apr. 16, 2024); and

POSCO Co. Ltd. v. ArcelorMittal, IPR2024-01376 (PTAB)
(filed Sep. 6, 2024).

Pet. 90; Paper 4, 1. We also note that IPR2019-01275 addressed U.S. Patent No. 9,708,683 B2 which is related to the '602 patent. Ex. 1001, code (60). Also, IPR2025-00371 is pending and addresses U.S. Patent 11,326,227 B2 which is also related to the '602 patent.

C. The '602 Patent

The '602 patent, titled “Coated Steel Strips, Coated Stamped Products and Methods,” issued March 30, 2021, with claims 1–30. Ex. 1001, codes (45), (54), 14:59–18:24. The '602 patent claims priority as a “[c]ontinuation of application No. 15/606,770, filed on May 26, 2017, which is a continuation of application No. 13/621,015, filed on Sep. 15, 2012, now Pat. No. 9,708,683, which is a division of application No. 12/447,777, filed as application No. PCT/IB2006/004019 on Oct. 30, 2006, now Pat. No. 8,307,680.” *Id.* at code (60).

The '602 patent explains that “the use of pre-coated steels in hot-stamping processes for the shaping of parts has become important, especially in the automotive industry,” with the fabrication including “[p]re-coating of a steel sheets by hot dipping; [t]rimming or cutting for obtaining blanks; [h]eating the blanks in order to obtain alloying of the steel substrate with the precoating . . . and [h]ot forming followed by rapid cooling of the part.” *Id.* at 1:37–46. The blanks having “an alloying of the pre-coating with the steel substrate, which has the effect of creating intermetallic alloys with high melting temperature . . . may be heated in a temperature range where

austenitizing of the metallic substrate takes place, allowing further hardening by quenching.” *Id.* at 1:50–55. “Heat treatments of the blanks . . . are most frequently performed in furnaces, where blanks are traveling on rollers,” but problems “are experienced with the furnace operation” because “the rollers may become fouled by metallic deposits which come from the pre-coating of the blanks” and “[i]f these deposits are excessive, maintenance of the rollers has to be performed and productivity is decreased.” *Id.* at 1:56–59, 1:65–2:2. The parts that are “obtained after heating and rapid cooling display very high mechanical resistance and may be used for structural applications, for example or automotive industry applications,” and “[t]hese parts must be frequently welded with others and high weldability is required.” *Id.* at 2:3–7.

The ’602 patent aims to provide “coated steels which may be conveniently used to prepare shaped parts by a stamping process” and “which may be used to prepare shaped parts by a stamping process which are suitable for welding,” as well as “processes for preparing such coated steels and stamped parts.” *Id.* at 2:27–33. Figure 1 of the ’602 patent, reproduced below, illustrates a “coated part, after heat treatment and stamping,” that “is particularly favorable for the further welding of the part.” *Id.* at 3:52, 3:55–56.

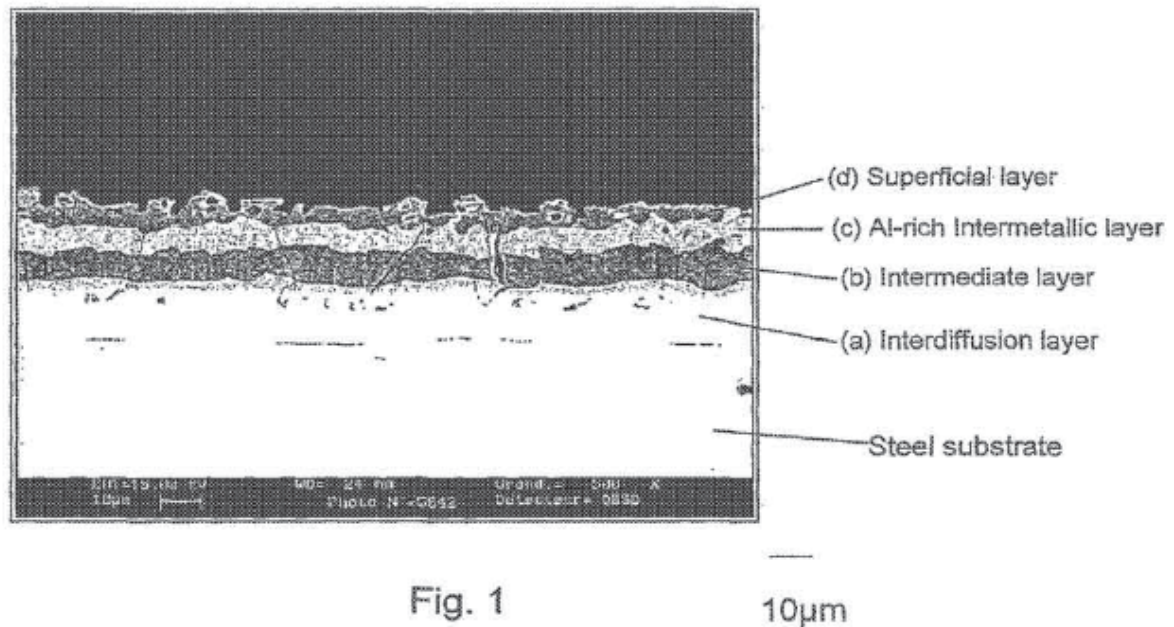


Figure 1 illustrates the “succession of layers of the coating on the steel substrate is: (a) interdiffusion layer; (b) intermediate layer; (c) intermetallic layer; and (d) superficial layer.” *Id.* at 3:52–55; *see id.* at 6:8–51.

D. Illustrative Claims

Claims 1, 21, and 24 are independent. The other challenged claims (claims 2–20, 22, 23, and 25–30) depend, directly or indirectly, from either claim 1, claim 21, or claim 24. *See* Ex. 1001, 14:59–15:16, 16:41–64, 17:3–18:2; 15:17–16:40, 16:65–17:3, 18:3–24.

Claim 1 (with identifiers of claim elements, *see, e.g.*, Pet. ix) is illustrative and is reproduced below.

[1pre] A precoated steel product comprising:

[1a] a strip of base steel having a first side and a second side; and

[1b] a coating on at least one of the first side of the strip of base steel and the second side of the strip of base steel,

[1c] wherein the coating results from interdiffusion between the base steel, and an aluminum or aluminum alloy pre-coating,

[1d] and wherein the coating includes, proceeding from the base steel outwards: (a) an interdiffusion layer having a first mean iron composition,

[1e] (b) an intermediate layer having a second mean iron composition different from the first mean iron composition,

[1f] (c) an intermetallic layer having a third mean iron composition different from the first and second mean iron compositions, the third mean iron composition being higher than the second mean iron composition; and

[1g] (d) a superficial layer having a fourth mean iron composition different from the third mean iron composition,

[1h] wherein the coating has a thickness greater than 30 micrometers.

Ex. 1001, 14:59–15:16.

E. Asserted Grounds of Unpatentability

Petitioner, supported by the declaration of Dr. Michael Miles (Ex. 1003), asserts the following grounds of unpatentability (Pet. 1):¹

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 2, 5, 6, 9–30	103(a)	Takagi, ² Cornette ³
3, 4, 7, 8	103(a)	Takagi, Cornette, Laurent ⁴

¹ The relevant sections of the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, took effect on March 16, 2013. The ’602 patent claims priority before this date. *See* Ex. 1001, code (60). For the purposes of this Decision, pre-AIA statutes apply.

² US 2004/0009366 A1, published Jan. 15, 2004, Ex. 1016 (“Takagi”).

³ *High Strength Steels for Automotive Safety Parts*, SAE Technical Paper Series, published 2001, Ex. 1014 (“Cornette”).

⁴ US 6,296,805 B1, issued Oct. 2, 2001, Ex. 1023 (“Laurent”).

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
3–6	103(a)	Takagi, Cornette, Nishibata ⁵
1, 3, 4, 11–17, 19–25, 27–30	103(a)	Takagi, GMW14400 ⁶
3, 4, 7	103(a)	Takagi, GMW14400, Laurent
3–5	103(a)	Takagi, GMW14400, Nishibata
1, 2, 5, 6, 9–30	103(a)	Suehiro, ⁷ Cornette
3, 4, 7, 8	103(a)	Suehiro, Cornette, Laurent
3–6	103(a)	Suehiro, Cornette, Nishibata
1–4, 9–30	103(a)	Suehiro, GMW14400
3, 4, 7, 8	103(a)	Suehiro, GMW14400, Laurent
3–6	103(a)	Suehiro, GMW14400, Nishibata

III. ANALYSIS

A. Legal Standard

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter 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 to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying

⁵ WO 2004/106573 A1, published Dec. 9, 2004, Ex. 1050 (“Nishibata”).

⁶ *Low Carbon, Heat-Treatable Boron Steel – Uncoated or Aluminized Pre-Coated*, GM Worldwide Engineering Standards, Material Specification Metals, published Nov. 2005, Ex. 1026 (“GMW14400”).

⁷ *Properties of Aluminum-coated Steels for Hot-forming*, Nippon Steel Technical Report No. 88, published July 2003, Ex. 1053 (“Suehiro”).

factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

In order to determine whether an invention would have been obvious at the time the application was filed, we consider the level of ordinary skill in the pertinent art at the critical time. *Graham*, 383 U.S. at 17. The resolution of this question is important because it allows us to “maintain[] objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). In assessing the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quotation omitted). Generally, it is easier to establish obviousness under a higher level of ordinary skill in the art. *Innovation Toys, LLC v. MGA Entm’t, Inc.*, 637 F.3d 1314, 1323 (Fed. Cir. 2011) (“A less sophisticated level of skill generally favors a determination of nonobviousness . . . while a higher level of skill favors the reverse.”).

Petitioner contends that a person of ordinary skill in the art (POSITA) “would have had an undergraduate degree in materials science, manufacturing engineering, mechanical engineering, or equivalent knowledge, training, or experience, with two years of experience working in

metallurgy.” Pet. 6 (citing Ex. 1003 ¶¶ 13–16). Patent Owner does not challenge Petitioner’s definition of a POSITA for this proceeding. PO Resp. 8.

Because the parties agree and because Petitioner’s proposal is reasonable and consistent with the ’602 patent specification and the prior art, we adopt Petitioner’s proposal. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art may reflect an appropriate level of skill in the art).

