

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SOLUS ADVANCED MATERIALS CO., LTD.,
Petitioner

v.

SK NEXILIS CO., LTD.,
Patent Owner

Case IPR2024-01460
U.S. Patent No. 10,480,090

**PATENT OWNER PRELIMINARY RESPONSE
UNDER 37 C.F.R. § 42.107(a)**

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Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

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PATENT OWNER'S EXHIBIT LIST

Exhibit No.	Description
2001	Defendants' Motion to Stay, <i>SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.</i> , No. 2:23-cv-00539 (E.D. Tex. Oct. 24, 2024)
2002	Plaintiff's Opposition to Defendants' Motion to Stay, <i>SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.</i> , No. 2:23-cv-00539 (E.D. Tex. Nov. 7, 2024)
2003	Defendants' Reply in Support of Motion to Stay, <i>SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.</i> , No. 2:23-cv-00539 (E.D. Tex. Nov. 14, 2024)
2004	Plaintiff's Sur-Reply in Opposition to Defendants' Motion to Stay, <i>SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.</i> , No. 2:23-cv-00539 (E.D. Tex. Nov. 21, 2024)
2005	Amended Docket Control Order, <i>SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.</i> , No. 2:23-cv-00539 (E.D. Tex. Jan. 2, 2025)
2006	Federal Court Management Statistics (Sept. 30, 2024)
2007	Complaint, <i>SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.</i> , No. 2:23-cv-00539 (E.D. Tex. Nov. 21, 2023)
2008	Results charted from DocketNavigator.com, run on January 5, 2025, for Success of Motion to Transfer Venue for Convenience Decided by Judge Rodney Gilstrap
2009	Order Granting Service Waiver, <i>SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.</i> , No. 2:23-cv-00539 (E.D. Tex. Feb. 23, 2024)
2010	Defendants' P.R. 3-3 Invalidity Contentions, <i>SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.</i> , No. 2:23-cv-00539 (E.D. Tex. Aug. 23, 2024) (including Apps. A3, A12, A18, A19, A23)

Exhibit No.	Description
2011	Appendix B – Secondary References Chart
2012	Overview of U.S. Pat. Appl. Publ. No. 2009/0047539 to Dobashi <i>et al.</i> , accessed January 5, 2025 at: https://worldwide.espacenet.com/patent/search/family/038509458/publication/US2009047539A1?q=US 2009%2F0047539
2013	Overview of U.S. Pat. Appl. Publ. No. 2013/0108922 to Shinozaki <i>et al.</i> , accessed January 5, 2025 at: https://worldwide.espacenet.com/patent/search/family/045402087/publication/US2013108922A1?q=US2013108922A1
2014	Overview of Korean Pat. Appl. Publ. No. KR20120003485A to Toshio <i>et al.</i> , accessed January 5, 2025 at: https://worldwide.espacenet.com/patent/search/family/043050177/publication/KR20120003485A?q=KR 2012%2F0003485
2015	Overview of U.S. Pat. Appl. Publ. No. 2013/0108887 to Kim <i>et al.</i> , accessed January 5, 2025 at: https://patentcenter.uspto.gov/applications/13722585/continuity?application=
2016	Overview of U.S. Pat. Appl. Publ. No. 2006/0191798 to Sano <i>et al.</i> , accessed January 5, 2025 at: https://worldwide.espacenet.com/patent/search/family/033156730/publication/US2006191798A1?q=us 2006%2F0191798
2017	Average Roughness Basics, Michigan Metrology, LLC (2025), accessed at: https://michmet.com/average-roughness-basics/

I. Introduction

U.S. Patent No. 10,480,090 (“the ’090 patent”), claims innovative, non-obvious improvements to electrolytic copper foil for secondary batteries. The inventors discovered that, by manipulating material and chemical properties within the foil and the foil manufacturing process, certain unexpected and desirable performance characteristics could be achieved. The claims include specific limitations directed to these material and chemical properties. For example, the claims include limitations directed to defining foil roughness attributes (e.g., peak counts, valley depths, peak thresholds). They also include limitations drawn to combinations of specific compounds (e.g., chromate, benzotriazole and silane). SK nexilis Co., Ltd. (“Patent Owner”), the ’090 patent assignee, has long remained a leader in the battery copper foil industry, with significant investment in the research and development of battery copper foil products.

Solus Advanced Materials Co., Ltd.’s (“Solus” or “Petitioner”) Petition for review of claims 1-11 should be denied because it fails to demonstrate a reasonable likelihood that any challenged claim will be found unpatentable. Not only are claim elements missing in the prior art, but Petitioner failed to demonstrate a motivation to combine or reasonable expectation of success in this unpredictable art. But the Board need not even reach the merits, as the facts and circumstances here warrant denying institution under *both* Sections 314(a) and 325(d).

Under Section 314(a), the *Fintiv* factors strongly support discretionary denial. Notably, the co-pending litigation trial date is nearly six months before the FWD deadline, significant investment in the co-pending litigation has occurred and will continue to occur prior to institution, the Petition was filed ten months after the complaint was filed, and the Petition's merits are very weak—failing to even address all the claim elements and relying on rehashed arguments substantially similar to those in the original prosecution of the '090 patent.

As to discretionary denial under Section 325(d), the Petition fares even worse. The Petition provides a perfunctory and misleading single-sentence argument stating the Board should not exercise its discretion under Section 325(d) to deny the Petition. Petitioner states that “[t]his Petition presents new prior art and arguments against the Challenged Claims for which the file history contains no indication that the Office ever previously considered in connection with the '090 Patent.” Pet., 79. That is blatantly false. Petitioner's *leading primary reference* (Shinozaki) in the Petition was previously considered, applied in a rejection by the Office, and overcome via Applicant's arguments. Dobashi's international parent application was also considered by the Office during original prosecution. Moreover, the additional references included in the Petition are substantially similar to references that were before the Office previously.

Should the Board reach the merits, the Petition is riddled with deficiencies—

missing elements, misguided obviousness rationale, and no reasonable expectation of success. The Petition fails to demonstrate that any Ground renders obvious the peak count roughness (Rpc) limitations of claim 1—let alone the Rpc limitations for *both sides* of the copper foil. Solus rehashes references that were either previously before or substantially similar to references previously considered by the Office. But none of the references disclose an Rpc as claimed. As the Office already confirmed, Solus’ attempt to derive an Rpc based on other roughness parameters lacks merit. The only reference where the text “RPC” even appears is Griesi; but Griesi does not provide any context or discussion about what “RPC” is or how it is measured.

In addition to the missing claim elements, the Petition also fails to demonstrate that a person of ordinary skill in the art would have been motivated to combine the references or had a reasonable expectation of success in doing so. The claims recite, and the specification describes, a particular Rpc range that achieves desired characteristics. The Grounds all start with references that say nothing about an Rpc. To fill this hole, Petitioner provides tortured math, manufacturing an Rpc value that allegedly meets the claim range. Petitioner, however, provides only conclusory statements alleging a POSA would have been motivated to undertake its convoluted calculations (with unsupported assumptions) while modifying teachings from the references to arrive at the claimed Rpc range. Further,

Petitioner fails to articulate why a POSA would have had a reasonable expectation of success. Dr. Randall's own admissions and prior art disclosures concerning the myriad manufacturing conditions for copper foil production highlight the difficulty a POSA would have had in making Petitioner's unguided modifications. Thus, Petitioner's obviousness challenge is gutted to its core.

In sum, the Board should apply its discretion to deny institution under either or both of *Fintiv* or Section 325(d). Alternatively, the Board must deny institution on the merits, as the Petition is fundamentally deficient—failing to address all claim elements and failing to demonstrate a reasonable expectation of success for combining references.

II. Person of Ordinary Skill in the Art

For purposes of this Preliminary Response, Patent Owner applies Petitioner's level of skill for a person of ordinary skill in the art (POSA). Pet., 3-4.

III. Claim Construction

The Board need not construe any term in order to determine that institution should be denied. Patent Owner reserves the right to contest Petitioner's implicit or explicit constructions during the proceeding.

IV. The '090 Patent

The '090 patent is directed to an electrolytic copper foil that "can secure secondary batteries with high capacity maintenance." EX1001, Abstract. The electrolytic copper foil includes a first surface and a second surface opposite to the

first surface, with each surface having “a peak count roughness *R_{pc}* of 10 to 100.”

EX1001, Abstract.

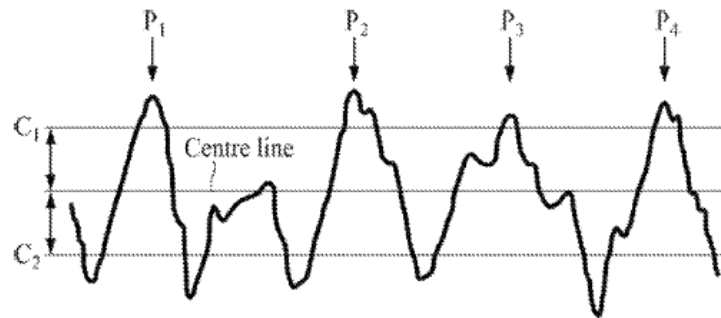
A. Overview of the '090 Patent and Claims

The independent claim of the '090 patent recites an electrolytic copper foil for a secondary battery ([1pre]). The electrolytic copper foil has a first surface and a second surface opposite to the first surface ([1a]-[1b]). The invention enables “long-lifespan secondary batteries which are capable of maintaining high charge/discharge capacity for a long time in spite of repetition of charge/discharge cycles.” EX1001, 3:16-19. This minimizes “electronic product consumers’ discomfort and energy waste resulting from frequent change of secondary batteries.” EX1001, 3:19-22.

Important to the inventors’ advancement was that *each* of the first and second surfaces has a *peak count roughness (R_{pc}) of 10 to 100* ([1c]). Specifically, “[a]s a result of repeated research, the [inventors] found that a peak count roughness *R_{pc}* of the electrolytic copper foil 111 is an important factor in stably securing capacity maintenance of 90% or higher.” EX1001, 5:19-22, FIGs. 1-2.

Claim 1 precisely specifies in [1d] and [1e] how *R_{pc}* must be measured—as does the specification. EX1001, 2:23-32; 5:26-42, 8:7-19, FIG. 2.

FIG. 2



EX1001, FIG. 2.

As shown above with reference to Figure 2, [1e] recites that the peak count roughness R_{pc} of each point is the “number of effective peaks which *rise above an upper criteria line of 0.5 μm*” (shown as C₁ in Figure 2) “per unit sampling length of 4 mm.”¹ And [1e] further specifies that in order for a peak to be counted as an “effective peak,” there must be “at least one valley *deeper than a lower criteria line of -0.5 μm*” (shown as C₂ in Figure 2) “between adjacent ones of the effective peaks.” See also EX1001, 2:23-32, 5:26-42, FIG. 2. [1d] specifies that the peak count roughness R_{pc} of each of the first and second surfaces is an average of peak count roughness R_{pc} values measured at three randomly-selected points. If there is “no valley deeper than the lower criteria line C₂ of -0.5 μm between adjacent peaks rising above the upper criteria line C₁,” the adjacent peaks are not “effective peaks”

¹ Emphasis added unless otherwise noted.

used for measurement R_{pc} —the relatively lower one is excluded in determining the number of “effective peaks.” EX1001, 5:36-42.

The '090 patent explains the criticality of the claimed R_{pc} range:

When the peak count roughness R_{pc} , is less than 10, capacity maintenance of the secondary battery is deteriorated. This is because the stress caused during the charge/discharge of the secondary battery is concentrated on mountains which locally protrude.

Furthermore, when the peak count roughness R_{pc} , exceeds 100, capacity maintenance of the secondary battery is also deteriorated. This is because the active material cannot be uniformly coated on the electrolytic copper foil 111 due to the excessive number of mountains.

EX1001, 5:46-55. So, the '090 patent's unique solution—each of the first and second surfaces of the electrolytic copper foil having a peak count roughness R_{pc} of 10 to 100 ([1c])—increases the capacity maintenance of the secondary battery by (1) decreasing stress concentrations during the charge/discharge cycles *and* (2) improving adhesion of the active material. EX1001, 5:46-55.

B. Prosecution History of the '090 Patent

During prosecution, the Office acknowledged that the applied art (including Shinozaki, EX1004—Petitioner's lead reference here) did not disclose *any* of the '090 patent's R_{pc} limitations ([1c]-[1e]). EX1002, 71-72. Instead, the Office alleged that unrelated parameters would have led to those limitations being obvious as a result-effective variable. EX1002, 71-72.

