

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CAIHONG DISPLAY DEVICES CO., LTD.,
Petitioner

v.

CORNING INC.,
Patent Owner

Case IPR2025-00439
U.S. Patent No. 7,851,394

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

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PATENT OWNER'S UPDATED EXHIBIT LIST

Exhibit No.	Description
2001	Dr. Goel vs. Dr. Ernst Declaration Comparison
2002	Letter from John Thorne to Rutgers
2003	Board Email (April 10, 2025)
2004	Meet and Confer Email; Opposing Motion Email (April 10, 2025; April 16, 2025)
2005	English-Language Translation and Japanese-Language Original Copies of Miwa Submitted by Patent Owner during Prosecution of the '394 Patent
2006	Declaration of Dr. Richard Brow in Support of Patent Owner Discretionary Denial Brief
2007	<i>Curriculum vitae</i> of Dr. Richard Brow
2008	Order 6: Scheduling Order (ITC-337-TA-1441)
2009	Office Action dated March 27, 2008 from U.S. Application No. 11/275252
2010	2007 Display Component of the Year, accessed Apr. 9, 2025 at: https://www.sid.org/Awards/Display-Industry-Awards/DIAAwardsArchive
2011	Corning wins awards for EAGLE XG(TM), May 23, 2007, accessed Apr. 9, 2025 at: https://www.glassonline.com/corning-wins-awards-for-eagle-xgtm/
2012	In Handbook of Visual Display Technology, chapter 5.1.1 “Glass Substrates for AMLCD, OLED and Emerging Display Platforms,” Peter L. Bocko, pp. 599-623 (2012)
2013	Ellison, A. & Cornejo, I.A., “Glass Substrates for Liquid Crystal Displays,” <i>International Journal of Applied Glass Science</i> , 1(1):87-103 (2010)

Exhibit No.	Description
2014	Ex. 127 – Corning® EAGLE XG® Glass substrates Innovation Timeline, <i>Certain Glass Substrates for Liquid Crystal Displays, Products Containing the Same, and Methods for Manufacturing the Same</i> , Case No. 337-TA-1441
2015	Kim, K.D., “Influence of BaO/(SrO+BaO) on melt properties in R2O-RO-SiO2 glasses for plasma display panel substrates,” <i>Glass Technol.</i> 41(5):161-164 (2000)
2016	Wallenberger, F.T., et al., “Design of energy and environmentally friendly fiberglass compositions derived from the quaternary SiO2-Al2O3-CaO-MgO phase diagram - Part I: Structures, properties and crystallization potential of eutectic and selected multi-oxide e-glass compositions,” <i>Melt Chemistry, Relaxation, and Solidification Kinetics of Glasses</i> (2005)
2017	Darwish, H. & Gomaa, M.M., “Effect of compositional changes on the structure and properties of alkali-alumino borosilicate glasses,” <i>Journal of Materials Science: Materials in Electronics</i> , 17:35-42 (2006)
2018	Kaur, N., et al., “Conductivity, dielectric, and structural studies of (30-x) SrO-xBaO-10Al2O3-45SiO2-5B2O3-10Y2O3 (5≤x≤25) glasses,” <i>Ionics</i> , 24:2343-2353 (2018)
2019	Zanotto, E.D. & Coutinho, F.A.B, “How many non-crystalline solids can be made from all the elements of the periodic table?,” <i>Journal of Non-Crystalline Solids</i> , 347:285-288 (2004).
2020	Shannon, R.D. & Prewitt, C.T., “Effective Ionic Radii in Oxides and Fluorides,” <i>Acta Cryst.</i> , B25:925-946 (1969).
2021	Mysen, B.O., et al., “The structural role of aluminum in silicate melts: a Raman spectroscopic study at 1 atmosphere,” <i>American Mineralogist</i> , 66:678-701 (1981).
2022	Scarfe, C.M., “Viscosity-temperature relationships at 1 atm in the system diopside-anorthite,” <i>American Mineralogist</i> , 68:1083-1088 (1983).