C. Claim Construction

In *inter partes* reviews, the Board interprets claim language using the district-court-type standard, as described in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See* 37 C.F.R. § 42.100(b). Under that standard, we generally give claim terms their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the specification, and the prosecution history. *See Phillips*, 415 F.3d at 1313–14. Although extrinsic evidence, when available, may also be useful when construing claim terms under this standard, extrinsic evidence should be considered in the context of the intrinsic evidence. *See id.* at 1317–19.

Petitioner does not propose any claim constructions. Pet. 3. Patent Owner addresses claim construction for “superficial layer” and for “intermetallic layer.” PO Resp. 8–15. We address construction of these two claim terms below.

1. *superficial layer*

All independent claims at issue, claims 1, 21, and 24, recite a “superficial layer.” Ex. 1001, 15:11, 16:60, 17:21. Patent Owner argues that, based on plain and ordinary meaning, the term “superficial layer” refers to a “surface layer” or “top layer.” PO Resp. 8–9. Petitioner does not dispute this construction. *See* Pet. Reply 21–22 (arguing that the relevant layer of the Suehiro reference is a superficial layer because it is outermost and present at the surface).

Because the parties are in agreement and because that agreement is consistent with plain language, claim language, and the ’602 specification, we construe “superficial layer” as referring to a surface layer or top layer.

2. *intermetallic layer*

All independent claims at issue, claims 1, 21, and 24, recite an “intermetallic layer.” Ex. 1001, 15:6, 16:55, 17:18. Patent Owner argues that an “intermetallic layer” is “a layer containing two or more metallic (or metalloid) elements atomically joined with defined stoichiometry in an ordered crystal structure.” PO Resp. 10. In reply, Petitioner argues that an intermetallic layer is “composed of two or more metals or of a metal and a nonmetal in an alloy.” Pet. Reply 6 (citing Ex. 1031, 24 (Petitioner taking same position in a prior IPR with Patent Owner not disputing); Ex. 1079, 3 (Webster’s dictionary providing this definition of “intermetallic”).

It is well-settled that, in interpreting an asserted claim, the court should look first to the intrinsic evidence of record, *i.e.*, the patent itself, including the claims, the specification and, if in evidence, the prosecution history.” *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). “In most situations, an analysis of the intrinsic evidence alone

will resolve any ambiguity in a disputed claim term.” *Id.* at 1583. To address the parties’ dispute, we consider claim language, the ’602 patent specification, the prosecution history, and extrinsic evidence.

a. The ’602 Claim language

Claim 1 recites, for example, “*an intermetallic layer* having a third mean iron composition different from the first and second mean iron compositions.” Ex. 1001, 15:6 (emphasis added). The intermetallic layer is one of four recited layers: an interdiffusion layer, an intermediate layer, an intermetallic layer, and a superficial layer. Thus, one purpose of the phrase “intermetallic layer” is to differentiate that layer from the other three recited layers.

Dr. Miles persuasively testifies that the claims recite “mean” composition (in the context of “mean iron composition”) and that “mean ... composition” includes layers without defined stoichiometry. Ex. 1075 ¶ 8. We agree that use of mean (averaging) to determine composition suggests layers that are not consistent throughout; in other words, the layers have “disordered structure or otherwise undefined stoichiometry.” *Id.* If the layer were consistent throughout, there would be no need for a mean average calculation.

None of the claims include language expressly stating whether or not the intermetallic layer (or any other layer) must have defined stoichiometry, an ordered structure, or must be alloyed. Ex. 1001, 14:59–18:25.

b. The ’602 specification

Neither party identifies a portion of the ’602 specification that defines “intermetallic,” and we likewise identify no such definition. Similarly, Patent Owner does not identify any portion of the Specification that

indicates whether or not an intermetallic layer must be “elements atomically joined with defined stoichiometry in an ordered crystal structure.” PO Resp. 9–12; *see also* Tr. 41–42 (PO arguing that the specification refers to atomically joined by referring to intermetallics); *id.* at 46 (PO arguing that specification teaches the benefits that derive from the intermetallic layer); Ex. 1075 ¶¶ 12–13 (Dr. Miles testifying that the specification is silent as to stoichiometry or ordered crystal structure). Rather, the words “metalloid,” “atomically,” “stoichiometry,” and “crystal structure” or similar do not appear in the specification.

Figure 2 of the ’602 patent identifies an “Al-rich Intermetallic layer” along with an “Interdiffusion layer.” Ex. 1001, Fig. 2. Figure 2 presents a two-layer structure as compared to the claimed four-layer structure. The Specification states that Figure 2 “does not correspond to the invention.” *Id.* at 3:57–61. It also states that Figure 2’s “succession of layers (interdiffusion layer and intermetallic layer) yields inferior results in resistance spot welding.” *Id.* Thus, Figure 2 indicates that inclusion of an intermetallic layer, at least by itself, is not key to the claimed invention.

We also note that the ’602 specification emphasizes that “the inventors have discovered that the control of the homogeneity of the pre-coating thickness over the entire sheet within given tolerances is an important factor for obtaining the desired degree of intermetallic alloying.” *Id.* at 2:53–59; *see also* Pet. Reply 3 (addressing this passage). Thus, the ’602 patent suggests that an alloyed layer may be considered “intermetallic.”

c. Prosecution history

Petitioner argues that the prosecution history does not describe, recite, or discuss “defined stoichiometry” or “ordered crystal structure” for

“intermetallic layer.” Pet. Reply 1 (citing Ex. 1075 ¶¶ 4–15). Aside from this, neither party argues that prosecution history impacts construction of intermetallic layer.

d. Extrinsic evidence

Both parties present extrinsic evidence in support of their claim construction positions.

Petitioner cites the following:

1. Dr. Miles testifies that “intermetallic layer” does not require a “defined stoichiometry” or an “ordered crystal structure.” Ex. 1075 ¶ 4. Dr. Miles also takes the position that layer 1f of Takagi and is an intermetallic layer within the parlance of the ’602 patent’s claims. Ex. 1003 ¶ 58.
2. Patent Owner’s prior witness, Dr. Deardo, testified that “intermetallic” could be “a series of compounds in a matrix.” Ex. 1075 ¶ 18 (citing Ex. 1077, 107:18–109:20).
3. Takagi, a U.S. Patent Publication dated January 15, 2004, teaches that growth of its Al-Si-Fe alloy layer by heat treatment “produces various Al-Si-Fe ternary intermetallic compounds.” Pet. 26 (citing Ex. 1016 ¶ 16).
4. Suehiro ’073 (a 2002 WIPO patent publication) uses the term “intermetallic compound” to refer to an entire “alloyed aluminum-system played layer.” Ex. 1075 ¶ 23 (citing Ex. 1035, 5:19–21, 14:30–32, 28:15–19).
5. “Hot Stamping of USIBOR 1500” is an article⁸ that refers to “the intermetallic alloying reaction between the AlSi-coating and the iron substrate of the blank.” *Id.* at ¶ 23 (citing Ex. 1019, 6).

⁸ This article cites other articles from 2004 (*id.* at 13) so must date 2004 or prior.

6. A generalist dictionary (Webster's Third New International Dictionary) defines "intermetallic" as "composed of two or more metals or a metal and a nonmetal in an alloy." Ex. 1079, 3; *see also* Pet. Reply 6 (citing Ex. 1079).

7. In the context of a prior IPR challenging another of Patent Owner's patents, the Board did not construe "intermetallic" but determined that "Cornette [taught or suggested] an intermetallic layer." Pet. Reply 7–8 (citing Ex. 1029, 50).

Patent Owner cites the following:

1. Dr. Raabe testifies that a person having ordinary skill in the art would understand "'intermetallic' is defined by those metals or metalloids being *atomically joined*." Ex. 2040 ¶ 118. Dr. Raabe cites references including those referenced below.

2. "Intermetallics Structures, Properties, and Statistics," is a textbook bearing a 2016 date. Ex. 2037, 4–5. Patent Owner and Dr. Raabe cite this exhibit as establishing that an intermetallic layer must be atomically joined in solid-state compounds that exist with defined stoichiometry. PO Resp. 10. This text, however, refers to "amorphous intermetallic phases" (Ex. 2037, 452), and Dr. Raabe admits that "[a]morphous means you don't have [a] crystal structure." Ex. 1075 ¶ 27 (citing Ex. 1078, 116:18–1) (first alteration in original). Also, in its glossary, this provides the following definition:

Intermetallics Intermetallic compounds are chemical compounds between metallic elements with well-defined stoichiometry ("line compounds"), while intermetallic phases are the generic term for phases consisting of two or more metallic elements, which may have a narrow or extended compositional stability range. The term "intermetallics" may be used as short for either of them.

Ex. 2037, 527.

3. Intermetallics by Gerhard Sauthoff is a textbook bearing a 1995 copyright date. Ex. 2038, 2.⁹ This text states that “[i]ntermetallics have been made use of since the beginning of metallurgy” with a table dating back to 2500 B.C. This text states that “intermetallics form particular crystal structures with ordered atom distributions where atoms are preferentially surrounded by unlike atoms.” *Id.* at 15. But it also states that “intermetallics are compounds of metals whose crystal structures are different from those of the constituent metals, and thus intermetallic phases and ordered alloys are included.” *Id.* at 12–13; *see also* Pet. Reply 6; Ex. 1075 ¶ 25 (Dr. Miles citing this portion of the text).

4. Intermetallics – Synthesis, Structure, Function by Rainer Pöttgen and Dick Johrendt is a textbook bearing a 2014 copyright date. Ex. 2039, 4. This text states that “[i]ntermetallic compounds and alloys are a highly important class of modern functional and construction materials, e.g., steels, bronzes, brasses, light-weight alloys. . . .” *Id.* at 11.

e. Analysis

The intrinsic evidence provides context, as we discuss below, but it does not expressly define “intermetallic” as used in the claims at issue.

The extrinsic evidence shows that, to a person of skill in the art, the word “intermetallics” in the relevant field can have multiple meanings. The glossary definition of “intermetallics” in the textbook first cited by Patent Owner is illustrative. The word *may* refer to “metallic elements with well-

⁹ We provide page citations to the parties’ pdfs as indicated in the lower right corner of the exhibits.

defined stoichiometry” (Ex. 2037, 527) but the word *may also* be a “generic term for phases . . . which may have a narrow or extended compositional stability range” (*id.*). The first glossary meaning is consistent with Patent Owner’s position. The second, broader, glossary meaning is consistent with Petitioner’s position. Some of the sources before us support the broad definition, and some support the narrow definition. *See* PO Sur-Reply 3–4 (arguing that Dr. Miles admitted that various treatises distinguish intermetallic compounds from alloys and solid solutions) Thus, neither Dr. Miles or Dr. Raabe is “wrong scientifically” in how they use the term “intermetallic” in this proceeding. *Id.* at 2 (noting that Dr. Miles agreed that Dr. Raabe’s construction is not wrong scientifically). As explained below, however, only one of these meanings is appropriate here.

