

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 IPR2024-01463
Patent 11,591,706

**PETITIONER'S REPLY TO
PATENT OWNER'S PRELIMINARY RESPONSE**

LIST OF EXHIBITS

SOLUS-1001	U.S. Patent No. 11,591,706 (“the ’706 Patent”)
SOLUS-1002	U.S. Patent No. 11,591,706 File History
SOLUS-1003	Declaration of Dr. Michael Randall
SOLUS-1004	Korean Patent Publication No. 10-2017-0000761
SOLUS-1005	Translation of SOLUS-1004 (“Kim ’761”) and Certificate of Translation
SOLUS-1006	RESERVED
SOLUS-1007	U.S. Patent No. 9,209,485 (“Cheng”)
SOLUS-1008	U.S. Patent No. 5,834,140 (“Wolski”)
SOLUS-1009	U.S. Patent No. 9,457,541 (“Kim ’541”)
SOLUS-1010	U.S. Patent Application Publication No. 2016/0260981 (“Lee”)
SOLUS-1011	WIPO Publication No. 2014/115681
SOLUS-1012	Translation of SOLUS-1011 (“Shinozaki ’681”) and Certificates of Translation ¹
SOLUS-1013	RESERVED
SOLUS-1014	U.S. Patent No. 8,715,836 (“Dobashi”)
SOLUS-1015	U.S. Patent Application Publication No. 2013/0108922 (“Shinozaki ’922”)
SOLUS-1016	U.S. Patent Application Publication No. 2015/0267313 (“Chou”)
SOLUS-1017	ASME B46.1-2009
SOLUS-1018	Excerpts from ASME B46.1-2019

¹ Title page translated by Michael Fletcher, remainder translated by Dwaine Palmer

SOLUS-1019	RESERVED
SOLUS-1020	U.S. Patent No. 10,547,081 (“Kim ’081”)
SOLUS-1021	JIS B 0601 (1994)
SOLUS-1022	JIS B 0601 (2001)
SOLUS-1023	U.S. Patent No. 9,365,942 (“Tsai”)
SOLUS-1024	U.S. Patent No. 7,789,976 (“Sano”)
SOLUS-1025	John A. Marshall, “Measuring Copper Surface Roughness for High Speed Applications”
SOLUS-1026	Declaration of June Munford
SOLUS-1027	Korean Publication No. 10-2014-0078883
SOLUS-1028	Translation of SOLUS-1027 (“Lee ’883”) and Certificate of Translation
SOLUS-1029	RESERVED
SOLUS-1030	Young, H. (1962). <i>Statistical treatment of experimental data</i> . McGraw-Hill.
SOLUS-1031	U.S. Patent Publication No. 2016/0212846 (“Kohiki”)
SOLUS-1032	Song et al., “Texture and temperature dependence on the mechanical characteristics of copper electrodeposits,” <i>Mat. Sci. and Eng. A</i> , 559 (2013) (“Song”)
SOLUS-1033	U.S. Patent Application Publication No. 2014/0302281 (“Yacovone”)
SOLUS-1034	RESERVED
SOLUS-1035	Harrington, G.F., Santiso, J. “Back-to-Basics tutorial: X-ray diffraction of thin films,” <i>J Electroceram</i> 47, 141–163 (2021)
SOLUS-1036	ASTM E8/E8M standard