Exhibit No.	Description
2023	Ex. 8 – Supplemental Declaration of Professor Steve W. Martin, <i>Certain Glass Substrates for Liquid Crystal Displays, Products Containing the Same, and Methods for Manufacturing the Same</i> , Case No. 337-TA-1441
2024	Ex. 131 – Claim Charts for U.S. Patent 7,851,394, <i>Certain Glass Substrates for Liquid Crystal Displays, Products Containing the Same, and Methods for Manufacturing the Same</i> , Case No. 337-TA-1441
2025	Corning Eagle XG Glass Substrates
2026	The Story of Corning® EAGLE XG® Slim Glass Substrates
2027	Declaration of Dr. Richard Brow in Support of Patent Owner’s Preliminary Response

I. INTRODUCTION

U.S. Patent No. 7,851,394 (“the ’394 patent”) claims innovative, non-obvious improvements to alkali-free boroaluminosilicate glass compositions. The inventor discovered that, by precisely controlling the amount of specific divalent metal oxides and metal-oxide ratios in boroaluminosilicate glass, certain unexpected and desirable performance characteristics could be achieved. These characteristics included low inclusion levels (such as bubbles), low density, high liquidus viscosity, high strain point, and low coefficient of thermal expansion (CTE), all *without* the use of toxic arsenic (As) or antimony (Sb) for glass fining.

Achieving these characteristics without using arsenic or antimony in the fining process was a long-felt, unmet need from major glass consumers for years prior to the ’394 patent’s filing. The inventor overcame that obstacle by precisely controlling the magnesium oxide (MgO) amount and the ratio of divalent metal oxides to aluminum oxide (Al₂O₃), which allowed a small amount of tin oxide (SnO₂) to function as an effective fining agent—a result that no one in the art expected. Commercially, it led to the launch of Corning® EAGLE XG® glass, a best-selling product for Corning Incorporated (“Patent Owner” or “PO”) covered by claims of the ’394 patent.

The claims reflect the precision needed to achieve the desired results by reciting specific oxide composition ranges and specific oxide mole-percent ratios.

For example, claim 1 recites that the alkali-free glass comprises, on an oxide basis, the following oxide ranges: SiO₂: 64.0-71.0, Al₂O₃: 9.0-12.0, B₂O₃: 7.0-12.0, MgO: 1.0-3.0, CaO: 6.0-11.5, SrO: 0-2.0, BaO: 0-0.1; wherein the ratio of the concentration of the divalent metal oxides (MgO, CaO, SrO, and BaO; collectively, RO) to Al₂O₃ ($\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$) is between 1.00 and 1.25; the glass has at least 0.01 mol% SnO₂; and the glass has a density of less than or equal to 2.41 grams/cm³.

Caihong Display Devices Co., Ltd. (“Petitioner”), has challenged claims 1-16 of the '394 patent as anticipated and/or obvious in view of two prior art references that were already considered during prosecution and do not even disclose the precise selection of specific ranges recited in the claims.

The Petition is riddled with conclusory, unsupported arguments that lack technical merit and fail to address an unpredictable technology the industry was grappling with at the time of the invention.

The Petition fails to demonstrate that a person of ordinary skill in the art (POSA) would have been motivated to modify the primary reference (Miwa) as proposed, or that a POSA would reasonably expect success in doing so. Critically, Petitioner does not address the interplay between different oxides within a glass composition, or the affect that changes to those oxides have on significant properties of the glass. Instead, the Petition relies on conclusory testimony made

by an unqualified expert, Dr. Ernst, who does not even meet Petitioner's stated level of skill for a POSA.