To decide which possible meaning applies to the ’602 patent, we focus on the patent claims and specification. The claims indicate that the intermetallic layer has a “*mean* iron composition” (emphasis added). Ex. 1001, 15:6–10. This indicates, albeit weakly, that the iron composition across the layer may vary rather than having ordered stoichiometry—consistent with Petitioner’s position. The specification also indicates that “intermetallic alloying” is a possibility—again, consistent with Petitioner’s position. *Id.* at 2:50–54. Meanwhile, nothing in the ’602 specification explicitly (or implicitly) suggests that “intermetallic layer” must be limited to elements atomically joined with defined stoichiometry in an ordered crystal structure.

We also find that Dr. Miles’s testimony regarding the meaning of “intermetallic” is more credible than Dr. Raabe’s testimony. Dr. Raabe, in deposition, stated that Figure 2 of the challenged patent “does not show a

layer that meets [his] construction of intermetallic.” Ex. 1078, 129:21–24. The ’602 patent, however, states that Figure 2 includes an “Al-rich Intermetallic layer.” Ex. 1001, Fig. 2, 3:57–61 (“FIG 2. Illustrates a coating . . . which does not correspond to the invention. This succession of layers (interdiffusion layer and intermetallic layer) yields inferior results in resistance spot welding.”). Also, Dr. Raabe previously referred to a layer of Takagi as having “intermetallic phase layering and structure.” Pet. Reply 4 (citing Ex. 1076, 166; Ex. 1075, 17) (emphasis omitted). Thus, Dr. Raabe’s definition of “intermetallic” does not fully account for the ’602 patent usage of the word “intermetallic” and does not fully account for Dr. Raabe’s prior usage of the word “intermetallic.”

Patent Owner argues that Petitioner’s construction “erases the meaningful distinction” between the claimed layers. PO Resp. 11. Patent Owner further argues that Petitioner’s construction renders the word “intermetallic” superfluous because allowing the intermetallic layer to be “merely a multi-element alloy erases the meaningful distinction among these layers.” *Id.* We disagree. The word intermetallic serves to require that the layer be composed of two or more metals or a metal and a metalloid. The word intermetallic also serves as a label to differentiate each of the four claimed layers. For example, in claim 1, the word “intermetallic” is used much like the words “interdiffusion” and “intermediate” to give each of the four layers (each having differently defined mean iron compositions) different labels.

For the above reasons, we determine that Petitioner’s proposed claim construction is better supported on the record before us. Based on the record, however, we do not agree that a mixture of a metal and *any* non-metal can

form an “intermetallic layer” within the context of the ’602 patent. Although the generalist dictionary supports this definition, the other evidence refers to “intermetallic” as requiring two metals or a metal and a metalloid. Thus, we construe “intermetallic layer” as “a layer composed of two or more metals or of a metal and a metalloid in an alloy.”¹⁰

D. Objective Indicia

All of Petitioner’s invalidity challenges are based on obviousness under 35 U.S.C. § 103. Pet. 1–2. Patent Owner argues that objective indicia (sometimes referred to as secondary considerations) of commercial success, long-felt need, praise, and unexpected results weigh in favor of non-obviousness. PO Resp. 57–59.

Patent Owner argues that its USIBOR and DUCTIBOR products are now very successful and were not prior to the ’602 patent invention. Patent Owner argues long felt need, praise, and unexpected results based on better weldability, paintability, and corrosion resistance. *Id.* at 58–59.

We agree with Petitioner that Patent Owner does not establish that USIBOR or DUCTIBOR embody or are coextensive with the challenged claims. Pet. Reply 25–27. Patent Owner does not establish a nexus between these products and the patent claims, and Patent Owner does not establish that it is the patented technology rather than some other factor that led to the alleged benefits. As such, Patent Owner’s objective indicia arguments are entitled to little or no weight. We consider Patent Owner’s objective indicia

¹⁰ At oral argument, both parties indicated no objection to this modification to Petitioner’s claim construction (in the event that we favored Petitioner’s position over Patent Owner’s with regard to the dispute discussed above). Tr. 81:2–7; 83:1–85:9.

arguments holistically along with all other arguments and evidence presented and, even if these objective indicia arguments were entitled to some weight, we reach our determinations below based on the strength of the Petitioner’s invalidity evidence outweighing any value of the objective indicia evidence. *Truswall Sys. Corp. v. Hydro-Air Engineering, Inc.*, 813 F.2d 1207, 1212 (Fed. Cir. 1987) (“That evidence [of purported commercial success] is ‘secondary’ in time does not mean that it is secondary in importance.”).

E. Overview of the Asserted Art

1. Takagi (Ex. 1016)

Takagi relates to “an aluminum-coated structure member, such as a structural member used for motor vehicles, produced by applying heat treatment and forming operation to aluminum-coated steel sheet, and coated with an alloy layer of an Al–Si–Fe alloy for improvement in formability, weldability and corrosion resistance.” Ex. 1016 ¶ 1. The Al-Si-Fe “alloy layer includes a softer region having a hardness smaller than or equal to a hardness of the steel substrate layer” and “extends from the surface of the steel substrate layer toward a surface of the alloy layer, over a depth range greater than or equal to 50% of a thickness of the alloy layer.” *Id.* at Abstract.

2. Cornette (Ex. 1014)

Cornette generally relates to “high strength steels (HSLA, DP, TRIP, etc.)” and “testing and different design solutions associated with these steel grades.” Ex. 1014, Abstract. Cornette’s “high and ultra high strength steels (TRIP and Boron steels)” offer “strength and formability.” *Id.* at 3.

3. *Laurent (Ex. 1023)*

Laurent “relates to a coated, hot- and cold-rolled steel sheet comprising a very high resistance after thermal treatment.” Ex. 1023, 1:6–8. Laurent describes “produc[ing] a hot- or cold-rolled steel sheet of a desired thickness, coated, and affording extensive shaping possibilities and which, after thermal treatment performed on the finished casing, makes it possible to obtain” a desired “mechanical resistance . . . a substantial resistance to shocks, fatigue, abrasion and wear, while retaining a good resistance to corrosion as well as a good capacity for painting and gluing.” *Id.* at 1:37–44.

4. *Nishibata (Ex. 1050)*

Nishibata relates to “hot-formed members which can be produced from high-strength steel plates by using a hot-forming method and which also have stabilized strengths and toughnesses, as well a hot-forming method for producing them.” Ex. 1050, 4.

5. *GMW14400 (Ex. 1026)*

GMW14400 relates to “the requirements for low carbon, heat-treatable boron steel used in the manufacture of structural parts requiring heat treatments to achieve high strength.” Ex. 1026, 1. GMW14400 explains “austenitizing a precut blank [or pre-stamped part], hot stamping the heated blank, and rapid cooling (quenching) the stamped part in the die” or “austenitizing a precut blank, hot stamping the heated blank and rapid cooling (quenching) the stamped part in the die or via water quenching.” *Id.*

6. *Suehiro (Ex. 1053)*

Suehiro relates to “[p]roduction of parts with high strength by means of hot-forming process” with the “[a]pplication of aluminized steel with

good hardenability.” Ex. 1053, Abstract. The result is steel showing “good spot weldability due to the stable surface layer at high temperature.” *Id.*

7. *Disputed Prior Art Status of GMW14400, Suehiro, and Cornette*

Patent Owner argues that Petitioner does not adequately establish that GMW14400, Suehiro, and Cornette are prior art. We note that the earliest possible priority date for the ’602 patent is October 30, 2006. Ex. 1001, code (60). We address each of these three references in turn.

GMW14400. Petitioner provides a declaration of Shannon Schuster to support public availability of GMW14400 prior to October 30, 2006. Ex. 1027, 23. Schuster testifies that GMW14400 was listed in the database of Information Handling Services (IHS) and its successors since December 1, 2005. *Id.* Schuster testifies that the document was available “to the public” for purchase its online “Standards Store” as of (at least) December 1, 2005. *Id.* Schuster testifies that the purpose of IHS was to “provide information for aerospace engineers through microfilm databases” and launched its online store in 2000. *Id.* Shuster testifies that it served as a third-party distributor for General Motor’s engineering standards. *Id.* June Ann Munford further testifies that the Internet Archive Wayback Machine also reflects public availability of GMW14400. *Id.* at 6–8. The evidence demonstrates that the database including “HIS Subscriptions” was searchable by keyword. *Id.* at 30, 33. Also Petitioner’s witness, Dr. Miles, testifies that the purpose of a material specification like GMW14400 was for General Motors “to inform steel makers of the requirements of steel to be used in GM vehicles.” Ex. 1003 ¶ 116. Petitioner provides evidence that HIS was a well-known source of standards. Ex. 1082 ¶¶ 43, 45, 46; *see also* Pet. Reply 22–25.

Because IHS was a company that created an online database with the purpose of providing (selling) standards including General Motors standards to the public, we determine that a person of ordinary skill in the art would have known to look to this database and would have been able to find GMW14400. Patent Owner presents no evidence to the contrary. Because a preponderance of the evidence supports Petitioner, we determine Petitioner establishes GMW14400 is qualifies as prior art.

Suehiro. Petitioner provides a declaration of June Ann Munford to support public availability of GMW14400 prior to October 30, 2006. Suehiro, on its face, indicates a July 2003 date in NIPPON STEEL TECHNICAL REPORT. Ex. 1058, 2.¹¹ Munford testifies that Suehiro is available on the Nippon Steel Technical Report website. *Id.* at 4. Munford testifies that the Internet Archive Wayback Machine indicates that the Nippon Steel Corporation website hosted Suehiro as of November 19, 2004. *Id.* at 6. Munford confirmed via the Internet Archive Wayback Machine that the Nippon Steel Technical Report July 2003 issue was available as of October 2, 2003. *Id.* at 7. Munford also confirmed that Suehiro was received, indexed, and added to the National Diet Library in Japan in 2003. Ex. 1082 ¶¶ 19–24; *see also* Pet. Reply 24–25.