Petitioner alleges that, during the prosecution, “[t]he applicant did not address the Examiner’s assertion regarding result-effective variable [sic].” Pet., 3. Petitioner could not be more wrong. Applicant provided *five pages* of argument against the obviousness of claim 1 (unamended), and *directly responded* to the Office’s statements regarding its result-effective variable assertion. EX1002, 58-63; *see* EX1002, 60-63.

Applicant first noted the Office’s concession that the art applied in the rejection did *not* disclose the Rpc features ([1c]-[1e]). EX1002, 60-61. Applicant then observed that the Office relied on (1) an incorrect understanding of 10 point mean roughness Rz and/or (2) the distance between peaks of the applied art. EX1002, 61. Applicant explained further, consistent with the specification, that even if a prior art reference has an Rz of a particular value, “it does not *necessarily* have ‘peak count roughness (Rpc)’ of [the] claimed range (i.e., 10 to 100).” EX1002, 62 (emphasis in original).

Petitioner correctly notes that Applicant pointed out that the art applied by the Office did not obtain peak data in the manner prescribed by the claim (i.e., a surface roughness profile obtained according to steel iron test schedule (SEP 1940), EX1002, 62). Pet., 3. Indeed, none of the Office’s applied art obtains peak data as recited by the claim.

Petitioner ignores that Applicant went on to explain that even setting that

aside, the applied art does not determine “effective peaks” as required by the claim.

Applicant explained that Rz and distance between peaks relate to *all* peaks.

EX1002, 62-63. There is no way to reasonably square the art’s Rz measurement with the claimed R_{pc} features’ specific, upper/lower criteria lines at +/- 0.5 μm *and* the requirement that there be at least one valley deeper than the lower criteria line between adjacent ones of the effective peaks, let alone the other features of [1c]-[1e]. EX1002, 62-63. Accordingly, Applicant affirmatively argued that the Office had not established obviousness of the claims “because none of the cited references explicitly or implicitly teach or suggest an electrolytic copper foil having a peak count roughness (R_{pc}) of the claimed range.” EX1002, 63.

The Office found the Applicant’s arguments persuasive and allowed the application. EX1002, 42-43.

V. The Board should use its discretion under Section 314(a) to deny the Petition in view of the parallel litigation.

The facts here fit squarely within the type of cases the Board uses its discretion to deny petitions under § 314(a). In *Apple Inc. v. Fintiv, Inc.*, the Board articulated six nonexclusive factors for determining whether to institute an AIA post-grant proceeding where there is parallel district-court litigation. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (P.T.A.B. Mar. 20, 2020) (“*Fintiv*”). On June 21, 2022, Director Vidal issued a Memorandum re: Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court

Litigation (“*Fintiv* Memo”) clarifying the procedure that the Board should follow when evaluating the six *Fintiv* factors. Here, the Board should exercise its discretion to deny the Petition because (1) *Fintiv* factors two through five support discretionary denial; and (2) the Petition does not provide a compelling, meritorious challenge (*Fintiv* factor six).

Fintiv factor one: An opposed motion to stay has been filed in the parallel litigation. EX2001-EX2004. But this motion is still pending, and the Board should not speculate whether the court would grant a stay in the event this proceeding were instituted. Factor one, therefore, is neutral. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 15 at 12 (P.T.A.B. May 13, 2020) (informative) (“*Fintiv IP*”) (holding the Board should “decline to infer ... how the District Court would rule should a stay be requested by the parties.”); *see also Fusion Orthopedics, LLC v. Extremity Medical, LLC*, IPR2023-00894, Paper 15 at 28-29 (P.T.A.B. Nov. 17, 2023) (“[W]e decline to speculate whether the pending motion to stay might be successful.”).

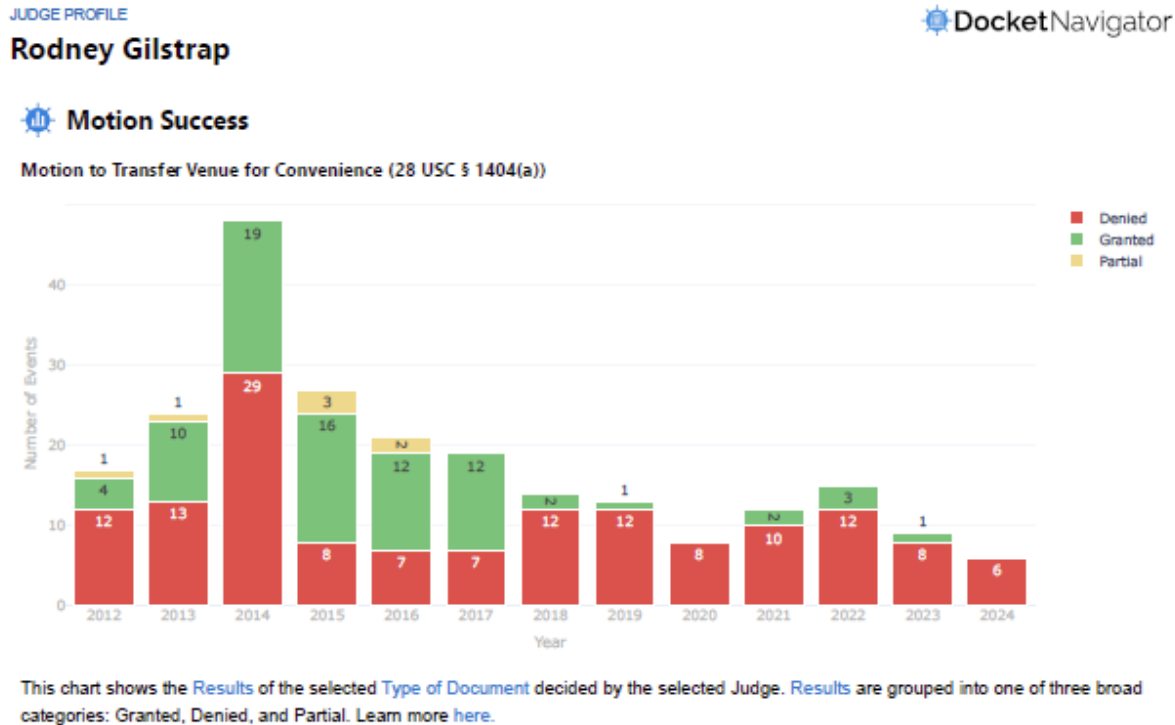
Fintiv factor two: Factor two weighs heavily in favor of discretionary denial. The projected statutory deadline for issuing a Final Written Decision (FWD) in this IPR is April 23, 2026. Jury selection in the parallel litigation is scheduled to begin November 3, 2025, nearly six months before the projected FWD deadline. EX2005, 1. The *Fintiv* Memo also authorizes panels to “consider

the median time from filing to disposition of the civil trial for the district in which the parallel litigation resides” as reported on the uscourts.gov website. *Fintiv* Memo, 3 n.4. The median time-to-trial for civil actions in the Eastern District of Texas is 21.9 months. EX2006, 35. The complaint in the parallel litigation was filed November 21, 2023. EX2007. Applying the median time-to-trial, the estimated trial date would be in mid-September 2025, which is even earlier than the scheduled trial date.

Petitioner further asserts that a pending motion to transfer “will help ensure that the FWD outpaces any trial date.” Pet., 78. But, like a motion for stay, a judge determines whether to grant a motion to transfer “based on the facts of each specific case as presented in the briefs by the parties.” *See Fintiv II* at 12. The Board should not speculate on how the court will rule on the pending motion to transfer. *See id.*; *Samsung Display Co., Ltd. v. Pictiva Displays Int’l Ltd.*, IPR2024-00855, Paper 12 at 8-9 (P.T.A.B. Nov. 19, 2024)² (declining to speculate

² Acting Director Brent recently issued a *sua sponte* Director Review decision modifying this decision. *Samsung Display Co., Ltd. v. Pictiva Displays Int’l Ltd.*, IPR2024-00855, Paper 13 (Acting Director Brent Jan. 10, 2025). That decision addresses a specific issue related to factor 6, not relevant here, and affirms the panel’s exercise of discretion to deny institution.

how the district court might rule on pending motions). Even if the Board was inclined to speculate, according to Docket Navigator statistics, since 2018 Judge Gilstrap rarely grants such transfer motions:



EX2008.

Under the current facts, trial in EDTX is scheduled to begin nearly six months before the FWD deadline, and thus factor two weighs heavily in favor of denying institution. *See AT&T Services Inc. v. ASUS Tech. Licensing Inc.*, IPR2024-00992, Paper 14 at 10-11 (P.T.A.B. Dec. 16, 2024) (denying institution; finding “the second factor weighs substantially in favor of discretionary denial” where trial was scheduled “four to five months prior” to FWD deadline); *Ericsson*

Inc. v. Active Wireless Techs. LLC, IPR2024-00886, Paper 8 at 8-9 (P.T.A.B. Nov. 12, 2024) (denying institution; finding factor 2 weighs in favor of denial with trial date approximately 4 months prior to FWD deadline).

Fintiv factor three: Factor three weighs in favor of denying institution.

Here, the Board “consider[s] the amount and type of work already completed in the parallel litigation by the court and the parties *at the time of the institution decision.*” *Fintiv*, 9. The deadline for issuing a Decision on Institution (DI) in this IPR is April 23, 2025. The parties have already exchanged invalidity and infringement contentions and are engaged in fact discovery, with each party already producing over 5,000 documents, and corporate depositions are ongoing. By the April 23, 2025 DI deadline, the parties will have completed claim construction briefing, the Claim Construction Hearing will be imminent (on May 14, 2025), and the parties will be nearing the end of fact discovery. EX2005, 4-5; EX1038, 3-5.

Petitioner contends “the EDTX litigation is still in its early stages and the parties and the court have yet to expend significant resources on invalidity,” Pet., 78-79, but Petitioner considers the state of the parallel litigation at the time the Petition was filed, not at the time of the DI, and does not even consider the then-

current proposed case schedule, which Petitioner filed as Exhibit 1038.³ Nor was Petitioner diligent in filing the Petition. *See* Pet., 78-79. The Petition was filed September 20, 2024, which was ten months after the complaint was filed, and seven months after the February 23, 2024 order noting Petitioner’s waiver of foreign service. EX2009. Petitioner’s only argument of diligence is that it filed the Petition “months ahead of the one-year time bar.” Pet., 78-79. But this alone is insufficient. *See Ericsson Inc.*, IPR2024-00886, Paper 8 at 9-10 (denying institution; determining that merely “filing the Petition ‘in advance of the statutory deadline’” alone does not weigh in favor of institution, noting “Petitioner [did] not explain how it was diligent or even identify the time period during which it contends it was diligent.”).

Because the parties and the court will have expended significant resources by the April 23, 2025 DI deadline and because Petitioner was not diligent in filing the Petition, factor three weighs in favor of denying institution.

Fintiv factor four: Factor four weighs in favor of denying institution.

³ The current schedule, issued January 2, 2025, and filed as Exhibit 2005, includes only minor differences from the June 12, 2024 proposed schedule Petitioner submitted with the Petition (EX1038). Petitioner should not be granted additional briefing to address any alleged updates to the schedule since filing the Petition.

“*Fintiv* factor four looks at the overlap between the issues raised in the IPR petition and in the parallel proceeding in order to evaluate ‘concerns of inefficiency and the possibility of conflicting decisions.’” *Fintiv* Memo, 7; *Fintiv*, 12. Here, there is significant overlap between the invalidity issues: the Petition challenges the validity of the claims of the ’090 patent based on various combinations of Shinozaki, Toshio, Kim, Sano, Griesi, and Dobashi, Pet., 1; in the parallel litigation, Petitioner challenges the validity of claims 1-6 using each of these references⁴ in addition to others, EX2010, 21-23, 34-52, Apps. A3, A12, A18, A19, A23.

Petitioner’s stipulation—to “not [] seek resolution in the district court of the same grounds presented in [the] Petition”—does not allay the concerns undergirding factor four. Pet., 79. In fact, Petitioner’s stipulation is essentially meaningless. All but one of Petitioner’s asserted references has at least one counterpart or related patent/publication that is not included in the stipulation. Shinozaki was also published as WIPO publication WO 2012/002380. EX2013. Toshio was also published as WIPO publication WO 2010/128681. EX2014. Kim

⁴ In the invalidity contentions, Petitioner relies on the U.S. Patent equivalent of Dobashi. EX2010, 22, App. A3; EX2012. Toshio is cited in the discussion. EX2010, 48, 50; EX2011, 3.

was also published as U.S. Patent No. 8,349,518. EX2015. Sano was also published as WIPO publication WO 2004/090197. EX2016. Dobashi was also published as WIPO publication WO 2007/105635. EX2012. But even if Petitioner stipulated not to use these related references, that still does not prevent Petitioner from using other references that have cumulative teachings.