In fact, objective indicia overwhelmingly support nonobviousness of the claimed compositions. Corning's flagship LCD glass product, EAGLE XG Glass, which embodies the claimed compositions, has enjoyed immense commercial success and industry praise due at least in part to the product solving a long-felt need for a lightweight, defect-free LCD glass panel made without arsenic or antimony.

The Petition's lack of technical merit is further highlighted by Petitioner's and Dr. Ernst's failure to consider the various ways chlorine could have been incorporated into to Miwa's Embodiment 20 (cited as anticipating claims 1 and 3 in Ground 2). By failing to address this important issue, the Petition fails to show that Miwa's Embodiment 20 explicitly or necessarily anticipates the oxide ranges and the $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ range in claim 1 of the '394 patent.

II. PERSON OF ORDINARY SKILL IN THE ART (POSA)

A POSA is presumed to be aware of all pertinent art. The POSA possesses the "understandings and knowledge reflected in the prior art" and thinks along conventional wisdom. *See Abbott Labs. v. Andrx Pharm., Inc.*, 452 F.3d 1331, 1336 (Fed. Cir. 2006). For the '394 patent, a POSA at the time of the invention would have had a bachelor's degree in materials science, geology, chemistry, or a

comparable field of study, and at least two to three years of research or industrial experience with the design, manufacturing, characterization, and testing of glasses, including oxide glasses. Alternatively, the POSA would have had a master's degree or higher in the same fields of study. EX2027, ¶¶13-16.

At this stage, PO submits that the Board does not need to resolve the appropriate level of skill for a POSA for purposes of deciding institution because the Petition fails under either the definition above or Petitioner's proposed definition. While PO does not necessarily agree with Petitioner's proposed definition of a POSA, what is important for purposes of institution is that Petitioner's expert does not satisfy Petitioner's own definition, and therefore cannot competently support the positions in the Petition.

III. CLAIM CONSTRUCTION

For purposes of this Preliminary Response, PO agrees the Phillips standard applies. PO reserves the right to contest Petitioner's implicit or explicit constructions during the proceeding.

IV. FACTUAL BACKGROUND

The '394 patent is directed to boroaluminosilicate glasses that can be used for displays, such as LCDs. EX1001, Abstract. The '394 patent teaches that "arsenic raises environmental and health issues, and thus there has been a continuing effort in the art to produce glasses with lower arsenic levels and,

preferably, glasses which are substantially arsenic free[,]” and that while efforts have been made to replace arsenic with antimony, “antimony has its own environmental and health issues.” EX1001, 3:26-37. The compositions claimed by the ’394 patent allow for the fining (the removal of bubbles) of glass suitable for LCD screens without either of these toxic elements. EX1001, 11:63-12:31. This improvement is made possible through precise control of various metal oxide ratios, which is reflected in the claims.

A. Overview of the Technology

The ’394 patent identifies and improves upon a composition of silicate glass to solve a critical problem: the production of nearly defect-free glass without the use of harmful chemicals such as arsenic or antimony. During glass manufacturing, materials such as SiO_2 , Al_2O_3 , or B_2O_3 are melted to create molten glass, which can produce gas bubbles. If gas bubbles are not removed, they can create defects in the glass product. Removing gas bubbles from glass is called “fining.” Historically, arsenic and antimony were used as “fining agents” to remove gas bubbles from molten glass, but they present environmental and health risks.

One of the key innovations of the ’394 patent glass composition is the specified range of MgO and the precise ratio of RO to Al_2O_3 between 1 and 1.25. Although MgO had been used in display-glass compositions before the ’394 patent, doing so was known to increase the liquidus temperature of the glass,

making it more difficult to prevent crystals from forming prematurely during a glass-sheet manufacturing process. The inventor of the '394 patent discovered that this effect could be counteracted by tightly controlling the amount of MgO along with the ratio of RO to Al_2O_3 , and that within the claimed range of RO to Al_2O_3 ratio, adding MgO actually *decreased* the liquidus temperature rather than increasing it as expected at the time. EX1001, 10:19-54.