Patent Owner argues that its witness was unable to locate a capture date on the internet archive prior to November 3, 2005. PO Resp. 55. Patent Owner argues that Petitioner and Munford did not explain why “something purportedly existing when she submitted her declaration is no longer available.” *Id.* at 55–56. We understand Patent Owner’s argument as an

¹¹ Exhibit 1058 has two sets of page numbers. We refer to the bottommost page number.

indirect attack on Munford's credibility. Patent Owner, however, provides no evidence that Munford's declaration is factually wrong. The inability of Patent Owner's witness to find the same information at a later date does not mean that Munford did not find the information. Also, even a November 3, 2005, date would still be sufficient to constitute prior art to the '602 patent.

Patent Owner also argues that there is no evidence a person having ordinary skill in the art would have been able to locate the table of contents for the publication in question. *Id.* at 56. We disagree. Munford provides evidence that Suehiro was published in Nippon Steel Technical Report as of October 2, 2003. The nature of the Nippon Steel Technical Report (and the Suehiro document within it) along with the fact that the document was available on the Nippon Steel web site indicate that the report was a publication intended for the relevant industry. It would not make sense for Nippon Steel to generate a professional publication for the industry that people in the industry could not locate. The nature of the report and the apparent purpose of the report provides some evidence that a person of ordinary skill would have been able to find Suehiro as of October 2, 2003. Also, Munford's testimony that Suehiro was indexed and added to the National Diet Library in 2003 is unrebutted and conclusive. Patent Owner presents no contrary evidence. Because a preponderance of the evidence supports Petitioner, we determine Petitioner establishes Suehiro qualifies as prior art.

Cornette. Petitioner provides a declaration of Mel DeSart (a professional librarian) to establish that Cornette was stamped and shelved at the Engineering Library at the University of Washington as of March 13, 2001. Ex. 1015, 1–2. Munford, also a professional librarian, testifies that “in

the library context” DeSart’s reference to “shelving” is indicative of public availability and indexing. Ex. 1082 ¶¶ 51–72; *see also* Pet. Reply 25–26. Munford testifies that indexing and cataloguing is a standard library practice. Ex. 1082 ¶ 29.

Patent Owner argues that Petitioner provides no evidence that Cornette was meaningfully indexed. PO Resp. 56. The evidence before us, however, supports that Cornette was “routing for shelving” and that this means the reference was catalogued and routed for placement in the library. Munford’s declaration supports that the University of Washington Engineering Library indexes and/or catalogues references it shelves. Patent Owner presents no evidence to the contrary. Cataloguing and library availability is sufficient for publication. Because a preponderance of the evidence supports Petitioner, we determine Petitioner establishes Suehiro qualifies as prior art.

F. Unpatentability Grounds

1. Unpatentability over Takagi and Cornette (Ground 1A)

Petitioner asserts that claims 1, 2, 5, 6, and 9–30 are unpatentable under 35 U.S.C. § 103(a) as obvious over Takagi and Cornette, citing the Declaration of Dr. Miles for support. Pet. 1, 6–46 (citing Ex. 1003) (Petitioner’s Ground 1A).

a. Reason to Combine and Expectation of Success

The parties’ arguments regarding reason to combine and expectation of success center primarily on the challenged claims’ requirement that the coating (after hot stamping) be greater than 30 μm . *See, e.g.*, Pet. 11; PO Resp. 26.

Petitioner explains why a person having ordinary skill in the art would

have had reason to combine teachings of Takagi and Cornette with a reasonable expectation of success. Pet. 11–20 (citing, e.g., Ex. 1003 ¶¶ 28–42; Ex. 1016 ¶ 35; Ex. 1014, 9; Ex. 1025, 5:17–20; Ex. 1026, 7; Ex. 1034 ¶ 13). In particular, Petitioner argues that Takagi discloses a pre-coating thickness of 10–20 μm but does not explicitly disclose a post hot-stamping coating thickness corresponding to the pre-coating thickness. Pet. 11. Cornette teaches that the hot-stamping thickness causes coating expansion from 25 μm to about 40 μm , an increase of 60%. *Id.* (citations omitted). Petitioner and Dr. Miles reason that, when hot stamping Takagi’s product, the thickness would be 32 μm . *Id.* (citing Ex. 1003 ¶ 32); *see also* Pet. Reply 20–21. Thus, Patent Owner argues that Cornette evidences Takagi’s final coating thickness without requiring modification of Takagi.

Petitioner further argues that Takagi and Cornette teach that post hot-stamping thickness could be varied and optimized as a result effective variable. *Id.* at 12–13; *see also* Pet. Reply 17–18. Cornette teaches, for example, that “[t]he average [pre-coating] layer thickness showing the best compromise between corrosion protection and weldability is 25 μm ” and links this pre-coating thickness to a final thickness of “about 40 μm at the steel surface.” Ex. 1014, 9. Petitioner also argues that it would have been obvious to fill in other details of Takagi including, for example, selecting USIBOR 1500 steel, based on the teachings of Cornette. Pet. 14.

Patent Owner argues that there is no reason to combine Takagi with the teachings of Cornette. PO Resp. 26. Patent Owner makes seven related arguments. Patent Owner first argues that the Petitioner’s position is speculative and lacks basis. *Id.* at 26–27. We disagree. Cornette evidences a final coating thickness for Takagi, and the references also suggest that final

coating thickness is result effective.

Second, Patent Owner argues that there would have been no incentive to seek a motivation to seek a thicker coating post-hot stamping. *Id.* at 28–35. This argument does not undermine Petitioner’s position that Takagi, by itself, would have reached a thicker coating after stamping as evidenced by Cornette. Pet. 11–12. Petitioner takes the position, with evidence, that practice of Takagi *alone* would reach the recited thickness. No motivation to modify Takagi is required under this position.

Patent Owner’s argument also does not undermine Petitioner’s evidence that thickness is result effective. Patent Owner identifies a number of potential problems with increasing thickness (PO Resp. 28–32), but this does not undermine Takagi and Cornette teaching that different thicknesses may nonetheless be desirable.

Third, Patent Owner argues that it would have been beyond the ordinary skill of a person having ordinary skill in the art to “Mix and Match” specification criteria. *Id.* at 35–36. This argument relates to “microstructure” and appears to depend on Patent Owner’s claim construction for intermetallic layer that we reject above. The particular “intermetallic layer” microstructure Patent Owner urges is not required by the recited claims. Also, this argument again fails to address Petitioner’s argument that Takagi alone would result in the recited thickness and also fails to persuasively undermine Petitioner’s result effective variable theory.

Fourth, Patent Owner argues that the material science at issue is “complex and unpredictable.” PO Resp. 36–41. Patent Owner’s argument again appears to depend on “microstructure” of the “intermetallic layer,” and we reject Patent Owner’s claim construction. Patent Owner does not provide

evidence undermining Petitioner's position that Takagi would result in a material meeting claim 1 and does not undermine Petitioner's position that thickness is a result effective variable within a range that could be reached by following Takagi's teachings.

Also, we agree with Petitioner that the disclosure of the '602 patent undermines Patent Owner's argument here. Pet. Reply 19–20. The '602 patent does not include disclosure with any significant manufacturing details beyond that provided by the prior art. Thus, when Patent Owner's witness Dr. Raabe contends that a person of skill in the art could have achieved the claimed coatings based on the '602 patent, this serves as contradiction to his position that a person of skill in the art could not have achieved the same coatings based on prior art with similar disclosure.

Fifth, sixth, and seventh, Patent Owner argues that person having ordinary skill in the art would lack the expertise to reasonably succeed in combining the prior art, could not reach the claims without reasonable experimentation, and would not find it "obvious to try" different techniques and parameters. PO Resp. 41–44. Again, this argument appears to rely on Patent Owner's construction of "intermetallic layer." Also, it does not address Petitioner's argument based on Takagi alone as evidenced by Cornette.

In the Sur-Reply, Patent Owner emphasizes that its witness, Dr. Raabe, testified that there is no defined link between pre-coating and final thickness. PO Sur-Reply 20–21 (citing Ex. 1078, 236:6–237:19). Cornette, however, evidences a relationship. On balance, the preponderance of the evidence before supports that, after hot stamping, the Takagi product starting at 20 μm would reach a thickness greater than claim 1's recitation of 30 μm .

In sum, a preponderance of the evidence establishes that it would have been obvious to follow Takagi in order to reach a thickness within the scope of the '370 patent claims as evidenced by Cornette. In the alternative, the evidence establishes that varying the thickness would have been obvious as a result-effective variable.

b. *Claim 1*

Petitioner argues that Takagi and Cornette teach or suggest each recitation of claim 1. Pet. 6–30. Petitioner argues, for example, that the preamble of claim 1 is not limiting or, alternatively, imparts no structural distinction from Takagi. *Id.* at 20–23 (citing, e.g., Ex. 1003 ¶ 48). Petitioner further argues that Takagi and Cornette teach forming or hot stamping to arrive at their products. *Id.* at 23 (citing, e.g., Ex. 1016 ¶ 36 (Takagi referring to “form[ing]” its products shape); Ex. 1014, 9–11 (Cornette referring to “hot stamping”); Ex. 1003 ¶ 48. Petitioner argues that Takagi teaches a strip of base steel having a first and second side. Pet. 24–15 (citing, e.g., Ex. 1003 ¶ 49; Ex. 1016 ¶¶ 13, 36). Petitioner argues that Takagi teaches a coating that is a “diffusion layer” having five phases as depicted by Takagi Figure 2A and explained by Takagi Table 1 (Takagi Fig. 4). *Id.* at 24–29 (citing, e.g., Ex. 1003 ¶¶ 47–59; Ex. 1016 ¶ 20, Fig. 2A). Petitioner argues that Takagi alone or as modified by Cornette teaches a coating thickness greater than 30 μm . *Id.* at 31–33; Ex. 1014, 9; Ex. 1016 ¶ 35; Ex. 1003 ¶¶ 60–61.

Petitioner identifies specific layers in Takagi’s Table 1 as being the intermetallic layer for various Takagi coatings 1, 4, and 5. Pet. 31. Patent Owner argues that Petitioner does not establish that Takagi nor Suehiro disclose claim 1’s recited “intermetallic layer.” PO Resp. 12–15; 22–24. In

particular, Patent Owner argues that Petitioner does not establish that the alleged “intermetallic layer” includes metals or metalloids that are atomically joined with defined stoichiometry in an ordered crystal structure. *Id.* As we explain above, we do not agree that an “intermetallic layer,” in the context of the ’602 patent claims, requires such a structure. *See* Section III(C), *supra*. Thus, Patent Owner’s argument does not undermine Petitioner’s showing that Takagi teaches an intermetallic layer.