Accordingly, because there is significant overlap in validity issues and Petitioner's stipulation does nothing to reduce this overlap, factor four weighs in favor of denying institution.

Fintiv factor five: Factor five weighs in favor of denying institution because, as Petitioner acknowledges, "parties in the parallel litigation are the same." Pet., 79; *Fintiv II*, 15 ("Because the petitioner and the defendant in the parallel proceeding are the same party, this factor weighs in favor of discretionary denial."); *see also Ericsson Inc.*, IPR2024-00886, Paper 8 at 13-14 (factor five weighs in favor of denial where the district court is likely to precede the FWD).

Fintiv factor six: The *Fintiv* Memo explains that "[c]ompelling, meritorious challenges are those in which the evidence, if unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence." *Fintiv* Memo, 4. Petitioner provides nothing more than a bare statement that "the Petition presents a compelling case of invalidity." Pet., 79. Petitioner fails to demonstrate: 1) why the claimed features would be applied on

both sides of the foil, 2) that peak count roughness (Rpc) is disclosed or suggested by any combination, and 3) a reasonable expectation of success and/or a motivation to combine references for any Ground. *See* Section VII. Petitioner's expert largely repeats the Petition verbatim without providing additional analysis or corroborating evidence. *Id.*; *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (P.T.A.B. Aug. 24, 2022). Therefore, factor six favors denying institution. *Fintiv*, 15.

* * *

At bottom, the scheduled trial date is nearly six months before the projected FWD, the parties will have invested significant resources in the district court, Petitioner's narrow stipulation does nothing to alleviate concerns of inefficiency or the possibility of conflicting decisions, and the merits are not compelling. The Board should exercise its discretion to deny the Petition in view of the parallel litigation.

VI. The Board should exercise its discretion to deny the Petition under Section 325(d).

The Board has discretion to deny review where “the same or substantially the same prior art or arguments previously were presented to the Office.” 35

U.S.C. § 325(d). The Board's two-part framework considers:

- (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and

- (2) if either condition of [the] first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.

Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GMBH, IPR2019-01469, Paper 6 at 8 (P.T.A.B. Feb. 13, 2020) (precedential March 24, 2020). Here, if the Board finds the first part of the framework is satisfied, the second is, too—Petitioner does not even attempt to allege that the Office erred in a manner material to the patentability of the challenged claims. *See, e.g.*, Pet., 2, 3, 79. The Board considers the *Becton, Dickinson* factors when applying the framework. *Advanced Bionics*, IPR2019-01469, Paper 6 at 9; *see also Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17-18 (P.T.A.B. Dec. 15, 2017) (informative).

The facts here support denial under § 325(d), at least because Petitioner relies on art and arguments that are the same or cumulative of those expressly considered and overcome during prosecution. Moreover, Petitioner’s single-sentence treatment of § 325(d) is disingenuous. Petitioner states that “[t]his Petition presents new prior art and arguments against the Challenged Claims for which the file history contains no indication that the Office ever previously considered in connection with the ’090 Patent.” Pet., 79. As explained below, this is simply not true.

A. Shinozaki was applied by the Office, and Dobashi's parent application was also before the Office during prosecution.

Petitioner conceals the fact that its *leading primary reference* (Shinozaki) was previously considered, applied in a rejection by the Office, and overcome via Applicant's arguments without further amendment. EX1002, 74-75. Indeed, following Applicant's arguments related to the Rpc features [1c]-[1e], the Office agreed that the art of record—including Shinozaki—"fail to teach or suggest the combination of limitations of claim 1." EX1002, 42. And Dobashi's (single reference in Ground 3) counterpart was cited in an IDS submitted December 18, 2018 as WO2007105635A1 and was considered by the Office. EX1002, 98 (IDS citing Dobashi's parent), 85 (noting all references considered except where lined through, and not lining through Dobashi's parent).⁵

Accordingly, Shinozaki and Dobashi, as relied on by Petitioner, satisfy *Becton* factors (a), (b), and (d), under the first prong of the framework. Petitioner does not address factors (c), (e), or even allege that the Office erred in its evaluation of the asserted prior art, which is required for the second prong. Regarding factor (f), no amount of faulty assumptions and pages of incorrect math

⁵ Compounding Petitioner's misstatements of the record, Kim's (EX1012) counterpart (JP2012022939A) was cited on the same IDS as Dobashi's parent and was considered by the Office. EX1002, 98, 85.

from Petitioner's declarant can constitute new facts or evidence to warrant reconsideration of the prior art or arguments. *See, e.g.*, Sections VII.A-VII.B, *infra*.

The *Advanced Bionics* framework is therefore met with respect to Shinozaki and Dobashi.

B. Sano, Griesi, and the Petition's arguments applying them are substantially similar to those made and overcome during prosecution.

As discussed above, Patent Owner already explained—and the Office confirmed through the '090 patent's issuance—that R_{pc} is *not* an inherent/implicit characteristic of R_z⁶/R_{zj}, or distance between peaks (or R_a⁷ or S_m⁸ as in

⁶ The Petition states that “R_z represents the sum of the absolute values of the five highest peaks and the absolute values of the five lowest valleys, divided by 5.” Pet., 6 n.3. Patent Owner accepts this statement as representative.

⁷ The Petition states that “R_a represents the average roughness of a surface, calculated as the mean absolute deviation of the surface profile from the central mean line over a specified sampling length.” Pet., 6 n.4. Patent Owner accepts this statement as representative.

⁸ S_m is referred to in the Petition as the mean value of the profile element widths within a sampling length, without any specification on criteria line qualification for profile elements. Pet., 13-14. R_{sm} is referred to as the mean width

Shinozaki). Nonetheless, the Petition revisits this argument. It uses references that teach substantially the same features as references considered during prosecution to make substantially similar arguments that have already failed.

Petitioner relies on Sano as a primary reference in Grounds 2A and 2B for teachings that are substantially the same as what was already presented to the Office and therefore should be considered substantially the same prior art. *See Advanced Bionics*, IPR2019-01469, Paper 6 at 16-17 (“Thus, Petitioner relies on Charvin in the same manner as the Examiner relied on Zimmerling during prosecution . . . [and] is substantially the same art as Zimmerling”); *see also Siemens Mobility, Inc. et al. v. Metrom Rail, LLC*, IPR2024-00947, Paper 12 at 12-13, 18-19 (P.T.A.B. Nov. 19, 2024) (denying institution where references cited on an IDS were considered by the Examiner during original prosecution, other references or arguments presented were substantially similar as those in the original prosecution, and Petitioner failed to demonstrate material error by the Examiner). Specifically, Petitioner relies on Sano’s (EX1008) Rz features in

of profile elements (formerly: groove spacing). Pet., 13-14. Patent Owner accepts these as expressing the same concept, that is, mean width of profile elements without any regard to whether such profile elements would have been properly counted in an Rpc measurement.

Grounds 2A and 2B—just as the Office relied on Shinozaki’s Rz features during prosecution, which Applicant distinguished. Pet., 45-46. The *Advanced Bionics* framework is therefore met with respect to Sano under part 1 of the framework, and as discussed there is no analysis required for part 2 because the Petition does not allege any error by the Office. Petitioner also relies on Griesi’s (EX1015) disclosure of Rz but does so in the same manner as it does on Shinozaki’s. Pet., 49.⁹

Petitioner also relies on Dobashi in Ground 3 for teachings that are substantially the same as what was already considered by the Office (and overcome), and therefore should be considered substantially the same prior art. *Advanced Bionics*, IPR2019-01469, Paper 6 at 16-17. Specifically, Petitioner relies on Dobashi’s (EX1007) Rzjis and Rsm (in the same manner as Shinozaki’s Rz and Sm). Pet., 65-66, 68-70. Additionally, Petitioner relies on Dobashi’s maximum peak to valley height PV, which is not tethered to Rpc at all for the same reasons explained during prosecution. Pet., 65-66, 68-70. The first part of the *Advanced*

⁹ Petitioner also points to Griesi’s alleged Rpc value as confirming its Rz theory. But as discussed in Section VII.B.4., *infra*, Griesi provides no discussion of the alleged RPc value and does not support revisiting the argument that was overcome during prosecution.

Bionics framework is therefore met with respect to Dobashi under part 1 of the framework.

Because Petitioner (1) relies on art and arguments that are the same or substantially similar to the art and arguments that were expressly considered and overcome during prosecution—including leading with a primary reference that was *overcome through argument during prosecution*—and (2) fails to demonstrate or even allege that the Office erred in a manner material to the patentability of challenged claims, *Advanced Bionics* counsels that the Board should exercise its discretion and deny institution under Section 325(d).

VII. Petitioner fails to establish a reasonable likelihood of prevailing on any challenged claim.

None of Petitioner’s prior art discloses an electrolytic copper foil for a secondary battery having a peak count roughness R_{pc} of 10 to 100, much less one that meets the claimed R_{pc} limitations on each side of the surfaces. Petitioner’s background references, which are not even part of the Grounds, do not rectify the shortcomings of the applied art. Additionally, contrary to Petitioner’s assertion, R_{pc} cannot be obtained from other surface roughness parameters such as R_{sm}/S_m, R_a, or R_z/R_{zj}. All of Petitioner’s Grounds suffer from missing element deficiencies.

Moreover, Petitioner fails to articulate a reasonable expectation of success for any Ground, and/or a motivation to combine references. Indeed, Petitioner’s

own references and analysis demonstrate there would *not* have been a reasonable expectation of success. Manipulating and adjusting the surface parameters of copper foil depends on myriad parameters and conditions, an unavoidable fact that Petitioner leaves unaddressed.

In an IPR, “the burden of proving a proposition of unpatentability” is borne by (and remains at all times with) the petitioner. 35 U.S.C. §§ 314(a), 316(e); *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1375 (Fed. Cir. 2016). To satisfy its burden, a petitioner must “articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness”—“mere conclusory statements” will not suffice. *Magnum Oil*, 829 F.3d at 1380. Indeed, “[i]t is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (quoting 35 U.S.C. § 312(a)(3)); *see also Parus Holdings, Inc. v. Google LLC*, 70 F.4th 1365, 1371 (Fed. Cir. 2023) (a party’s burden “cannot be met simply by throwing mountains of evidence at the Board without explanation or identification of the relevant portions of that evidence”).

“[O]bviousness requires a suggestion of *all limitations in a claim.*” *CFMT, Inc. v. Yieldup Int’l Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003) (citing *In re*

Royka, 490 F.2d 981, 985 (C.C.P.A. 1974)). Petitioner has not met this requirement here because it has not shown obviousness of the claimed Rpc ranges on *both* sides, or even that the combinations disclose Rpc.

Additionally, “[a]n obviousness determination requires finding that [a Skilled Artisan] would have been motivated to combine or modify the teachings in the prior art *and* would have had a reasonable expectation of success in doing so.” *Regents of the Univ. of Cal. v. Broad Inst., Inc.*, 903 F.3d 1286, 1291 (Fed. Cir. 2018); *Intelligent Bio-Sys.*, 821 F.3d at 1367-68; *see also, e.g., NJOY, LLC v. JUUL Labs, Inc.*, IPR2024-00536, Paper 17 (P.T.A.B. Aug. 12, 2024) (denying institution where petitioner did not show a reasonable expectation of success in combining the asserted references); *Honeywell Int’l Inc. v. DSM IP Assets, B.V.*, IPR2024-00493, Paper 7 (P.T.A.B. Aug. 21, 2024) (same). Indeed, as *KSR* stated, “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citation omitted). Here, Petitioner fails to provide sufficient rationale for a POSA to have modified any of the references to arrive at the claimed Rpc features of [1c]-[1e]. Likewise, Petitioner fails to account for any reasonable expectation of success where Petitioner’s own references show unpredictability and the ’090 patent’s claims recite critical ranges.

A. The claims require *the first and second* surfaces of the copper foil to have the claimed peak count roughness R_{pc} of 10-100, but the art fails to disclose or suggest this.