These claimed glass compositions are designed to be formed using a fusion downdraw process, which allows for tightly controlled and reproducible glass dimensions and allows for glass sheets that are flat, smooth, defect-free, and thermally and mechanically durable, without further mechanical surface processing, such as grinding or polishing. EX1001, 3:53-58, 4:59-67, 10:45-54, 12:56-13:4. The claimed glass compositions, suitable for the fusion downdraw process and lacking arsenic or antimony for fining, represent a substantial improvement over the prior-art glass compositions. EX1001, 3:53-67.

The inventive compositions resulted from years of experimentation to get to a commercially viable and industry accepted glass for LCD panels. The development of Corning's EAGLE XG Glass can be traced all the way back to 1993-1994 when Corning introduced Code 1737, a lower density alkali-free substrate that significantly reduced sheet distortion during LCD processing. EX2013, 92 (Table 1), 94. However, Code 1737 was fined with arsenic, so the

need arose to eliminate arsenic from Code 1737 to avoid potentially harmful manufacturing waste streams. EX2013, 96-97. In 1997, Corning introduced Code 1737G, an alkali-free substrate with properties very similar to its predecessor, but fined with antimony rather than arsenic. EX2013, 96-97. However, while 1737G was considered an improvement, LCD manufacturers still wanted lower-density glasses than Code 1737. EX2013, 95 (“Customer queries confirmed that a less dense, lower CTE substrate would have value.”). So, in 2000, after “exhaustive characterization of about 1000 glasses,” Corning introduced Corning® EAGLE2000®, an alkali-free glass with significantly lower density than any other substrate on the market at the time. EX2013, 95.

But the story does not end there. EAGLE2000 Glass again required the use of arsenic to eliminate defects greater than 100 microns in size, including bubbles. EX2013, 89. LCD panel makers expected glass panels devoid of such defects. EX2013, 89. And due to growing concerns about the presence of arsenic in EAGLE2000, particularly as a component of the waste streams resulting from display fabrication, LCD panel makers wanted a more environmentally friendly solution. EX2013, 97 (“[S]everal panel manufacturers expressed interest in an arsenic-free version of [EAGLE2000]”). Indeed, “[t]he elimination of heavy metals from the glass composition was seen as necessary in the long term because of emerging environmental regulations worldwide.” EX2012, 0018.

So, beginning in approximately 2001, the inventor, Adam Ellison, began experimenting with ways to achieve the advantages of the already novel EAGLE2000 Glass without intentional additions of arsenic or antimony. After Ellison's initial attempts to remove arsenic from EAGLE2000 Glass resulted in unusable glass, he started experimenting with glass compositions having an $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ ratio greater than or equal to 1.00. EX2013, 97. Unexpectedly, and due to the “stunningly complex” relationship between oxides in the glass, Ellison's experiments showed that changing the composition of glass to have a $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ ratio greater than or equal to 1.00 resulted in far fewer bubbles. EX2013, 97-98. Ellison's experiments also unexpectedly revealed that the level of MgO in the composition needed to be at least 1.0 in mol%, as compared to about 0.2 mol% in EAGLE2000. EX1001, 10:19-54; EX1002, 134-143.

Ellison's discoveries—increasing the $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ ratio and increasing the baseline use of MgO—proved a major breakthrough that reduced defects within glass panels by an order of magnitude without the intentional use of arsenic or antimony. His work took three to four years and required hundreds of experimental melts. The labor and facility costs of those experimental melts averaged about \$3 million every six months (not including raw materials costs).

Finally, in 2006, Corning introduced EAGLE XG Glass. When introduced, EAGLE XG Glass was the first heavy-metal-free TFT LCD glass on the market.