Petitioner also argues that, even if Patent Owner’s claim construction were adopted, Takagi and Suehiro each disclose an intermetallic layer. We agree. Takagi teaches that during coating formation, “mutual diffusion . . . produces various Al-Si-Fe ternary intermetallic compounds.” Ex. 1016 ¶ 16; *see also* Ex. 1075 ¶ 33. If, as a Patent Owner argues, a person having ordinary skill in the art would understand “intermetallic” to mean that metals or metalloids are atomically joined with defined stoichiometry in an ordered crystal structure, then a person having ordinary skill in the art would have had this same understanding reading Takagi.

Patent Owner argues that, for various reasons, it is possible that Takagi’s process will not inherently result in an intermetallic phase layer under Patent Owner’s construction. PO Sur-Reply 13–15. As explained above, however, Takagi expressly teaches that it produces intermetallic compounds and teaches layers of intermetallic compounds. Pet. Reply 8–9. Also, as Petitioner explains, Takagi’s process is the same, or substantially the same, process as the process set out in the ’602 patent. *Id.* at 9–11. Thus, even if Patent Owner’s claim construction position were adopted, a

preponderance of the evidence supports that Takagi and Suehiro suggest intermetallic layers.¹²

Patent Owner argues that Petitioner’s alternative theory, under Patent Owner’s claim construction, is “improper sandbagging and inadmissible.” *Id.* at 11–12. We disagree. Our reviewing court has held that a Petitioner may respond to a proposed claim construction by Patent Owner in this scenario:

[W]here a patent owner in an IPR first proposes a claim construction in a patent owner response, a petitioner must be given the opportunity in its reply to argue and present evidence of anticipation or obviousness under the new construction, at least where it relies on the same embodiments for each invalidity ground as were relied on in the petition.

Axonics, Inc. v. Medtronic, Inc., 75 F.4th 1374, 1384 (Fed. Cir. 2023).

Petitioner properly, for example, argues that Takagi teaches an intermetallic layer under both Petitioner’s proposed construction and Patent Owner’s proposed construction.

Patent Owner also argues that Takagi would not enable a person having ordinary skill in the art to carry out claim 1. PO Resp. 15–22. Petitioner argues that Takagi is enabling. Pet. Reply 9–14. A reference is not inadequate just because it leaves the skilled artist to engage in some measure of adaptation or testing. *Amgen Inc. v. Sanofi*, 598 U.S. 594, 611 (2023). As a threshold matter, we again emphasize that an “intermetallic layer” does not

¹² Because Takagi suggests intermetallic layers (even under Patent Owner’s construction) and, thus, the Takagi-Suehiro combination would comprise intermetallic layers, we need not also address the issue of whether or not Suehiro suggests intermetallic layers (under Patent Owner’s construction).

require atomically joined with defined stoichiometry in an ordered crystal structure. Thus, for Takagi to be enabling, it does not need to teach how to achieve such a structure. To the extent Patent Owner's arguments relate to microstructure requirements based on claim construction we do not adopt (*see, e.g.*, PO Sur-Reply 22) those arguments are unpersuasive.

Takagi provides process parameters that are in, or overlap, each of the '602 patent's process parameters. Pet. Reply 10 –11 (citing Exs. 1001, 1016, 1014). Other process parameters, such as dewpoint, are also missing from the '602 patent's disclosure. *Id.* at 13. Dr. Raabe agreed a person having ordinary skill could find a suitable dew point. *Id.* (citing Ex. 1078, 57:3–59:9). Patent Owner alleges that the '602 patent is enabling (PO Resp. 34), and Patent Owner's (and its witness's) argument that the Takagi patent is not enabling thus lacks credibility given the similarity of the disclosures. Pet. Reply 12. Petitioner's witness, in contrast, credibly testifies that Takagi's disclosure would have enabled a person having ordinary skill in the art to reach claim 1. Ex. 1075 ¶ 42.

Patent Owner argues that a person of skill in the art would not have the benefit of the '602 patent's "microstructural design goal" and thus would not know what to aim for. PO Sur-Reply 22. We disagree that Petitioner's position requires undue hindsight. Rather, as we explain herein, a person of skill in the art would have reached the recitations of claim 1 by following the guidance of the prior art and by attempting to create the product the prior art discloses. No knowledge of '602 patent microstructure disclosures would be necessary. Given the details Takagi provides as to how to create its product and given that those details are similar to that provided by the '602 patent,

the preponderance of the evidence establishes that Takagi is an enabling reference.

With respect to the illustrative factors enumerated in *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988), we assess based on the evidence before us (1) that a person of ordinary skill in the art would have been able to practice Takagi to reach claim 1 with no more than a reasonable amount of experimentation, (2) Takagi provides adequate direction and guidance (similar in kind and nature to the '602 patent which Patent Owner's witness agreed is adequate), (3) Takagi provides working examples, (4) Takagi is the same nature of technology as the '602 patent and the field of metallurgy is old and well established, (5) Petitioner presents a great deal of relevant art in this technology space, (6) the relevant skill in the art is adequate to practice Takagi in view of its disclosure, (7) while the evidence supports that the nature of the invention creates some predictability in outcome, Takagi provides sufficient guidance to address that predictability, and (8) the claims at issue are quite broad allowing great variance in the nature of the recited four layers.

Based on the above, we determine that Petitioner has established by a preponderance of the evidence that claim 1 would have been obvious over Takagi and Cornette.

c. Remaining Claims 2, 5, 6, and 9–30

Claims 21 and 24 are independent claims. Claims 2, 5, 6, and 9–20 depend from claim 1. Ex. 1001, 15:17–21, 15:51–55, 15:62–16:40. Claims 22 and 23 depend from claim 21. *Id.* at 16:65–17:3. Claims 25–30 depend from claim 24. *Id.* at 18:3–24.

Petitioner has shown that that each element of claims 2, 5, 6, and 9–30 is taught or suggested by Takagi and Cornette. Pet. 33–46. Petitioner shows reason to combine the references’ teachings with rational underpinning and reasonable expectation of success. *Id.*

Claim 10 recites that the interdiffusion layer is less than 10 μm . Ex. 1001, 15:65–67. Petitioner argues that Cornette’s layer (a) has a thickness of 10.7 μm and that GMW14400 teaches that thickness measurements should be made using instruments with plus or minus 1.0 μm accuracy. Pet. 37–38 (citations omitted). Petitioner thus argues that a person having ordinary skill in the art would have understood that Cornette’s 10.7 μm could be as thin as 9.7 μm and be within expected variation. Petitioner also argues that thickness is a result effective variable that could be reached via optimization and reasonable experimentation. *Id.* at 38–39 (citations omitted).

Patent Owner argues that Petitioner’s argument is speculative and that Petitioner does not explain why a person having ordinary skill would have been inclined to experiment to adjust the thickness of the interdiffusion layer. PO Resp. 50–51. Patent Owner’s argument does not undermine Petitioner’s position. In particular, Patent Owner does not address or rebut Petitioner’s evidence that a person having ordinary skill in the art would have known that a 10 μm interdiffusion layer was within the variance expected by Cornette’s express teachings. We thus determine Petitioner demonstrates obviousness of claim 10 by a preponderance of the evidence.

Claim 12 requires that the intermediate layer comprise 39 to 47% iron, 53 to 61% aluminum, and 0 to 2% silicon by total weight. Ex. 1001, 16:5–8. Petitioner argues, for example, that Inter 2 layer of the Takagi/Takagi-Cornette 1 and 4 coatings have compositions near but not within the recited

ranges. Pet. 40 (citing, for example, Ex. 1003 ¶ 77); *see also* Ex. 1016, Fig. 4 (Table 1). Petitioner argues that Takagi teaches that diffusion quantity of iron can be varied, that iron relates to hardness, and aluminum provides corrosion resistance. *Id.* at 41 (citing Ex. 1016 ¶¶ 20–21).

Patent Owner argues that there is no support that a person having skill in the art would have reason to experiment to adjust Takagi to reach the claimed ranges. PO Resp. 51. We disagree. Takagi expressly discusses the balance between inclusion of iron (for hardness) and (aluminum) for resistance and drawbacks and benefits of more or less iron diffusion. Ex. 1016 ¶¶ 20–24. Petitioner adequately demonstrates that, at least very near Takagi’s examples, Takagi suggests adjustment of iron and aluminum as a result effective variable. We thus determine Petitioner demonstrates obviousness of claim 12 by a preponderance of the evidence.

Claim 19 requires that the first mean iron composition is 90 percent, the second mean iron composition is 43 percent, the third mean iron composition is 63 percent, and the fourth mean iron composition is 45 percent. Ex. 1001, 16:33–37. Petitioner argues that Takagi’s number 1, 4, and 5 embodiments have similar values. We have placed the values at issue in the table below for reference.

	First Fe	Second Fe	Third Fe	Fourth Fe
Claim 19	90	43	63	45
Takagi 1	89.6	50.1	62.0	44.5
Takagi 4	90.7	46.8	63.1	49.8
Takagi 5	94.3	42.7	51.4	38.4

Ex. 1001, 16:33–37; Ex. 1016, Fig. 4 (Table 1).

Patent Owner again argues that there is no support that a person having ordinary skill in the art would experiment to reach claim 19's percentages. We again disagree. Takagi's express examples are near claim 19's recitations and suggest a range of possibilities that encompass claim 19's recitations. Moreover, as we explain above, Takagi explains the advantages and disadvantages of more or less iron diffusion thus making iron diffusion a result effective variable. We determine Petitioner demonstrates obviousness of claim 19 by a preponderance of the evidence.

Patent Owner does not address these claims except as we discuss above. *See* Section III(F)(1)(b), *supra*. Thus, we determine that Petitioner has established by a preponderance of the evidence that claims 2, 5, 6, 9–20, 22, 23, and 25–30 would have been obvious over Takagi and Cornette.

2. *Unpatentability over Takagi, Cornette, and Laurent (Ground 2)*

Petitioner asserts that claims 3, 4, 7, and 8 are unpatentable under 35 U.S.C. § 103(a) as obvious over Takagi, Cornette, and Laurent. Pet. 1, 46–48 (citing Ex. 1003) (Petitioner's Ground 1B).

Petitioner accounts for the limitations recited in claims 3, 4, 7, and 8. Pet. 46–48. Petitioner has shown that each element of claims 3, 4, 7, and 8 is taught or suggested by the teachings of Takagi, Cornette, and Laurent, and shows reason to combine the references' teachings with rational underpinning and reasonable expectation of success. Patent Owner does not address these claims except as we discuss above. *See* Section III(F)(1)(b), *supra*. Thus, we determine that Petitioner has sufficiently established by a preponderance of the evidence that claims 3, 4, 7, and 8 would have been obvious over Takagi, Cornette, and Laurent.