- SOLUS-1037 RESERVED
- SOLUS-1038 RESERVED
- SOLUS-1039 *Modern Electroplating*, 3rd Ed., Ed. Lowenheim, J. Wiley and Sons, NY, 1974
- SOLUS-1040 Rodgers, *Professional Manual of Electroplating*, University Publishing House, Utah, pp. 115-129
- SOLUS-1041 Screen capture of www.textech.co.jp/en/products/foil-electrolytic (September 14, 2024)
- SOLUS-1042 Screen capture of www.denora.com/applications/copper-foil-electrodeposition.html (September 14, 2024)
- SOLUS-1043 Huang, "Studies of Interfacial Adhesion and Copper Plating Chemistry for Metallization of Through-Package-Vias in Glass Interposers," Thesis, Georgia Institute of Technology, December 2017
- SOLUS-1044 U.S. Patent No. 6,776,893
- SOLUS-1045 Vereecken et al., "The chemistry of additives in damascene copper plating," in IBM Journal of Research and Development, vol. 49, no. 1, pp. 3-18, Jan. 2005
- SOLUS-1046 *SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.*, Case 2-23-cv-00539 (EDTX), Proposed Scheduling Order
- SOLUS-1047 *SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.*, Case 2-23-cv-00539 (EDTX), Motion to Transfer Venue
- SOLUS-1048 Board Email of February 24, 2025 authorizing Petitioner's Reply
- SOLUS-1049 Federal Court Management Statistics (Dec. 31, 2024)
- SOLUS-1050 Amended Complaint, *SK nexilis Co., Ltd. v. Solus Advanced Materials Co., Ltd. et al.*, No. 2:23-cv-00539 (E.D. Tex. May 15, 2024)
- SOLUS-1051 Stipulation Letter

On February 24, 2025, the Board authorized a 5-page reply addressing issues of discretionary denial addressed in the Preliminary Response (“POPR”). Ex. 1048. Consistent with *Fintiv* and *Sotera*, discretionary denial is not warranted.

Fintiv Factor 1 is neutral: As Patent Owner (“PO”) acknowledges, this factor is at best neutral as the motion to stay remains pending. Moreover, in EDTX, motions for stays are routinely granted where all asserted claims are under PTAB review. *See AGIS Software Dev. LLC v. Google LLC*, No. 2:19-cv-361, 2021 WL 465424, at *3 (E.D. Tex. Feb. 9, 2021) (“[W]here the PTAB has instituted IPR proceedings . . . this Court has likewise routinely stayed cases[.]”).

Fintiv Factor 2 is neutral: In view of EDTX’s growing backlog of cases and Petitioner’s offered *Sotera* stipulation, *infra*, the potential for conflict between the district court case and the instant IPR proceeding is minimal. *See* Ex. 1049 (showing median time-to-trial having increased further from 21.9 to 23.0 months).

Fintiv Factor 3 favors institution: As PO acknowledges, there will have been no court issued substantive orders related to the ’706 Patent by the DI deadline, and fact discovery will also remain open. Moreover, the instant petition was filed within four months of PO’s amended complaint of May 15, 2024, in which the list of asserted patents was expanded, thereby adding further strain and uncertainty to Petitioner’s preparation efforts. *See* Ex. 1050 (amended complaint).

Fintiv Factor 4 favors institution: Petitioner hereby stipulates that, should the

Petition be granted, Petitioner will not pursue in the parallel district court proceeding the same grounds as in this Petition or any grounds that could have reasonably been raised in this Petition pursuant to *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020). *See* Ex. 1051 (stipulation letter).

Fintiv Factor 5 is neutral: As noted, parties in the litigation are the same.

Fintiv Factor 6 favors institution: PO's assertion that "the Petition does not provide a compelling, meritorious challenge" ignores the robust disclosures of the references in the Petition's two non-overlapping obviousness grounds. POPR, 9. In fact, the strength of the cited art belies PO's assertions that the Petition did not present a compelling challenge.

First, PO's *Fintiv* Factor 6 assertion that Petitioner "fails to demonstrate: (1) a reasonable expectation of success in combining the three-reference combinations in Grounds 1A and 2A" disregards the extensive discussion of reasonable expectation of success provided in the Petition. POPR, 16. The Petition's arguments, corroborated by additional discussion by Petitioner's expert, Dr. Randall, draw upon analyses of processes parameters such as electrodeposition temperature, current density, and electrolytic solution compositions to argue that a POSITA would have had a reasonable expectation of success in combining Kim '761, Cheng, and Wolski or Dobashi, Shinozaki '922, and Chou to obtain the

recited combination of ΔPD , TC(220), and $|\Delta(Rz/Ra)|$. *See, e.g.*, Petition 14-15, 17-18, 20, 22, 57-59 and SOLUS-1003, 69-70, 75, 80-81, 174-178, 181-182.