As a threshold matter, the R_{pc} elements [1c]-[1e] require *each* of the first and second surfaces to have a peak count roughness R_{pc} of 10-100. This is not disclosed by Petitioner's art, and Petitioner fails to explain why a POSA would have modified any of the references to arrive at the claimed R_{pc} features for *each side* of a copper foil, contravening *KSR*'s requirements. *KSR*, 550 U.S. at 418 (citation omitted); *see* Pet., 22-23, 31-32, 54-55. Indeed, Petitioner cannot, because Petitioner's art does not address R_{pc}, R_{pc} cannot be obtained from other surface roughness parameters, and R_{pc} was not a recognized result-effective variable. *See* Section VII.B (discussing R_{pc} is a missing element for even a first side).

A skilled artisan generally does not depart from or modify a method that works as intended absent a specific teaching that doing so would satisfy an unmet need or overcome an identified deficiency. *See In re Rosuvastatin Calcium Patent Litig.*, 703 F.3d 511, 517-18 (Fed. Cir. 2012) ("obviousness is not shown when what was obvious to try was to explore a new technology or general approach that seemed to be a promising field of experimentation, where the prior art gave only general guidance as to the particular form of the claimed invention or how to achieve it.") (internal quotations omitted); *Yamanouchi Pharm. Co., Ltd. v. Danbury Pharmacal, Inc.*, 231 F.3d 1339, 1345 (Fed. Cir. 2000) (affirming

nonobviousness on the basis that prior art provided no motivation to modify existing compounds to obtain the invention, where challenger showed only that the skilled artisan would have expected similar results). Here, none of the art provides such a teaching.

Shinozaki discloses Rz and Ra characteristics, which do not correlate to Rpc as claimed, as explained in Section VII.B and already confirmed during prosecution. EX1004, Abstract, ¶¶29, 31, 32, 73, 74. Without showing the claimed Rpc for even one side of a copper foil, Petitioner of course cannot show it for both sides of a copper foil.

Sano's Rz features, EX1008, Abstract, ¶¶6, 10, are just like Shinozaki's Rz features. Again, Rz was distinguished during prosecution and is nonetheless irrelevant for arriving at the claimed Rpc range for both sides of a copper foil.

Griesi, at best, has a passing reference to "RPC" with no discussion at all of what that is, let alone how it is measured. Even assuming that "RPC" is the claimed Rpc measured under the claimed conditions, Griesi is still deficient because it relates only to a single side. *See, e.g.*, EX1015, 28-29, 54. Indeed, Griesi explains that roughness characteristics of the shiny side of copper foil are *different* from the matte side and that *several factors contribute to this*, further undermining Petitioner's assumption that the alleged Rpc value applies to both sides:

The surface roughness of the matte side is determined by how uniformly the copper grows outward from the drum. Several factors contribute to this surface such as the flatness of the base (i.e. the drum), the purity of the copper sulfate (CuSO_4), the uniformity of the electric field, the pH and temperature of the solution, and the time allowed for growth as determined by the electrodeposition over potential and current. Since so many factors are associated with determining surface of the matte or “high profile” side of the ED foil, it usually has a larger deviation in the z-axis height typically ranging from 2-25 μm (Figure 2.9).

EX1015, 28-29.

Dobashi, too, is *only* concerned with one side of a foil. And because Dobashi’s single-side parameters are already “suitable for” use as a negative electrode current collector, a skilled artisan would have no need to duplicate any hypothetical “manually generated” Rpc data for *both* sides. *See* Pet., 68-69; EX1003, ¶¶203-207.

For at least these reasons, Petitioner fails to show that it would have been obvious for *each of the first and second* surfaces to have the claimed peak count roughness Rpc of 10-100, where the art only considers the roughness of a single surface.

B. The references and combinations do not disclose or suggest the Rpc limitations of [1c]-[1e] at all, even for one side of a copper foil.

As discussed above, Petitioner hand-waives the claim requirement that *each*

of the first and second surface has the claimed Rpc range (in [1c]). *See* Section VII.A. Even setting aside this error, the Petition should be denied because the references do not disclose measuring an Rpc using the claimed conditions, and Petitioner’s argument that one could determine an Rpc based on other roughness parameters lacks merit.

1. None of Petitioner’s art disclose determining an Rpc in the manner claimed.

The Petition begins with the premise that Rpc (peak count roughness) is a well-recognized measurement parameter that reflects the number of peak counts or effective peaks based on “(i) an ‘upper criteria line’ and (ii) a ‘lower criteria line’ per (iii) ‘unit sampling length’.” Pet., 8. But regardless of whether Rpc (peak count roughness) is a recognized *measurement*, Petitioner *ignores* the requirements that the measurement includes (1) an upper criteria line *as specified in the claims*, (2) a lower criteria line *as specified in the claims*, and (3) any unit sampling length *as specified in the claims*. None of Petitioner’s art discloses any of these features.

Petitioner relies on Yacovone (EX1025)—a reference that says nothing about a copper foil or secondary batteries—to suggest that Rpc was a well-recognized measurement. Pet., 8. But Yacovone does not provide any teaching or suggestion that one should use criteria lines of +/- 0.5 μm and unit sampling length of 4 mm, as claimed. To the contrary, Yacovone discloses using a *different* sampling length (i.e., 2.5 mm) and highlights the need to know the criteria lines

for the determination of R_{pc}. EX1025, ¶50 (“[t]he peak count is dependent on the profile type, and an upper and lower boundary (C1 and C2).”). Additionally, Yacovone confirms that, as the Applicant successfully argued during prosecution of the ’090 patent, R_{pc} cannot be ascertained from R_z because the two are different parameters. EX1025, ¶50 (“R_z values alone do not characterize the complete profile of the surface.”).

Petitioner’s reliance on the MarSurf M300 manual (EX1020) is likewise unavailing. Pet., 9. Like Yacovone, the MarSurf M300 manual discloses that the values for the “intersection lines” *must be set*:

Setting the intersection lines for peak count

To calculate the peak count RPC , an upper intersection line C1 (35) and a lower intersection line C2 (37) are placed into the roughness profile. Both intersection lines are parallel to the diagram mean line (36).

The distance (in μm or μin) from the intersection lines to the diagram mean line can be set to symmetrical or asymmetrical values.¹⁶

To set a symmetrical distance from the intersection lines C1 and C2 to the diagram mean line:

1. Set the upper intersection line C1.
The value for the lower intersection line C2 is automatically set to -C1.

To set an asymmetrical distance from intersection lines C1 and C2 to the diagram mean line:

1. First set the value for C1. The value for the lower intersection line C2 is automatically set to -C1.
2. Then select the "C2" button by pressing the key and set the desired distance C2 for the lower intersection line.
If the value is negative, the intersection line lies below the diagram mean line.



Each time the value for C1 is changed, C2 is reset to -C1. If $C2 \neq -C1$ is required, C2 must then be reset.

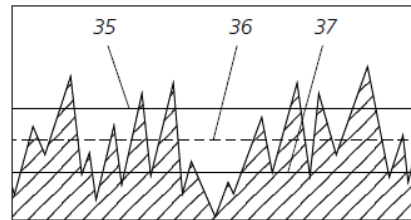


Fig. 7
Intersection lines for peak count

35 Upper intersection line C1
36 Diagram mean line
37 Lower intersection line C2

EX1020, 26 (excerpted).

The manual also states that determining R_{pc} requires peaks exceeding the *set* upper criteria line that then fall short of the *set* lower criteria line:

<i>RPc</i>	Peak count <i>RPc</i> (dependent on intersection lines C1 and C2): Number of profile elements (see <i>RSm</i>) per cm (or per inch) which first exceed the set upper intersection line C1 and then fall short of the lower C2.	EN 10049: 2005 ASME B46.1-2002 E DIN EN ISO 4287/A1: 2007-07 (D)
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EX1020, 41.

Conspicuously absent from the manual is *any* relationship between *Rpc* and any other parameter. The manual references *RSm* relating to “profile elements,” (shown above as a peak/valley pair without regard to any criteria lines). But *Rpc* requires counting only peaks that exceed the *set* upper criteria line and then fall short of the *set* lower criteria line. EX1020, 11, 41.

Nor does the ASME standard (EX1021, 21) disclose the claimed criteria lines or unit sampling length. Pet., 9-10. The ASME standard discloses that peak count (referred to as “peak density” or “Pc” in the ASME standard) is dependent on the consecutive crossing of the lower and upper boundary lines but leaves the values of the boundary lines at a user’s discretion. EX1021, 21 (“The boundary lines ... are set by a designer or an instrument operator for each application.”). Further, the ASME standard differentiates peak *count* from peak *spacing*, undermining Petitioner’s attempt to determine one from the other. EX1021, 22. Figures 1-13 and 1-14, shown below, illustrate that while *RSm* does not depend on *any boundary lines*, peak count requires a “peak count level” having both an upper and lower boundary line:

Fig. 1-13 The Mean Spacing of Profile Irregularities, RS_m

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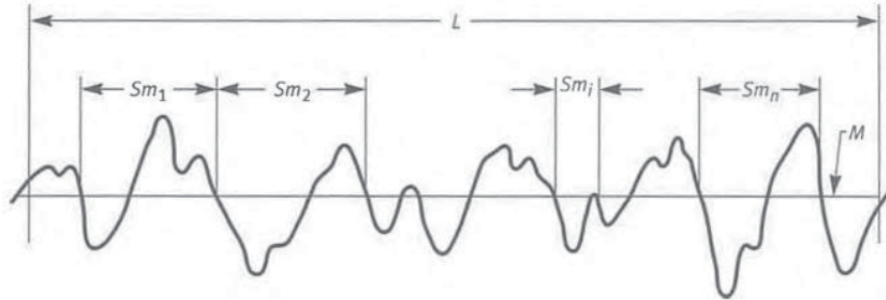
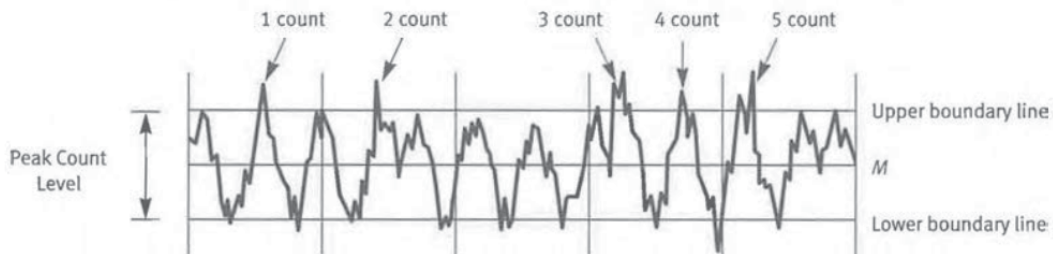
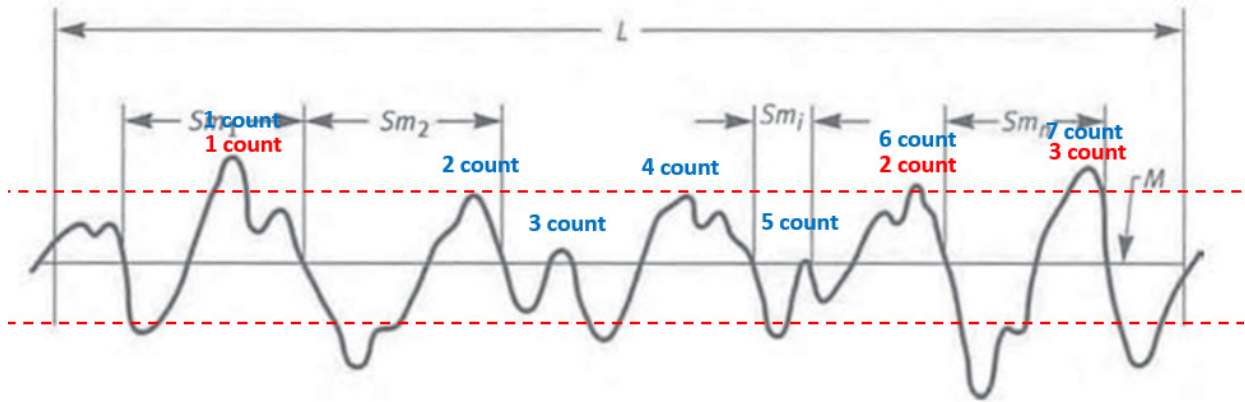


Fig. 1-14 The Peak Count Level, Used for Calculating Peak Density



EX1021, FIGs. 1-13, 1-14.