3. *Unpatentability over Takagi, Cornette, and Nishibata (Ground 3)*

Petitioner asserts that claims 3–6 are unpatentable under 35 U.S.C. § 103(a) as obvious over Takagi, Cornette, and Nishibata. Pet. 1, 48–51 (citing Ex. 1003) (Petitioner’s Ground 1C).

Petitioner accounts for the limitations recited in claims 3–6. Pet. 48–51. Petitioner shows that each element of claims 3–6 is taught or suggested by the combined teachings of Takagi, Cornette, and Nishibata, and shows reason to combine the references’ teachings with rational underpinning and reasonable expectation of success. Patent Owner does not address these claims except as we discuss above. *See* Section III(F)(1)(b), *supra*. Thus, we determine that Petitioner has established by a preponderance of the evidence that claims 3–6 would have been obvious in view of Takagi, Cornette, and Nishibata.

4. *Unpatentability over Takagi and GMW14400 (Ground 4)*

Petitioner asserts that claims 1, 3, 4, 11–17, 19–25, and 27–30 are unpatentable under 35 U.S.C. § 103(a) as obvious over Takagi and GMW14400. Pet. 1, 51–54 (citing Ex. 1003) (Petitioner’s Ground 1D).

Petitioner accounts for the limitations recited in claims 1, 3, 4, 11–17, 19–25, and 27–30. Pet. 51–54. Petitioner shows that each element of claims 1, 3, 4, 11–17, 19–25, and 27–30 is taught or suggested by the combined teachings of Takagi and GMW14400, and shows reason to combine the references’ teachings with rational underpinning and reasonable expectation of success.

In particular, with respect to reason to combine, Petitioner argues that GMW14400 is a material specification published by General Motors to

inform steel makers of its requirements. Pet. 51–52. In particular, it requires a coating thickness following hot stamping of more than 35 micrometers. *Id.* (citing Ex. 1026, 7). Petitioner also refers back to its prior discussion of why a person having ordinary skill in the art would have reason and expectation of success in reaching a coating thickness greater than 30 μm .

Patent Owner argues that a person having ordinary skill in the art would not have had motivation to increase thickness based on GMW14400. PO Resp. 26–52 (with particular arguments regarding GMW at 32–35). For the reasons we explain above when discussing Takagi and GMW14400, Patent Owner’s arguments do not undermine Petitioner’s position. The preponderance of the evidence establishes that GMW14400 provides motivation to reach a post-stamping thickness greater than 30 μm (so that product could be sold to GM), and Takagi would have reached such a thickness post-stamping even without modifying the Takagi process. *See* Pet. Reply 15–17 (explaining why GMW14400 provides a strong motivation); *see also Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (advantages and disadvantages do not obviate motivation to combine). Also, GMW14400 further enhances Petitioner’s result-effective variable position; a person having ordinary skill in the art would have been motivated to modify thickness to reach customers varying requirements.

Patent Owner emphasizes that, in a prior proceeding, Petitioner’s witness Dr. Miles testified that a person of ordinary skill in the art would have been motivated to decrease coating thickness rather than increase it. PO Resp. 28–29; PO Sur Reply 17. We see no contradiction. Petitioner takes the position that a person of skill in the art would have known to adjust thickness (i.e., make it thicker or thinner) depending on product needs.

While, in some scenarios, a person of ordinary skill in the art might desire thinner material to reduce weight and increase fuel economy (Ex. 2029 ¶ 19), there are other scenarios where a person of ordinary skill in the art would want to make a product that meets a customer's (General Motors) requirements.

Except as discussed above, Patent Owner does not separately address this ground. *See* Section III(F)(1)(b), *supra*. Thus, we determine that Petitioner has established by a preponderance of the evidence that claims 1, 3, 4, 11–17, 19–25, and 27–30 would have been obvious in view of Takagi and GMW14400.

5. *Unpatentability over Takagi, GMW14400, and Laurent (Ground 5)*

Petitioner asserts that claims 3, 4, and 7 are unpatentable under 35 U.S.C. § 103(a) as obvious over Takagi, GMW14400, and Laurent. Pet. 1, 54–55 (citing Ex. 1003) (Petitioner's Ground 1E).

Petitioner accounts for the limitations recited in claims 3, 4, and 7. Pet. 54–55. Petitioner shows for purposes of this Decision that each element of claims 3, 4, and 7 is taught or suggested by the combined teachings of Takagi, GMW14400, and Laurent, and shows reason to combine the references' teachings with rational underpinning and reasonable expectation of success. Patent Owner does not address these claims except as we discuss above. *See* Section III(F)(1)(b), *supra*. Thus, we determine that Petitioner has established by a preponderance of the evidence that claims 3, 4, and 7 would have been obvious in view of Takagi, GMW14400, and Laurent.

6. *Unpatentability over Takagi, GMW14400, and Nishibata (Ground 6)*

Petitioner asserts that claims 3–5 are unpatentable under 35 U.S.C. § 103(a) as obvious over Takagi, GMW14400, and Nishibata. Pet. 1, 55 (citing Ex. 1003) (Petitioner’s Ground 1F).

Petitioner accounts for the limitations recited in claims 3–5. Pet. 55. Petitioner shows for purposes of this Decision that each element of claims 3–5 is taught or suggested by the combined teachings of Takagi, GMW14400, and Nishibata, and shows reason to combine the references’ teachings with rational underpinning and reasonable expectation of success. Patent Owner does not address these claims except as we discuss above. *See* Section III(F)(1)(b), *supra*. Thus, we determine that Petitioner has established by a preponderance of the evidence that claims 3–5 would have been obvious in view of Takagi, GMW14400, and Nishibata.

7. *Unpatentability over Suehiro and Cornette (Ground 7)*

Petitioner asserts that claims 1, 2, 5, 6, and 9–30 are unpatentable under 35 U.S.C. § 103(a) as obvious over Suehiro and Cornette, citing the Declaration of Dr. Miles for support. Pet. 1, 55–84 (citing Ex. 1003) (Petitioner’s Ground 2A).

a. *Reason to Combine and Expectation of Success*

As with Petitioner’s first ground, the parties’ arguments regarding reason to combine and expectation of success center primarily on the challenged claims’ requirement that the coating (after hot stamping) be greater than 30 μm . *See, e.g.*, Pet. 59; PO Resp. 26.

Petitioner argues that a person of ordinary skill in the art would have been motivated to increase Suehiro’s coating thickness to achieve the

“typical” thickness of about “40 μm ” that Cornette describes as “the best compromise between corrosion protection and weldability.” Pet. 59 (citing Ex. 1014, 9; Ex. 1003 ¶ 135). Petitioner also argues that the prior art establishes that coating thickness is a result effective variable, and this would have further motivated a thicker coating. *Id.* at 59–60.

Petitioner also argues that Suehiro and Cornette are consistent with each other using the same precoated steel and similar heating temperatures and times. *Id.* at 60. Petitioner thus argues that a person having ordinary skill in the art would have had a reasonable expectation of success because Suehiro could reach a thicker coating with only a minor modification. *Id.*

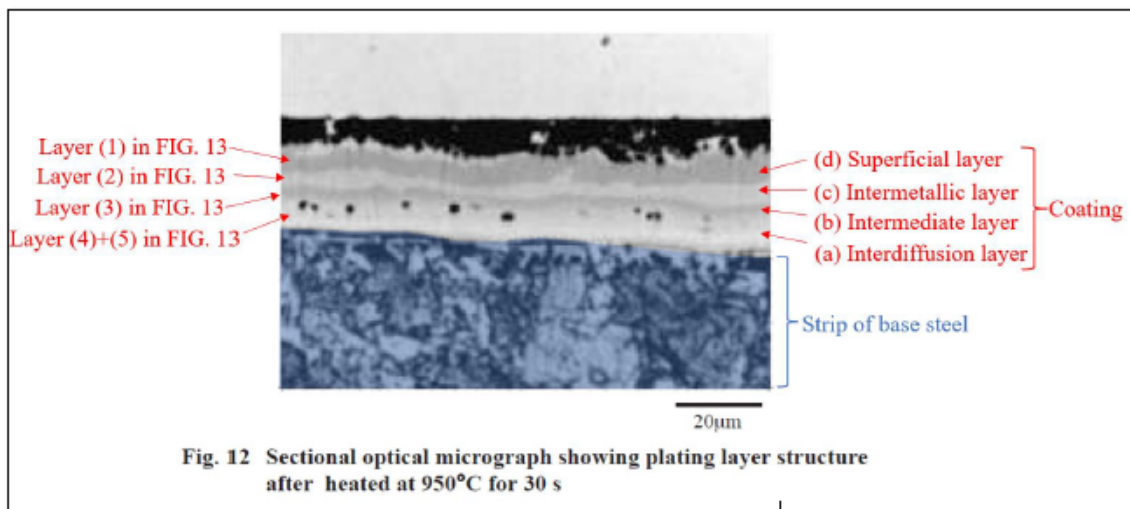
Patent Owner’s arguments are the same as those presented against the Takagi grounds. PO Resp. 26–52. As we explain above, these arguments do not persuasively undermine Petitioner’s showing that there would have been reason to combine the teachings of Suehiro and Cornette with reasonable expectation of success. Again, Patent Owner’s arguments are largely directed at “microstructure” which, because we do not agree with Patent Owner’s claim construction, appear to not be commensurate with claim scope. Also, Patent Owner does not provide persuasive evidence or argument that undermines Petitioner’s showing regarding the similarity of the Suehiro and Cornette processes.

b. *Claim 1*

Petitioner argues that Suehiro and Cornette teach or suggest each recitation of claim 1. Pet. 62–67. Petitioner argues, for example, that the preamble of claim 1 is not limiting, and also argues that Suehiro teaches hot stamped steel sheet product. *Id.* at 62 (citing, e.g., Ex. 1003 ¶ 142). Petitioner argues that Suehiro’s hot stamped steel sheets have two sides as

evidenced by Suehiro Figure 1. *Id.* at 63. Petitioner argues that Suehiro’s product has a “layered alloy phase” after heat treatment resulting in interdiffusion and a coating on both sides. *Id.* Suehiro teaches, for example that during heating the aluminum diffuses. Ex. 1055 ¶¶ 14–16. Petitioner argues, as explained above, that it would have been obvious to modify Suehiro based on Cornette to reach a thickness greater than 30 μm . Pet. 67.