Thus, PO's assertion that the Petition provides only "[s]ilence and assumptions" is baseless. POPR, 29. PO argues that the Petition fails to provide "the requisite analysis" without substantively responding to or disputing the extensive analysis that *is* provided. POPR, 23. For example, the Petition and Dr. Randall's Declaration include comparisons across multiple separate examples in several of the references to conclude that the claimed TC(220) and $|\Delta(Rz/Ra)|$ values "can be achieved robustly, as opposed to being highly sensitive to electrolytic solution composition," supporting a reasonable expectation of success. SOLUS-1003, 80-81, 181. This reasoning contradicts PO's argument that "unpredictability and difficulty in controlling surface characteristics" would have prevented a POSITA from achieving the recited parameter values. POPR, 26-27. But PO fails to acknowledge this analysis.

Second, Section IV.D.3 of the Petition – titled "A POSITA would have had a reasonable expectation of success in optimizing ΔPD , TC(220), and Rz/Ra in combination" – explicitly addresses the argument that "simultaneous optimization of these parameters of these variables would have been beyond the skill of a POSITA." Petition, 18. PO incorrectly claims that this section "*relies on the '706 patent* for support that different parameters could have been independently tuned to

obtain the claimed ranges.” POPR, 24. In fact, the Petition cites the ’706 Patent only in conjunction with the argument that “[i]t is inappropriate to hold the prior art to a stricter standard of disclosure than what is disclosed in the specification of the patent itself,” as held in *In re Epstein*, 32 F.3d 1559, 1568 (Fed. Cir. 1994). Petition, 19.

Third, PO’s Factor 6 assertion that Petitioner “fails to show how the Ground 2A combination discloses the PD limitation of the claims” (POPR, 17) does not bear on institution, as PO makes no similar argument for Ground 1A, apparently conceding the “[e]quivalence of [Kim ’761’s] Rpc and [the ’706 Patent’s] PD.” Petition, 7-9.

Further, PO’s arguments in relation to PD are unavailing. For example, in discussing Dobashi’s RSm parameter, PO incorrectly cites to the “ASME B46.1 (2009) standard” instead of the JIS B 0601 (2001) used by Dobashi, such that PO’s arguments citing ASME B46.1 are inapplicable. POPR, 29. There is no reason to think that two separate standards bodies – one American, one Japanese – would use the same terminology, as PO asserts (“if ‘height discrimination’ and ‘lower and upper boundary lines’ were the same, the standard would refer to them as such”). POPR, 29. Indeed, to support these PD-related arguments, PO improperly seeks to import limitations from the ’706 Patent’s Specification into the claims, arguing that “Dobashi’s example surfaces do not include any peaks that meet the $\pm 0.5 \mu\text{m}$ peak

count value specified by the '706 patent” – despite the fact that this value is not recited in any of the claims. POPR, 33. The weakness of these and other positions put forward by PO with respect to claim 1 suggests a high likelihood that Petitioner will be successful in challenging at least that claim.

Fourth, contrary to PO’s assertion that Factor 6 favors denial because “Petitioner’s expert largely repeats the Petition verbatim without providing additional analysis or corroborating evidence,” Dr. Randall provides significant additional analysis and evidence not found in the Petition. *See, e.g.*, SOLUS-1003, 14-26 (providing a technical overview of surface characterization), 27-29 (discussing how shiny-side profiles correspond to cathode drum profiles), 52-57 (analyzing PD and R_{pc}), 59 (analyzing TC(220) measurements), 62 (analyzing R_z and R_a in Wolski compared to the '706 Patent), 74 (discussing the art’s recognition of R_z/R_a as result-effective), 88-89 (providing a quantitative analysis of tensile strength ranges across the art), 96 (explaining Cheng’s use of units of “kg/mm²”), and many other examples throughout Dr. Randall’s Declaration.

Overall, PO’s assertion that “the Petition does not provide a compelling, meritorious challenge” does not withstand scrutiny. POPR, 9. The strength of the two independent, detailed obviousness grounds, bolstered by extensive argument, expert testimony, and evidentiary support, weighs in favor of institution and the benefit of a full record and briefing by the parties.

Dated: March 3, 2025

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR § 42.6(e), the undersigned certifies that on March 3, 2025, a complete and entire copy of this Petitioner's Reply to Patent Owner's Preliminary Response was provided by email, to the Patent Owner, by serving the correspondence address of record as follows:

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