Petitioner's declarant, Dr. Randall, opines that these figures provide "the *same* definition of R_{pc} as recited in the claim language of [1e]." EX1003, ¶32. Not so. They do not specify (1) a unit sampling length of 4 mm; (2) upper criteria line of 0.5 μm ; (3) lower criteria line of 0.5 μm ; or (4) even how the surface profile is obtained—all features specifically recited by [1e]. An annotated version of Exhibit 1021's Figure 1-13 below illustrates the significance of criteria lines in an R_{pc} measurement:



EX1021, FIG. 1-13 (annotated).

The dashed red lines show exemplary criteria lines, with corresponding peak counts shown along the profile. The peak count would be seven if measured without the criteria lines (annotated in blue) and three if measured with the criteria lines (annotated in red). And depending on where the criteria lines are, one would measure a peak count that falls in between this range. Thus, a reference that does not disclose the height of the criteria lines cannot disclose or render obvious the claimed Rpc limitations.

Finally, Petitioner's reliance on the DIN EN 10049 2014 Standard (EX1036) fails for the same reason: this standard explains that there must be a defined upper and lower "section line" for consecutive intersections, calculated over a specified evaluation length. EX1036, 14 (showing a figure similar to Exhibit 1021's Figure 1-14 and the '090 patent's Figure 2).

The Petition concludes that "Rpc (peak count roughness), as claimed in the '090 Patent" is a well-recognized measurement parameter. Pet., 11. Whether or not

Rpc is generally known, all of Petitioner's references recognize there must be a specified upper criteria line, lower criteria line, and sampling length. None of these are disclosed by Petitioner's applied references. And Petitioner does not even attempt to explain why a POSA would have used the claimed values (+/- 0.5 μ m criteria lines and sampling length of 4 mm) in view of the references it relies on.

2. Rpc cannot be obtained from other surface roughness parameters such as Rsm/Sm, Ra, or Rz/Rzjis.

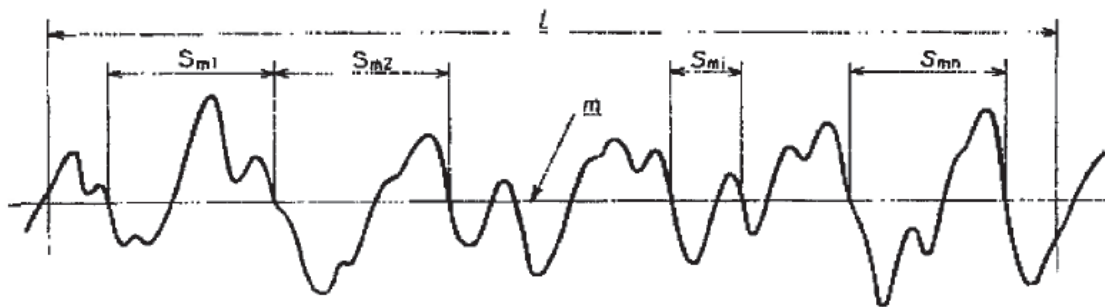
Contrary to Petitioner's claim, Pet., 12, Rpc *cannot* be obtained from other surface roughness parameters such as Rsm or Sm. Rsm and Sm relate to distance between peaks and do not take into account any criteria-line crossing determinations. In contrast, Rpc *requires* (1) an upper criteria line to be specified, (2) a lower criteria line to be specified, so that (3) only peaks that consecutively cross these lines are counted along (4) a specified sampling length. Rsm and Sm do not. *See, e.g.*, EX1025, ¶¶50-52; EX1020, 11, 40; EX1021, 21-22, FIGs. 1-13, 1-14; EX1036, 14. Petitioner's attempt to infer Rpc from Rsm fails for the same reasons the Applicant explained during prosecution. *See* EX1002, 61-63 (successfully arguing that Rpc cannot be determined from "the distance between peaks").

Petitioner cites the DIN EN ISO 4287 standard (EX1019) for the proposition that $R_{pc} = L / R_{sm}$. But the DIN EN ISO 4287 standard is plain that the peak count calculation *requires* height discrimination, EX1019, 17, defined as "minimum

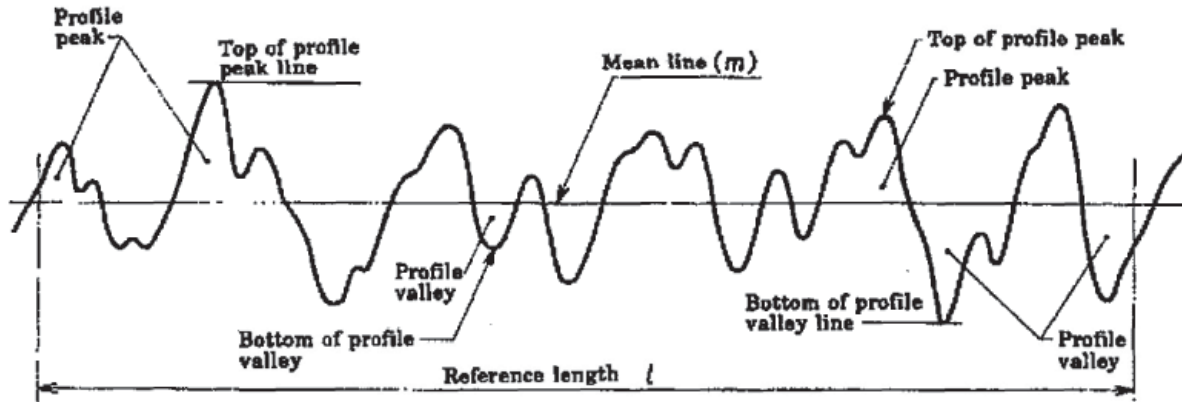
height . . . of profile peaks and profile valleys of the assessed profile which should be taken into account.” EX1019, 12. The DIN standard thus does not support Petitioner’s assertion that R_{pc} and R_{sm} are in a simple inverse relationship. Further, Exhibit 1019 discloses that the “default height discrimination” shall be 10% of R_z , EX1019, 17, 18, and that the preferred (and only) reference length is 10 mm, EX1019, 18, both of which are *different* from the claimed conditions for the criteria lines and sampling length (i.e., $\pm 0.5 \mu\text{m}$ and 4 mm, respectively).

Petitioner also cites JIS B 0601. Pet., 13; EX1017. But that standard also shows that R_{sm}/S_m , *see, e.g.*, EX1017, FIG. 5, does *not* require criteria-line crossing discrimination. This is evident from Exhibit 1017’s S_m -related figures, which show *no criteria line at all*:

Fig. 5. Determination of S_m



EX1017, FIG. 5.



EX1017, FIG. 1(b).

See also EX1018, 7 (defining profile peak and profile valley as connecting two adjacent points of the intersection of the profile with the X-axis), 14 (explaining RSm and requiring height discrimination and spacing discrimination, provided in percentages of maximum height and percentage of the reference length); EX1023, 9 (noting that RSm “is used to evaluate the horizontal size of parallel grooves and grains instead of the height parameters.”).

Nor do the other roughness parameters relied on by Petitioner, namely Ra and Rz, support Petitioner’s attempt to derive Rpc from Rsm. Pet., 15-16. Ra measures *absolute deviation* from the mean height and treats peaks and valleys equivalently—it cannot be used to derive Rpc. Similarly, because Rz represents the average magnitude of the five highest peaks and valleys, Rz provides no information about the number of peaks that cross certain threshold values within a sampling length. Indeed, these are precisely the roughness measurements that were successfully distinguished during prosecution. See EX1002, 61-63 (distinguishing

from Rz, Rzjis), 42-43, 71-72 (overcoming Shinozaki, which discusses Ra).

A simple, intuitive figure illustrates Petitioner's illogical assumptions. Two exemplary surfaces shown below¹⁰ with specified unit-less peak heights (2, 4, 6, or 8 as marked in the figure) have the *same* sample length, *same* Ra, *same* Rz, and *same* Rsm/Sm. Yet, depending on where the criteria line is set, the two samples would have *different* Rpc values along the length shown:

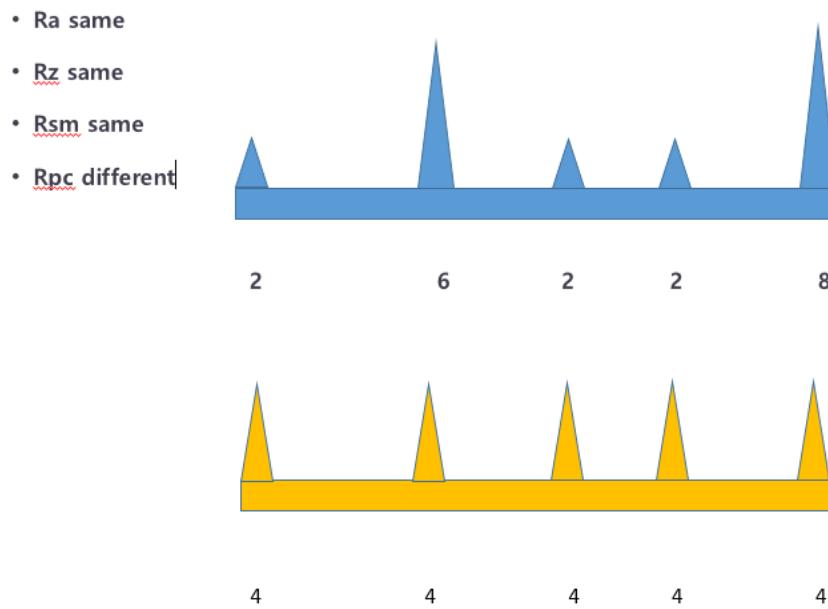


FIG. A.

In sum, for the same reasons discussed during prosecution, Petitioner's attempt to derive an Rpc value via different roughness parameters such as Rsm

¹⁰ For purposes of illustration, the figures show only the peaks and not the valleys.

strains credulity. This bleeds into Petitioner’s failure, discussed below, to demonstrate a sufficient motivation to modify and combine the references and establish a reasonable expectation of successfully arriving at the claimed electrolytic copper foil for a secondary battery.

3. Shinozaki: Grounds 1A and 1B

Shinozaki was applied and overcome during prosecution. EX1002, 42-43, 71-72. Petitioner provides no reason for the Board to revisit Shinozaki. In attempting to arrive at the claimed Rpc range, Petitioner (1) makes unreasonable assumptions about Shinozaki’s example data, (2) applies a convoluted Gaussian analysis that is unsupported by any reference, and (3) stretches its “recognized result-effective variable” rationale beyond reason.

a. Petitioner’s “first approach” suffers fatal flaws.

Shinozaki—like the other references—does *not* disclose any Rpc values. Petitioner’s attempt to re-write Shinozaki’s disclosures should be rejected.

Acknowledging that Shinozaki’s data it relies upon “do not specify upper and lower criteria lines”, Pet., 15, Petitioner and Dr. Randall propose *adjusting the measurement conditions to manipulate the Rpc*. Specifically, Dr. Randall opines that, “by *controlling Rpc based on its peak height threshold* (which can be similar to a height-related parameter, such as Ra), a POSITA can obtain certain surface profile characteristics, such as consistency or distribution of peaks that meet the

threshold height.” EX1003, ¶17. But what Dr. Randall is suggesting is that a skilled artisan would *control* the peak height threshold to control Rpc, rather than *measure* or *evaluate* Rpc based on a specified peak height threshold. EX1003, ¶17. This is backwards—a POSA would control surface characteristics or functional properties of a material (e.g., through manufacturing processes) and *then* measure the Rpc using agreed-upon criteria lines and sampling length to provide a quantified number of effective peaks to characterize the material. To change upper/lower criteria lines or sampling length, as Petitioner proposes, results in an apples-to-oranges comparison that cannot be reconciled with the claims.

Petitioner’s attempt to derive Rpc “*without considering the upper/lower criteria lines*,” Pet., 15-16, falls flat in view of Petitioner’s own background references. These teach that, to measure Rpc, one must set the criteria lines and sampling length. *See, e.g.*, EX1025, ¶¶50-52; EX1020, 11, 40; EX1021, 21-22, FIGs. 1-13, 1-14; EX1036, 14. Petitioner also simply assumes a 4-mm sample length without explaining why a POSA would have selected this sample length. Pet., 15.