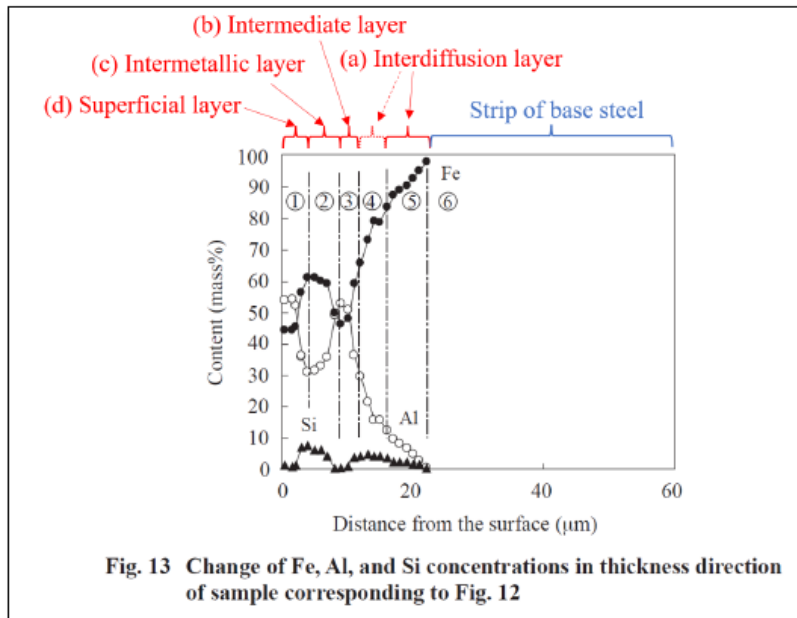
Petitioner annotates Figures 12 and 13 of Suehiro to illustrate how, according to Petitioner, Suehiro’s product has four layers corresponding to the ’602 patent’s claimed “interdiffusion layer,” “intermediate layer,” “intermetallic layer,” and “superficial layer.” *Id.* at 64–66. Because Suehiro’s figures are a focus of the parties’ dispute, we reproduce these annotated Figures herein. We reproduce Petitioner’s annotation of Suehiro Figure 12 below.



Suehiro FIG. 12

Pet. 65. Suehiro Figure 12 is a sectional optical photograph showing an alloy structure after retaining an aluminized steel sheet at 950°C for half a minute. Ex. 1053, 19. Petitioner labels the strip of base steel in blue and labels layers of the steel’s coating.

We reproduce Petitioner's annotation of Suehiro Figure 13 below.

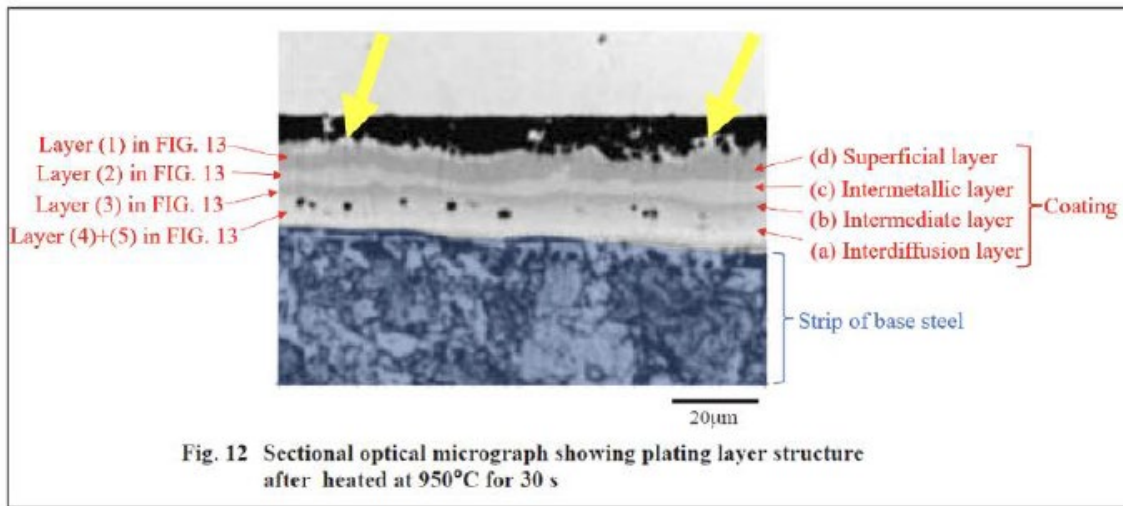


Suehiro FIG. 13

Pet. 66. Suehiro Figure 13 shows the concentration of iron, aluminum, and silicon in the plating layer measured in the thickness direction by SEM-EDS (i.e., Scanning Electron Microscopy (SEM) and Energy-Dispersive X-ray Spectroscopy (EDS)). Ex. 1053, 19. Petitioner annotates the figure to show the strip of base steel and four layers corresponding to the '602 patent claims.

Patent Owner argues that Petitioner does not establish that Suehiro includes the claimed superficial layer. As a threshold matter, we note that (as we discuss above when addressing claim construction) a “superficial layer” is a surface layer or top layer. *See* Section III(C), *supra*.

Patent Owner further annotates Petitioner's annotated Suehiro Figure 12. We reproduce that further annotated figure below.



PO Resp. 24–25. The Figure is above is the same as we previously reproduced except that Patent Owner’s further annotation adds yellow lines pointing to a thin ragged white area above the grey area that Petitioner labels in red in two ways: as “Layer (1) in FIG. 13” and as “(d) Superficial layer.” *Id.*

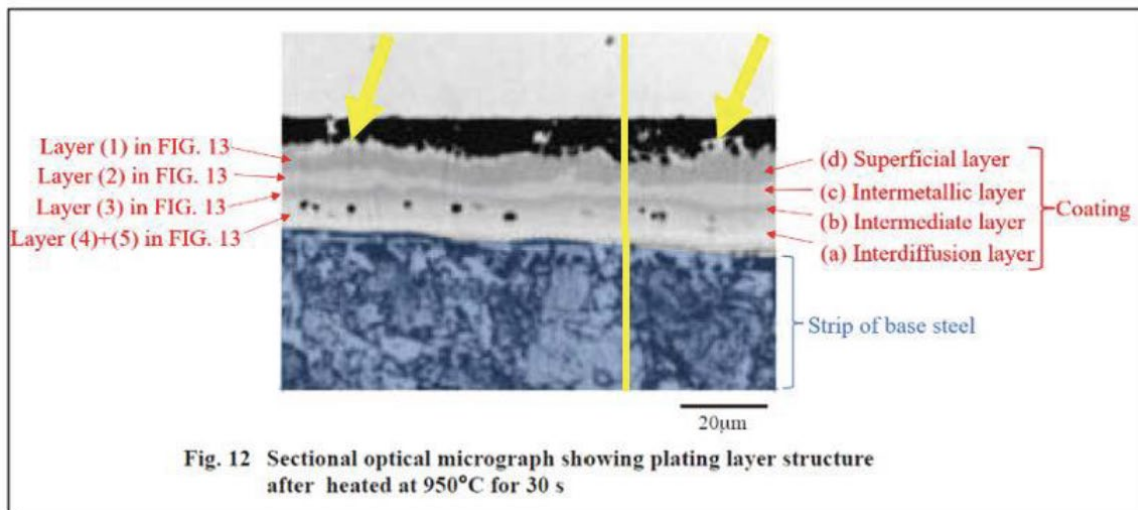
Patent Owner argues that, because the thin white layer is above the grey layer that Petitioner labels as a “superficial layer,” the alleged “superficial layer cannot be a superficial layer because it is not a surface or top layer.” PO Sur-Reply 24–26.¹³ Patent Owner argues that Petitioner’s witness, Dr. Miles, admitted that this lighter material is an additional layer. *Id.* at 25–26 (citing Ex. 2021, 206:12–25).

Petitioner argues that Patent Owner’s focus on Figure 12 is mistaken. Petitioner emphasizes that, in Figure 13, the Petition clearly maps “the

¹³ We note that the uppermost black area above the tips of the yellow arrows in Patent Owner’s annotated Figure 12 is not relevant to our analysis. Petitioner’s counsel suggested that this black area may be a coating for imaging purposes. Tr. 28:2–21. Patent Owner has not made any arguments concerning this black area.

superficial layer to the outermost layer (1) in Suehiro's coating." Pet. Reply 21.

Patent Owner responds by arguing that Figure 12 is a line-scan that could have been taken where the "white" extra layer was interrupted or thin. PO Sur-Reply 15–16. We reproduce that Patent Owner's further annotated version of Suehiro Figure 12 below.



The annotated version of Figure 12 above adds a vertical yellow line to indicate a "line" where the white layer may be "interrupted/thin." *Id.*

We summarize the evidence most relevant to Patent Owner's argument and Petitioner's response as follows:

1. Suehiro Figure 12 has a thin white or light grey jagged area above the grey area that Petitioner labeled a superficial layer.
2. Dr. Raabe testifies that this thin white or light grey jagged area is another layer:

[T]here is a layer above what the Petitioner identifies as the superficial layer. In Figure 12 of Suehiro, the section Dr. Miles points to as the superficial layer is not at the surface. There is another layer, indicated by a different lighter shading, above the layer in Suehiro that

Dr. Miles identifies, which he expressly testified and agrees constitutes an additional layer.

Ex. 2040 ¶ 177; *see also id.* ¶¶ 167–179.

3. Dr. Miles agreed that this white area constitutes a layer that Petitioner did not label. Ex. 2021, 206:12–25.

4. Suehiro indicates that its plating layer “consisted of five sublayers” and provides aluminum concentrations for each of those five sublayers. Ex. 1053, 19–20.

5. Suehiro Figure 13 is a line scan measuring concentration in the thickness direction. *Id.* at 19.

6. Suehiro Figure 13 indicates that its layer 1 extends to a distance 0 μm from the surface. *Id.* In other words, Suehiro Figure 13 indicates that layer 1 extends to the surface.

This evidence presents a close question for this panel. We agree with Patent Owner that *if* Petitioner relied only on its annotation of Figure 12 for its invalidity ground, Petitioner would lack that the labeled superficial layer is a surface layer.