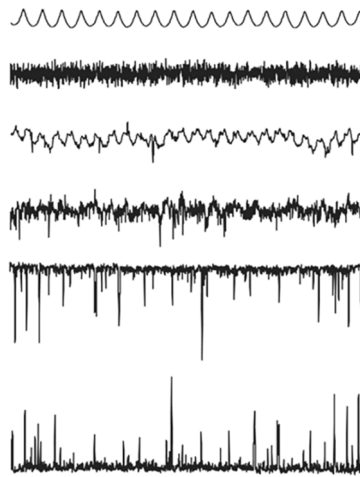
The Petition first relies on Dr. Randall’s unsupported assertion that one of Shinozaki’s example Ra values, namely 0.46 μm (mean absolute deviation of the surface profile from the central mean line, Pet., 6 n.4), can be used “as [a] proxy for the upper and lower criteria lines of $\pm 0.5 \mu\text{m}$.” Pet., 15 (citing EX1003, ¶41).

But the Petition provides no reason this value could be used as a proxy for the claimed features. Dr. Randall's assertion is merely a cherry-picked value that happens to be near, but not even the same as, the claimed upper and lower criteria lines (for both sides of the foil) of $\pm 0.5 \mu\text{m}$. Shinozaki does *not* describe *any* criteria lines, nor does it disclose that its Ra value could or would be a proxy for *any other surface characteristic*. See, e.g., EX1004, Table 3; see also EX1002, 60-63.

Petitioner then makes another unsupported assumption that a skilled artisan “would have known to estimate that approximately half of the peaks and valleys in Shinozaki's example will rise above and fall below the Ra or upper/lower criteria lines of $\pm 0.5 \mu\text{m}$.” Pet., 16; EX1003, ¶42. But Ra—as the Petition acknowledges—does not describe any distribution of peaks; rather, it just represents the average roughness, “calculated as the mean absolute deviation of the surface profile from the central mean line over a specified sampling length.” Pet., 6 n.4. Simply put, an Ra value by definition cannot provide any information about the number of peaks, location of peaks along a surface, or any single peak's height relative to a criteria line. Shinozaki does not suggest otherwise. Indeed, Shinozaki does not disclose any criteria lines or peak counts, much less support the inference that Ra can be used to determine the R_{pc}.

As discussed above, see Section VI.B, with respect to Petitioner's

background references, Ra measures *absolute deviation* from the mean height, and it treats peaks and valleys equivalently.¹¹ So there is no support for Petitioner's assertion that half of Shinozaki's peaks will be above or below the mean line. Pet., 16; *see also* Pet., 19 (similar misstatements related to Rz as an average measurement). Ra *cannot* distinguish the location of surface features across a profile. Indeed, a surface with randomly scattered peaks along a profile can have the *same* Ra as a surface with those same peaks clustered at one end of the profile. As an example, each of the six very different surfaces shown below all have similar Ra values—Ra does not give any information about peak count:



EX2017, 7.

¹¹ Because Rz represents the sum of the absolute values of the five highest peaks and the absolute values of the five lowest valleys, divided by 5, Rz similarly cannot be used to derive Rpc.

Similarly, as also discussed for Petitioner's background references, R_{pc} *requires set* upper and lower criteria lines for one to determine qualifying peaks, but R_{sm}/S_m does not. *See, e.g.*, EX1025, ¶¶50-52; EX1020, 11, 40; EX1021, 21-22, FIGs. 1-13, 1-14; EX1036, 14. The Petition states that S_m is the mean value of the profile element widths within a sampling length, but also that S_m does not specify any criteria line qualification for profile elements. Pet., 13-14. So, without any indication from a reference such as Shinozaki that its R_{sm}/S_m values discriminate based on the same set upper and lower criteria lines and count peaks in the same way, they simply cannot be used to calculate R_{pc} .

Indeed, the Petition implicitly acknowledges this. It states that Dr. Randall (even after his aforementioned convoluted math and assumptions) also assumes that there may not always be peaks and valleys which consecutively exceed his contrived criteria, so “the actual R_{pc} is likely to be slightly less than, if not equal to, the R_{pc} estimate” that he himself created for Shinozaki's Working Example 6. Pet., 16 (citing EX1003, ¶43). But neither the Petition nor Dr. Randall explains how a skilled artisan would be able to estimate—based on Shinozaki's material—how many peaks and valleys are *not* consecutively exceeding his own criteria, since there is no actual profile information contained in Shinozaki. As a result, there is no way to evaluate—even under Dr. Randall's first approach—to what extent he believes the “actual R_{pc} ” would be less than his R_{pc} estimate.

Accordingly, Shinozaki does not disclose or render obvious the Rpc features as claimed in [1c]-[1e] under Petitioner's first approach.

b. Petitioner's "second approach" also suffers fatal flaws.

Petitioner calls Dr. Randall's second approach a "more mathematically rigorous approach." Pet., 17. In actuality, it relies on fabricated data and unsupported assumptions. Dr. Randall requires Shinozaki's data to be entirely "re-developed," (Dr. Randall's words) and forced into a Gaussian distribution. Pet., 17; *see* EX1003, ¶¶44-57. Dr. Randall then layers on multiple unreasonable assumptions under the guise of "mathematical[] rigor[]." Dr. Randall's convoluted analysis merely underscores baselessness of Petitioner's obviousness analysis. Pet., 17; *see* EX1003, ¶¶44-57.

As an initial matter, Petitioner points to Bhushan (EX1024) to support Dr. Randall's Gaussian "re-development" of Shinozaki's data. Pet., 17. But Petitioner and Dr. Randall ignore Bhushan's guidance in order to make use of a Gaussian model and assumption, a "goodness of fit" test should be applied. As Bhushan explains:

The most practical method for the goodness of the fit between the given distribution and the Gaussian distribution is to use the Kolmogorov-Smirnov test [A] calculation is made to determine if the distribution is indeed Gaussian The chi-square test (Siegel, 1956) can also be used to determine how well the given distribution matches a Gaussian distribution.

EX1024, 10. Neither Petitioner nor Dr. Randall attempts to explain how to confirm that Shinozaki, or any other reference for that matter, would actually be Gaussian. A “goodness of fit” test is of no use, since it is Dr. Randall’s manufactured data, not Shinozaki’s actual data, that he forces into a Gaussian distribution. Petitioner also ignores Bhushan’s comments related to other roughness parameters or profile types. For example, Bhushan notes that “a profile with a very narrow spectrum has no peaks below a mean line, whereas a white noise profile with infinite spectral width has half of its peaks below this line.” EX1024, 26 (further demonstrating the unreasonableness of Petitioner’s first approach, since peak *spectrum* would affect peak *count*).

Worse yet, the Petition goes on to re-write Shinozaki’s data, randomly multiplies Shinozaki’s Ra values by 2 to guess at an average peak-to-valley height of the surface profile, and then shoehorns this re-written data into a Gaussian distribution. *See* Pet., 18-22. Even in this second approach, Petitioner admits that it “derive[s] [Rpc] from Sm without considering the upper/lower criteria lines.” Pet., 19-20. Nothing about this convoluted approach makes sense or would have been obvious.

c. Rpc is not a recognized result-effective variable.

Further to the two flawed approaches discussed above, Petitioner attempts a catch-all approach. Petitioner baldly asserts that Rpc is a recognized result-

effective variable, and so it would have been obvious to optimize the applied art to satisfy the claimed ranges. Pet., 23. But it is the '090 patent's claims and specification *alone* that describe the effect of Rpc, discovered by the '090 patent's inventors—not any of the Petitioner's art.

Even assuming that there was motivation to optimize the applied art, Petitioner's obviousness analysis fails because the claimed variable (here, Rpc as recited in [1c]-[1e] and described the '090 patent's specification) was *not recognized* in the prior art as a result-effective variable. *E.I. Dupont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1008 (Fed. Cir. 2018). In *E.I. Dupont*, the Federal Circuit explained that:

The idea behind the “result-effective variable” analysis is straightforward [A] person of ordinary skill would not always be motivated to optimize a parameter “if there is no evidence in the record that the prior art recognized that [that] particular parameter affected the result.” *Antonie*, 559 F.2d at 620. For example, in *Antonie* the claimed device was characterized by a certain ratio, and the prior art did not disclose that ratio and was silent regarding one of the variables in the ratio. *Id.* at 619. Our predecessor court thus reversed the Board's conclusion of obviousness. *Id.* at 620 In summarizing the relevant precedent from our predecessor court, we observed in *Applied Materials* that “[i]n cases in which the disclosure in the prior art was insufficient to find a variable result-effective, there was essentially no

disclosure of the relationship between the variable and the result in the prior art.” 692 F.3d at 1297.

E.I. Dupont, 904 F.3d at 1008-09. This is directly on point here, where *none* of Petitioner’s art supports that Rpc—as claimed and described by the ’090 patent—was a recognized result-effective variable.

i. Petitioner’s art does not recognize Rpc as result-effective.

Petitioner cites Shinozaki’s disclosure that one could control Ra and Rz to achieve certain purported advantages such as increasing anchoring or avoiding voids. Pet., 23; EX1004, ¶¶73-74. But as discussed above, Shinozaki does *not* disclose Rpc, and neither Ra nor Rz provide a skilled artisan with information related to a surface’s Rpc, let alone measured in the way recited by [1c]-[1e]. That Shinozaki allegedly discloses Ra and Rz as relevant parameters for controlling a material’s surface does not mean that Shinozaki discloses that Rpc is a result-effective variable. *See* Pet., 23, 25, 27.

Petitioner also references Gadelmawla as allegedly supporting its result-effective argument. Pet., 26 (citing EX1016). But Gadelmawla distinguishes between *height* parameters like Ra, Rz, *see* EX1016, 1-3, and *spacing* parameters like peak count, EX1016, 7-8. *See also* EX1016, 4-6 (demonstrating that Gaussian distribution of peaks is not a reliable assumption due to skewness/kurtosis). Gadelmawla does emphasize that in pressing sheet steel or producing brake drums,

controlling certain spacing parameters may be desirable. EX1016, 7-8. But Gadelmawla gives no particular guidance to a skilled artisan. *See E.I. Dupont*, 904 F.3d at 1008. For example, although Gadelmawla generally states that “controlling the spacing parameters [makes it] possible to obtain better bounding of finishes, more uniform finish of plating and painting,” such a statement does not support the proposition that R_{pc} is a result-effective variable. EX1016, 7.

Petitioner misrepresents Gadelmawla by changing “bounding” in the text to “bonding,” Pet., 23, presumably attempting to draw a parallel to the ’090 patent’s adhesion benefits. While Gadelmawla states that in some instances, controlling spacing parameters may obtain *better bounding* (e.g., better marking or forming of the limits) *of finishes* resulting in more uniform finish of plating and painting, EX1016, 7, Gadelmawla does not include any statement associating spacing parameters and adhesion. Further, under Dr. Randall’s own words, Gadelmawla is about “frictional contact or mechanical grip” such as in brake drums, and has nothing to do with a current collector and active material of secondary batteries. Pet., 23-24 (citing EX1003, ¶63). While Gadelmawla acknowledges that the “importance of the peak count parameter appears in some manufacturing processes such as forming, painting, or coating surfaces,” Gadelmawla does not provide any detail *at all* about how the parameter may influence these manufacturing processes or products produced by such processes. EX1016, 7. And—just like Petitioner’s

other references—Gadelmawla still recognizes the distinction between peak count and Sm. EX1016, 7-8.

Finally, as with Petitioner’s first and second approaches, *see* Sections VII.B.3.a.-VI.B.3.b, Petitioner acknowledges Rpc is categorized as a spacing parameter. Pet., 24. But in the same breath, Petitioner advances an illogical premise. Petitioner alleges that because Rpc uses upper/lower criteria lines, Rpc determination “establishes a correlation with height . . . parameters” like Ra, even though there is no connection to a sample length or criteria lines of Rpc, as claimed. Pet., 24. Petitioner continues:

Therefore, if Rpc’s upper/lower criteria lines are set to values such as $\pm 0.5 \mu\text{m}$ that are similar to average height Ra value(s) taught in Shinozaki (e.g., Ra of 0.25-0.7 μm), then Rpc becomes correlated with Ra, as they both express height characteristics.

Pet., 24; *see also* EX1003, ¶64 (“In other words, Ra and Rpc are correlated in certain scenarios.”). But these are unreasonable premises. As explained above, there is no relation between Ra and any criteria lines as required by Rpc, and these premises are not supported by *any* of Petitioner’s references.

ii. Petitioner admits that it is artificially controlling Rpc rather than measuring Rpc as specified by the claims.

Petitioner admits, *see* Pet., 24, 26, 29, that it is artificially “*controlling* Rpc” “based on its height characteristics (e.g., upper/lower criteria lines),” or Ra. Pet.,

24. This underscores Petitioner’s hindsight analysis of the critical, specifically claimed Rpc ranges. Petitioner asserts that its approach “target[s] and obtain[s] certain surface profile characteristics.” Pet., 24.

But changing a measurement’s upper/lower criteria lines does nothing to change surface profile characteristics, only its expressed measurements. A simple example illustrates the unreasonableness of Petitioner’s assumption. Assume a customer orders a product with a specified Rpc and specifies the upper and lower criteria lines and sample/evaluation length to be used in the measurement of Rpc. Petitioner’s rationale would allow a manufacturer to pick and choose its *own*, *independent* criteria line to meet the customer’s Rpc requirements.

Only the ’090 patent—not Petitioner’s art or declarant—explains the criticality of the specifically measured (and claimed) Rpc ranges the inventors discovered:

When the peak count roughness Rpc, is less than 10, capacity maintenance of the secondary battery is deteriorated. This is because the stress caused during the charge/discharge of the secondary battery is concentrated on mountains which locally protrude.

Furthermore, when the peak count roughness Rpc, exceeds 100, capacity maintenance of the secondary battery is also deteriorated. This is because the active material cannot be uniformly coated on the electrolytic copper foil 111 due to the excessive number of mountains.

EX1001, 5:46-55. Artificially controlling Rpc, as Petitioner suggests, rather than actually measuring Rpc as specified by the claims, is an act of impermissible hindsight. It ignores the language of the claims and any reasonable reading of Petitioner's art.

iii. Petitioner's background art does not cure the defects of the asserted Grounds.

None of Petitioner's background art cures the deficiencies in Petitioner's Rpc arguments. Petitioner asserts that Fabian (EX1005) shows Rpc values are useful for enhancing uniformity or void reduction of a copper foil surface. Pet., 25. But Fabian does not support Petitioner's assertion. Rather, just like Petitioner's other references, Fabian expressly states that a "surface profile can have the same surface roughness with a different number of PPC [(peaks-per-centimeter), similar to peak count]." EX1005, 7-8. And Petitioner acknowledges that Fabian does not provide the criteria lines for its PPC measurements (buried in Footnote 8) *and* assumes that Fabian's PPC measurement can be translated to the claimed 4 mm unit sampling length (buried in Footnotes 9 and 10). Petitioner's statement of a generic desire to "enhance uniformity or void reduction of copper foil surface," Pet., 30, is merely a bald assertion about what could have been achieved at the time of the invention.

Petitioner also contends that "[a]lternatively and/or additionally" Fabian's PPC values could be used to form a current collector for secondary batteries, and

that Fabian supports that the R_{pc} range in the '090 patent's claims was known to be effective for surface adhesion characteristics. Pet., 30-32. Not so. As a threshold matter, Fabian fails to support Petitioner's contention that PCB and microelectronics electrodeposited copper foils are compatible with use in secondary batteries. Pet., 30. Fabian is *solely* related to PCB and IC, and Fabian does not even describe PPC's effect on *those applications*. See generally EX1005; see also EX1011 (passing reference to battery applications tied only to R_z and R_{max}, not R_{pc}); EX1007, ¶107 (passing battery reference tied only to maximum peak to valley height P_V, R_{zjis}, and maximum waviness height W_{max}—all *height* parameters and *not spacing* parameters); EX1008 (discussing R_z or “degree of mirror gloss of the roughness surface” only).

Indeed, Dr. Randall acknowledges Fabian's shortcomings. Discussing claim 3, Dr. Randal states that “as explained in Fabian, ‘[a] surface profile can have the same surface roughness with a different number of PPC [R_{pc}].’” EX1003, ¶80; Pet., 34-35. Dr. Randall paraphrases, further distancing himself from his previous analysis that erroneously ties R_z to R_{pc}, see EX1003, ¶¶39, 46-57,: “In other words, a surface profile can have the same R_{pc} value while having a different surface roughness R_z value, unless the R_z value is significantly changed (e.g., to less than 1 μm) so as to affect the number of peaks that cross the upper and lower criteria lines in determining R_{pc}.” EX1003, ¶80. Dr. Randall's admissions are fatal

to Petitioner's attempt to shoehorn Rz into a metric that can be used to derive Rpc. These admissions are not surprising given this was already explained during prosecution. EX1002, 61-63.

4. Sano + Griesi: Grounds 2A and 2B

For Grounds 2A and 2B, Petitioner relies on the disclosures of Rz in both Sano(EX1008) and Griesi (EX1015) in the same way it relies on Shinozaki's Rz features for Grounds 1A and 1B. Pet., 45-46. As described above with respect to Shinozaki, Rz cannot be used to determine Rpc. Pet., 45-46; Sections VII.B.2, VII.B.3; EX1002, 60-63 (distinguishing Rz during prosecution). Because Rz represents the average magnitude of the five highest peaks and valleys, Rz provides no information about the number of peaks that cross certain threshold values within a sampling length. Petitioner's reliance on Rz in Sano and Griesi thus fails for the same reasons discussed above with respect to Shinozaki and as the Applicant explained during prosecution. *See* Sections VII.B.1-VII.B.3, VI; EX1002, 61-63.

Petitioner further points to a single figure in Griesi showing a "receipt" from a perthometer. Pet., 48; EX1015, 54. Although the receipt includes an "RPc" value, Griesi provides no context or discussion as to what the "RPc" value represents or how it is measured. Indeed, Griesi states that the perthometer "does not record discrete data points" and discloses no data points underlying the single receipt. So

it is impossible to ascertain what Griesi's "RPc" represents and how it is measured. Tellingly, Petitioner cannot even assert that Griesi's "RPc" was measured with a sample length of 4 mm and criteria lines of +/- 0.5 μm , as claimed.

Additionally, Patent Owner notes that Petitioner provides inconsistent statements regarding Griesi's availability as a prior art printed publication. The Petition alleges Griesi published on December 15, 2014. Pet., 2. Yet Petitioner's Munford Declaration asserts that not until January 21, 2015 was Griesi "available to download," but also that due to some self-citing at a conference, perhaps Griesi's publication date is "no later than May 22, 2015." EX1040, ¶14. As shown elsewhere in the Munford Declaration attachments, the conference in question was apparently in May 2015. EX1040, ¶¶13-14; EX1040, 60, 61. But the date the conference paper *citing* Griesi was added to IEEE Xplore was not until July 27, 2015, EX1040, 160, which is *a full month after* the June 24, 2015 Critical Date applied by the Petition. Pet., 1-2.

Thus, given the ambiguity of Griesi's publication date, Petitioner has not even shown that Griesi qualifies as a prior art publication. *See, e.g., Argentum Pharms. LLC v. Research Corp. Techs., Inc.*, IPR2016-00204, Paper 19 (P.T.A.B. May 23, 2016) (informative) (petitioner unable to demonstrate that a doctoral thesis was a printed publication); *In-Depth Geophysical, Inc. v. ConocoPhillips Co.*, IPR2019-00849, Paper 14 (P.T.A.B. Sept. 6, 2019) (informative) (petitioner

unable to demonstrate that a conference paper was a prior art printed publication); *First Solar, Inc. v. Rovshan Sade*, IPR2023-00827, Paper 13 (P.T.A.B. Nov. 16, 2023).

In sum, Ground 2A follows the same formula as Ground 1A, Pet., 45-51, pointing to Petitioner's same, faulty assumptions—and thus Ground 2A similarly fails. *See* Section VII.B.3. Ground 2B addresses only dependent claims and fails for at least the same reasons as Ground 2A.

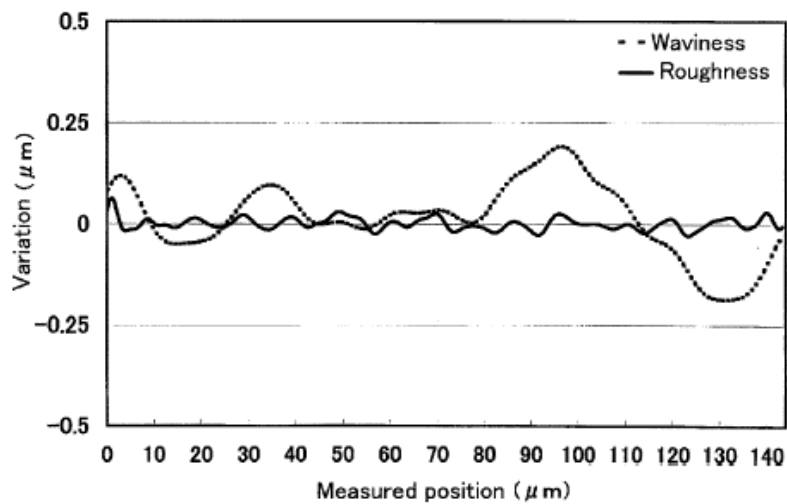
5. Dobashi: Ground 3

Petitioner's Dobashi Ground fails because it relies on a child of a reference considered in prosecution, any of its actual examples fail to meet the claim limitations, and Petitioner's generated data includes substantially similar flawed assumptions as the other Grounds. Dobashi's (single reference in Ground 3) parent application's publication was cited in an IDS as WO2007105635A1 (the "'635 publication") and considered by the Office. EX1002, 98, 85 (noting all references considered). As Dobashi's direct parent via national stage entry, the '635 publication has the same disclosures as Dobashi and includes all of the disclosures that Petitioner now relies on. Nonetheless, Petitioner's Ground 3 relies solely on Dobashi (EX1007). None of Petitioner's argument warrants revisiting the Office's decision to allow the claims over the '635 publication. Dobashi's objective is to produce low profile foils, having small waviness for use in printed wiring boards;

and Dobashi seeks to achieve that objective by focusing on Rzjis (average distance between the five highest peaks and lowest valleys over the sampling length). *See, e.g.,* EX1007, ¶¶1-3, 10, 57, FIGs. 1, 2.

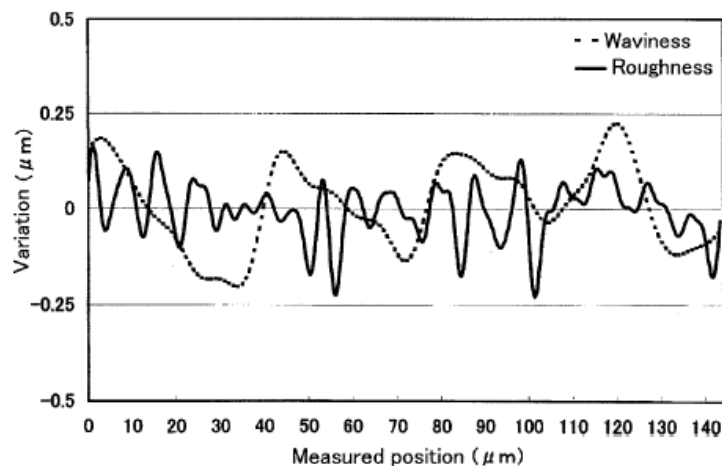
Dobashi's Figures 5 and 6 are illustrative, showing no peaks or valleys above or below 0.5 μm as specified in [1c]-[1e]:

Fig 5



EX1007, FIG. 5.

Fig 6



EX1007, FIG. 6.

Even under Petitioner's faulty analysis based on Rzjis and PV (maximum peak to valley height), Pet., 67-70 (faulty in substantially the same way as described in Section VII.B.3 for Shinozaki), Dobashi's actual examples do not meet the claims. Each of Dobashi's seven actual examples have Rzjis and PV of less than 1, as shown in Dobashi's Table 2:

TABLE 2

Subject	Deposit side of electro-deposited copper foil							
	Copper foil thickness (μm)	Three-dimensional surface structure analysis			Stylus-type roughness meter		Gloss Gs (60°)	
		Wmax	PV	Wmax/PV	Rzjis	RSm	TD	MD
		(μm)	(μm)	(-)	(μm)	(mm)		
Example 1	15	0.37	0.39	0.949	0.32	0.19	659	665
Example 2	12	0.45	0.48	0.938	0.31	0.16	664	671
Example 3	70	0.065	0.079	0.823	0.17	0.39	691	686
Example 4	15	0.27	0.30	0.904	0.29	0.18	790	790
Example 5	15	0.36	0.39	0.943	0.31	0.16	775	773
Example 6	12	0.42	0.44	0.959	0.47	0.22	654	687
Example 7	12	0.58	0.66	0.869	0.71	0.14	608	640
Comparative Example	12	0.82	1.87	0.439	1.00	0.07	324	383

EX1007, Table 2 (annotated).

This means that, even under Petitioner's assumptions, *no peaks* of Dobashi's actual examples would count towards the claimed Rpc as defined in [1c]-[1e], because no peaks would rise or fall above or below $\pm 0.5 \mu\text{m}$.