Petitioner, however, also relies on Figure 13. Petitioner’s annotation of Figure 13 indicates that Petitioner identifies a layer that extends all the way to the surface as being the superficial layer. Figure 13 indicates that this layer does extend all the way to the surface. Also, Suehiro indicates that its coating has five layers (e.g., “sublayers” in Suehiro’s parlance). Ex. 1053, 19–20. Suehiro’s Figure 13 accounts for all five of those layers. Suehiro’s text along with Figure 13 indicate that, at least where this line scan was taken, Suehiro only has five layers. Petitioner identifies a layer that, at Figure 13, extends to the surface. With respect to Figure 13, that layer is a

surface or superficial layer. This is sufficient, based on a preponderance of the evidence, to show that Petitioner adequately identified how Suehiro makes obvious inclusion of a superficial layer.

Patent Owner also argues that Petitioner does not establish that Suehiro has an intermetallic layer “for similar reasons as to Takagi.” PO Resp. 22–24. As we explain above, we do not agree that an “intermetallic layer,” in the context of the ’602 patent claims, requires such metals or metalloids atomically joined with defined stoichiometry in an ordered crystal structure. *See* Section III(C), *supra*. Also, Suehiro discloses a similar process that would result in an intermetallic layer even under Patent Owner’s construction. Pet. Reply 9, 11. Suehiro’s process is also similar to that of Takagi which describes its layers as “intermetallic.” *Id.* at 8–9 (citations omitted). Thus, Patent Owner’s argument does not undermine Petitioner’s showing that Takagi teaches an intermetallic layer.

Based on the above, we determine that Petitioner has established by a preponderance of the evidence that claim 1 would have been obvious over Suehiro and Cornette.

c. Remaining Claims 2, 5, 6, and 9–30

Claims 21 and 24 are independent claims. Claims 2, 5, 6, and 9–20 depend from claim 1. Ex. 1001, 15:17–21, 15:51–55, 15:62–16:40. Claims 22 and 23 depend from claim 21. *Id.* at 16:65–17:3. Claims 25–30 depend from claim 24. *Id.* at 18:3–24.

Petitioner accounts for the limitations recited in claims 2, 5, 6, and 9–30. Petitioner shows that each element of claims 2, 2, 5, 6, and 9–30 is taught or suggested by Suehiro and Cornette and shows reason to combine

the references' teachings with rational underpinning and reasonable expectation of success.

Patent Owner raises the same arguments as to claims 10, 12, and 19 that Patent Owner raised with respect to these claims for Petitioner's first ground.

As to claim 10, Petitioner argues that Suehiro's layer (5) thickness after scaling based on Cornette would be 9 μm , and this satisfies claim 10. Pet. 71. Patent Owner does not present persuasive argument or evidence disputing this point. Petitioner establishes obviousness of claim 10 by a preponderance of the evidence.

As to claim 12, Petitioner argues that Suehiro's third layer has similar compositions. Pet. 75. We compare claim 12 to Suehiro in the Table below.

	Fe %	Al %	Si %
Claim 12	39–47%	53–61%	0–2%
Suehiro Fig. 13, position 1	46.3%	52.7%	0.1%
Suehiro Fig. 13, position 2	48%	50.8%	0.6%
Suehiro Fig. 13, average of measured points	51.1%	46.5%	1.3%

Ex. 1001, 16:5–8; Ex. 1053, 19, Fig. 13. We determine Petitioner's measurements at specific points (position 1 and position 2) are not particularly relevant because claim 12 relates to composition of the entire intermediate layer. The average of measured points is relevant, but whose iron slightly above claim 12's range and aluminum 4.3% below the claimed range.

We nonetheless determine that Petitioner establishes obviousness by a preponderance of the evidence. Petitioner establishes that art provides extensive recognition of elemental composition as result-effective variables.

Pet. Reply 27–28. Patent Owner does not persuasively rebut this evidence. Petitioner establishes obviousness of claim 12 by a preponderance of the evidence.

As to claim 19, Petitioner argues that calculated average values of the first through fourth mean iron compositions are 91.9% / 51.1% / 57.4%, and 50.2%. Pet. 81. This compares to claim 19’s recited 90%, 43%, 63%, and 45%. Ex. 1001, 16:33–37. Although the composition is somewhat different, Petitioner establishes that art provides extensive recognition of elemental composition (including iron composition) as result-effective variables. Pet. Reply 27–28. Patent Owner does not persuasively rebut this evidence. Petitioner thus establishes obviousness of claim 12 by a preponderance of the evidence.

Patent Owner does not address these claims except as we discuss above. Thus, Petitioner has established by a preponderance of the evidence that claims 2, 5, 6, and 9–30 would have been obvious over Suehiro and Cornette.

8. *Unpatentability over Suehiro, Cornette, and Laurent (Ground 8)*

Petitioner asserts that claims 3, 4, 7, and 8 are unpatentable under 35 U.S.C. § 103(a) as obvious over Suehiro, Cornette, and Laurent. Pet. 1, 81–85 (citing Ex. 1003) (Petitioner’s Ground 2B). Petitioner shows that each element of claims 3, 4, 7, and 8 is taught or suggested by the combined teachings of Suehiro, Cornette, and Laurent, and Petitioner establishes reason to combine the references’ teachings with rational underpinning and reasonable expectation of success. Patent Owner does not address these claims except as we discuss above. *See* Section III(F)(7)(b), *supra*. Thus, we

determine that Petitioner has established by a preponderance of the evidence that claims 4, 7, and 8 would have been obvious in view of Suehiro, Cornette, and Laurent.

9. *Unpatentability over Suehiro, Cornette, and Nishibata (Ground 9)*

Petitioner asserts that claims 3–6 are unpatentable under 35 U.S.C. § 103(a) as obvious over Suehiro, Cornette, and Nishibata. Pet. 1, 85–86 (citing Ex. 1003) (Petitioner’s Ground 2C). Petitioner shows that each element of claims 3–6 is taught or suggested by the combined teachings of Suehiro, Cornette, and Nishibata, and Petitioner establishes reason to combine the references’ teachings with rational underpinning and reasonable expectation of success. Patent Owner does not address these claims except as we discuss above. *See* Section III(F)(7)(b), *supra*. Thus, we determine that Petitioner has established by a preponderance of the evidence that claims 3–6 would have been obvious in view of Suehiro, Cornette, and Nishibata.

10. *Unpatentability over Suehiro and GMW14400 (Ground 10)*

Petitioner asserts that claims 1–4 and 9–30 are unpatentable under 35 U.S.C. § 103(a) as obvious over Suehiro and GMW14400. Pet. 1, 86–87 (citing Ex. 1003) (Petitioner’s Ground 2D). Petitioner shows that each element of claims 1–4 and 9–30 are taught or suggested by the combined teachings of Suehiro and GMW14400. Petitioner establishes reason to combine the references’ teachings with rational underpinning and reasonable expectation of success. Patent Owner does not address these claims except as we discuss above. *See* Section III(F)(7)(b), *supra*. A preponderance of the evidence establishes reason to combine Suehiro and GMW14400 with

reasonable expectation based on a person of ordinary skill in the art having reason to achieve the GM's requirements and based on a result effective variable rationale. *See* Section III(F)(4) *supra*. Thus, we determine that Petitioner has established by a preponderance of the evidence that claims 1–4 and 9–30 would have been obvious in view of Suehiro and GMW14400.

11. Unpatentability over Suehiro, GMW14400, and Laurent (Ground 11)

Petitioner asserts that claims 3, 4, 7, and 8 are unpatentable under 35 U.S.C. § 103(a) as obvious over Suehiro, GMW14400, and Laurent. Pet. 2, 87–88 (citing Ex. 1003) (Petitioner's Ground 2E). Petitioner shows that each element of claims 3, 4, 7, and 8 are taught or suggested by the combined teachings of Suehiro, GMW14400, and Laurent. Petitioner establishes reason to combine the references' teachings with rational underpinning and reasonable expectation of success. Patent Owner does not address these claims except as we discuss above. *See* Section III(F)(7)(b), *supra*. Thus, we determine that Petitioner has established by a preponderance of the evidence that claims 3, 4, 7, and 8 would have been obvious in view of Suehiro, GMW14400, and Laurent.

12. Unpatentability over Suehiro, GMW14400, and Nishibata (Ground 12)

Petitioner asserts that claims 3–6 are unpatentable under 35 U.S.C. § 103(a) as obvious over Suehiro, GMW14400, and Nishibata. Pet. 2, 87–88 (citing Ex. 1003) (Petitioner's Ground 2F). Petitioner shows that each element of claims 3–6 are taught or suggested by the combined teachings of Suehiro, GMW14400, and Nishibata. Petitioner establishes reason to combine the references' teachings with rational underpinning and reasonable expectation of success. Patent Owner does not address these claims except

as we discuss above. *See* Section III(F)(7)(b), *supra*. Thus, we determine that Petitioner has established by a preponderance of the evidence that claims 3, 3–6 would have been obvious in view of Suehiro, GMW14400, and Nishibata.

IV. CONCLUSION

For the reasons above, we determine that Petitioner has proven, by a preponderance of the evidence, that claims 1–30 of the '602 patent are unpatentable as summarized in the following table:

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1, 2, 5, 6, 9–30	103(a)	Takagi , Cornette	1, 2, 5, 6, 9–30	
3, 4, 7, 8	103(a)	Takagi, Cornette, Laurent	3, 4, 7, 8	
3–6	103(a)	Takagi, Cornette, Nishibata	3–6	
1, 3, 4, 11–17, 19–25, 27–30	103(a)	Takagi, GMW14400	1, 3, 4, 11–17, 19–25, 27–30	
3, 4, 7	103(a)	Takagi, GMW14400, Laurent	3, 4, 7	
3–5	103(a)	Takagi, GMW14400, Nishibata	3–5	
1, 2, 5, 6, 9–30	103(a)	Suehiro, Cornette	1, 2, 5, 6, 9–30	
3, 4, 7, 8	103(a)	Suehiro, Cornette, Laurent	3, 4, 7, 8	

3–6	103(a)	Suehiro, Cornette, Nishibata	3–6	
1–4, 9–30	103(a)	Suehiro, GMW14400	1–4, 9–30	
3, 4, 7, 8	103(a)	Suehiro, GMW14400, Laurent	3, 4, 7, 8	
3–6	103(a)	Suehiro, GMW14400, Nishibata	3–6	
Overall Outcome			1–30	

V. ORDER

For the foregoing reasons, it is

ORDERED that Petitioner has demonstrated by a preponderance of the evidence that claims 1–30 of the '602 patent are unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 10,961,602 B2

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