With no actual qualifying surface examples from Dobashi to rely upon, Petitioner cites Dobashi's Rzjis and Rsm (in the same way as Shinozaki's Rz and Sm), along with Dobashi's maximum peak to valley height PV. Pet., 65-66. As an

initial matter, as confirmed during prosecution, these parameters do not involve counting the number of peaks and valleys that exceed criteria lines. *See, e.g.*, EX1002, 71-72; Section VI. Thus, they are not related to Rpc in any way. Dobashi does not suggest otherwise. Just like Petitioner's other art, Dobashi is not concerned *at all* with Rpc and does not even mention it once.

Similar to the Shinozaki analysis, Pet. 17-19, Petitioner contrives “manually generated hypothetical surface profiles,” for Dobashi, Pet., 68, and then attempts to convert non-Rpc metrics to Rpc measurements. But Petitioner provides no justification for this manipulation. Indeed, as shown above, Dobashi's actual examples do not have *any* peaks that would be counted under [1c]-[1e]. Finally, Patent Owner notes that only Dobashi's *comparative example* of a foil includes an Rzjis of 1.00, underscoring Petitioner's and Dr. Randall's errors in applying it in their math related to Dobashi's foils. *See* EX1007, Table 2 (annotated), above.

Ground 3 follows the same formula as Ground 1A, even pointing to those sections for Petitioner's same, faulty assumptions—and thus Ground 3 similarly fails. *See* Section VII.B.3.

C. All Grounds fail to show a reasonable expectation of success (and/or a motivation to combine references).

Petitioner relies on unsupported (and incorrect) assumptions that *all* material characteristics of copper foil may be mixed-and-matched without regard to each other. Petitioner's cursory analysis fails to articulate reasons *why* such features

would have been modified or combined. And fundamentally, Petitioner fails to show any predictable impact on copper foil performance of varying material characteristics or manufacturing methods, while even acknowledging such performance depends upon myriad parameters.

The Board properly denies institution where the petitioner does not show a reasonable expectation of success in combining asserted references. *See, e.g., NJOY*, IPR2024-00536, Paper 17; *Honeywell*, IPR2024-00493, Paper 7; *see also Eli Lilly & Co. v. Teva Pharms. Int'l GmbH*, 8 F.4th 1331, 1344 (Fed. Cir. 2021) (A finding that a patent challenger in an *inter partes* review demonstrated a motivation to combine references does not necessarily imply that the challenger also met its burden of showing a reasonable expectation of success in achieving a claimed method of treatment.). For example, in *Juniper Networks, Inc. v. Correct Transmission, LLC*, IPR2021-00682, Paper 26 at 23 (P.T.A.B. Oct. 3, 2022), the Board observed that the “Petitioner [Juniper] leaps silently over the requirement to evidence a reasonable expectation of success to establish obviousness” and, as a result, “[found] Petitioner’s alleged evidence of the requisite reasonable expectation of success fails to meet its evidentiary burden.” Here too, Petitioner’s analysis is cursory. And it ignores suggestions from its own art that show a *lack* of expected success.

The burden of proof is on Petitioner, not Patent Owner. Indeed, importantly,

the literature need not demonstrate an expectation of *failure* for the claimed features (here, for example, Rpc as claimed in [1c]-[1e], or the requirement for the Rpc range to be the *same* on the first and second surface). In order to withstand Petitioner's challenge—it is enough that the prior art supports no expectations one way or the other. *See Honeywell Int'l Inc. v. Mexichem Amanco Holdings S.A.*, 865 F.3d 1348, 1355 (Fed. Cir. 2017) (reversing PTAB's obviousness finding for improperly requiring patentee to show an expectation of failure, instead of properly finding no expectation of success—and thus nonobviousness—where the prior art gave no expectations one way or the other). Petitioner fails to meet its burden here.

1. Petitioner's cursory analysis fails to meet its burden.

Petitioner assumes that *all* material characteristics of copper foil have predictable impact on its performance regardless of the application and that teachings about the material characteristics apply equally across different applications. But Petitioner provides no support for this assumption.

Obviousness requires “a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” *KSR*, 550 U.S. at 418. Moreover, it is Petitioner's burden to demonstrate “that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.”

Intelligent Bio-Sys., 821 F.3d at 1367–1368 (citations omitted). Silence and assumptions are insufficient for a prima facie case of obviousness. *See Orexo AB v. Actavis Elizabeth LLC*, 903 F.3d 1265, 1273 (Fed. Cir. 2018) (finding that “silence is not a teaching or suggestion,” especially where the beneficial results could not be predicted); *Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368, 1379 (Fed. Cir. 2005) (finding that silence on a particular use for a known compound did not disclose that use for inherent anticipation or obviousness purposes).

Here, none of Petitioner’s references disclose the Rpc limitations, and the extensive modifications Petitioner proposes to fill that gap are unsupported by Petitioner’s cursory analysis. For example, Petitioner’s art teaches respective advantages for particular applications, *see, e.g.*, Sections VII.B.3-VII.B.5, but Petitioner provides *no sufficient reason* that a POSA would have been motivated to modify the references’ respective approaches. Indeed, in each set of modifications, *see, e.g.*, Pet., 27, 28, 30, 53, 61, 70, Petitioner focuses only on the individual references and provides no actual analysis of the specific combination or expected success. Tellingly, Petitioner never even uses the terms “modify” or “combine.” The governing law dictates that silence and assumptions are insufficient for Petitioner to demonstrate obviousness.

2. Petitioner’s own analysis demonstrates there would *not* have been a reasonable expectation of success.

Petitioner’s own analysis undermines that a POSA would have had a

reasonable expectation of success in making the proposed extensive modifications. Indeed, Dr. Randall acknowledges that manipulating or adjusting surface parameters of copper foil depends on myriad parameters or conditions. EX1003, ¶67 (noting parameters and conditions such as (1) electrodeposition conditions, (2) varying concentrations of additives, e.g., (3) organic additives, (4) electrolysis solution chemistry, which includes (5) copper sulfate and (6) sulfuric acid, (7) treatment time, and/or (8) current density, variation of additives such as (9) Guar or (10) APAM, (11) concentrations of electrolytic solutions and (12) their compositions). Dr. Randall does not explain how a POSA would have adjusted any of these conditions to arrive at the claimed Rpc features. The difficulty a POSA would face is compounded by the fact that none of the references provides any teaching or motivation to focus on Rpc in the first place, let alone disclose the effect that any of these parameters have on Rpc.

In fact, Petitioner's own cited art underscores the unpredictability and difficulty of controlling surface characteristics. *See* EX1004, ¶¶5 (noting the need for "selecting and adding various types of water-soluble polymers, various types of surfactants, various types of organic sulfur compounds, chlorine ions, or the like to an electrolytic solution"), 49-51 (controlling crystal grain size); EX1008, ¶¶5 (controlling concentration of chloride ions and glue or gelatin), 8 (selecting low-molecular-weight water-soluble cellulose ether, low-molecular-weight water-

soluble polyalkyleneglycol ether, low-molecular-weight water-soluble polyethyleneimine and water-soluble sulfonated organosulfur compound are added to an electrolyte), 13 (controlling polyoxyethylene surfactant, polyethyleneimine or its derivative, sulfonate of active organosulfur compound and chloride ions contained in an electrolyte of an aqueous solution of sulfuric acid/copper sulfate); EX1007, Abstract (using a sulfuric acid base copper electrolytic solution obtained by adding 3-mercapto-1-propanesulfonic acid or bis(3-sulfopropyl)disulfide, a quaternary ammonium salt polymer having a cyclic structure, and chlorine, and using a cathode having small surface roughness, under electrolysis conditions of carrying out continuous first-step electrolysis to n-th-step electrolysis at two or more different levels of electric current density). For at least these reasons, a POSA would not have had a reasonable expectation of success in making the proposed extensive modifications.

D. Petitioner failed to demonstrate a sufficient motivation to combine or reasonable expectation of success in combining Sano and Griesi in Ground 2.

Petitioner fails to demonstrate why circuit/printed circuit board (IC/PCB) art (such as in Griesi) would be relevant to secondary battery applications as claimed. But even if Griesi were analogous art (it is not), that is not sufficient to establish that one of ordinary skill would have had reason to combine Griesi's teachings with Sano. *See Securus Techs., Inc. v. Global Tel*Link Corp.*, 701 Fed. App'x 971,

977 (Fed. Cir. 2017) (“a broad characterization of [prior art references] as both falling within the same alleged field . . . without more, is not enough for [Petitioner] to meet its burden of presenting a sufficient rationale to support an obviousness conclusion”). Mere compatibility of the references is likewise not sufficient. *Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993 (Fed. Cir. 2017) (it is not enough to show that “a skilled artisan, once presented with the two references, would have understood that they could be combined”).

Sano discloses that its system is already adequate and performs as designed, particularly by controlling Rz to provide “low roughness without uneven surge.” EX1008, Abstract. No skilled artisan would look to Griesi—a thesis directed to a wholly unrelated “Snowball Model” for characterizing a single surface relative to conductor power loss in high frequency transmission for IC/PCB applications (an unrelated art)—to help solve a problem that Sano was not even concerned with. And Petitioner provides no reason a POSA would have attempted to apply Griesi’s purported “RPc” value to each side of Sano’s foil.

Petitioner alleges there was a desire to “further enhance uniformity or generally improve Sano’s copper foil surface.” Pet., 50. But other than this generic statement, Petitioner does not articulate why a POSA would have looked to Rpc values in particular to “improve” Sano’s copper foil surface. “Obviousness concerns whether a skilled artisan not only *could have made* but *would have been*

motivated to make the combinations or modifications of prior art to arrive at the claimed invention.” *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015). Just as in *Belden*, the fact that the combination *might* have been successful does not mean that an ordinarily skilled artisan would have been motivated to make the combination. *See Belden*, 805 F.3d at 1073.

Arguing that a combination of art would have been “intuitive,” “common sense,” or even “obvious” (as Petitioner does throughout its Petition here), without some articulated rationale, “is inadequate to support a finding that there would have been a motivation to combine.” *In re Van Os*, 844 F.3d 1359, 1361 (Fed. Cir. 2017). And the Petition’s conclusory rationale, *see, e.g.*, Pet., 30, 55, “tracks the *ex post* reasoning *KSR* warned of and fails to identify any actual reason why a skilled artisan would have combined the elements in the manner claimed.” *Van Os*, 844 F.3d at 1361; *KSR*, 550 U.S.

* * *

In Petitioner’s attempt to satisfy the ’090 patent’s claims, Petitioner strains to shoehorn deficient art into a deficient obviousness rationale. Based on Patent Owners arguments above, the Board should reject Petitioner’s arguments. *See, e.g., Kingston Tech. Co., Inc. v. North Star Innovations, Inc.*, IPR2018-01784, Paper 32 at 55 (P.T.A.B. Feb. 26, 2020) (rejecting petitioner’s obviousness arguments for “rest[ing] on hindsight” and “us[ing] the challenged patent as a roadmap to

reconstruct the claimed invention.”); *Intel Corp. v. VLSI Tech. LLC*, IPR2018-01033, Paper 32 at 88-89 (P.T.A.B. Feb. 6, 2020) (similar).

For at least the reasons discussed herein, Petitioner fails to meet its burden of showing a reasonable likelihood of prevailing as to claim 1. The remaining claims depend from claim 1, and thus, Petitioner also fails to meet its burden as to those claims.

VIII. Conclusion

The Petition fails to demonstrate a reasonable likelihood that any of the challenged claims is unpatentable as obvious in view of the cited art and, therefore, the Board should deny institution.

Respectfully submitted,

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CERTIFICATE OF WORD COUNT (37 C.F.R. § 42.24(d))

1. This Patent Owner Preliminary Response complies with the type-volume limitation of 14,000 words, comprising 13,566 words, excluding the parts exempted by 37 C.F.R. § 42.24(a)(1).

2. This Patent Owner Preliminary Response complies with the general format requirements of 37 C.F.R. § 42.6(a) and has been prepared using Microsoft® Word 2016 in 14-point Times New Roman font.

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CERTIFICATE OF SERVICE (37 C.F.R. § 42.6(e))

I certify that the above-captioned **PATENT OWNER PRELIMINARY RESPONSE UNDER 37 C.F.R. § 42.107(a)** and associated Exhibits 2001-2017 were served in their entireties on January 23, 2025, upon the following parties via electronic mail:

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