The industry immediately appreciated the uniqueness and importance of EAGLE XG Glass. In 2007, EAGLE XG Glass won the Display Component of the Year; Gold Award, and the Advanced Display of the Year (ADY) Award. EX2010, 0014; EX2011, 1. EAGLE XG Glass has since become the industry standard among the world's leading panel makers. Corning has produced more than 25 billion square feet of EAGLE XG Glass—enough to pave the Great Wall of China 25 times, or cover nearly 390,000 football fields. EX2014.

B. Overview of the '394 Patent Claims

Independent claim 1 of the '394 patent recites a glass composition comprising, in mole percent on an oxide basis, the following: SiO₂: 64.0-71.0, Al₂O₃: 9.0-12.0, B₂O₃: 7.0-12.0, MgO: 1.0-3.0, CaO: 6.0-11.5, SrO: 0-2.0, BaO: 0-0.1; wherein the ratio of the concentration of the divalent metal oxides (RO) to Al₂O₃ is between 1.00 and 1.25; the glass has at least 0.01 mol% SnO₂; and the glass has a density of ≤ 2.41 g/cm³. EX1001, 21:1-22. Independent claim 5 contains the same limitations as claim 1, except the SrO amount is at most 1.0 mol% and claim 5 does not specify a density of ≤ 2.41 g/cm³. EX1001, 21:32-49. Finally, independent claim 8 recites a glass with the following composition in mole percent on an oxide basis: SiO₂: 64.0-71.0, Al₂O₃: 9.0-12.0, B₂O₃: 7.0-12.0, MgO: 1.0-3.0, CaO: 6.0-11.5, SrO: 0-1.0, BaO: 0-0.1; wherein the ratio of the concentration of RO to Al₂O₃ is greater than 1.00. EX1001, 22:7-22.

C. Prosecution History of the '394 Patent

The application that resulted in the '394 patent went through an extensive examination at the Office. Four substantive Office Actions were mailed. PO utilized two inventor declarations to establish the criticality and unexpected results of the claimed invention in front of the Examiner.

The Examiner issued a Non-Final Office Action on the merits on April 1, 2008. EX1002, 259-270. This first Office Action rejected all claims as obvious over prior art references Dumbaugh and Narita, arguing that Dumbaugh disclosed “overlapping ranges with the composition of the instant claims,” and that Narita disclosed a “substantially arsenic free” fining agent. EX1002, 264, 267. PO responded with arguments that overcame the Examiner’s initial rejections. EX1002, 171-172. The Examiner then issued a Final Office Action on November 28, 2008, rejecting all claims as obvious over a newly-cited primary reference, Chacon, and the previously cited Narita reference, arguing that Chacon’s “composition has overlapping ranges with the composition of the instant claims.” EX1002, 152. In response, PO submitted a Rule 132 declaration of Adam Ellison (the inventor of the '394 patent and a co-inventor of the Chacon reference), explaining the criticality of the claimed MgO and $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ ratios that led to unexpected results relative to the Chacon reference. EX1002, 134-143.

The Examiner responded on October 13, 2009 with another Non-Final Office Action rejecting the claims (i) as obvious over the same cited prior art, Chacon and Narita, and (ii) as obvious over a single, newly-cited reference, Nishizawa. EX1002, 76-84. In response, PO submitted a second Rule 132 declaration of the inventor, with data showing that “the unexpected results come from applicant’s invention.” EX1002, 63.

In response, the Examiner issued another Final Office Action on April 15, 2010. EX1002, 50-56. The Examiner withdrew the rejection based on Chacon and Narita and agreed that PO’s Rule 132 declarations were successful in establishing criticality of the claimed oxide ranges. EX1002, 54. However, the Examiner maintained a rejection of pending claims 1, 2, 4, 5, and 8 based on Nishizawa. EX1002, 52-53.

In response, on July 15, 2010, PO amended the rejected claims by incorporating features of non-rejected dependent claims to overcome the rejection based on Nishizawa. EX1002, 35-41. The claims as amended on July 15, 2010 are the claims that issued in the ’394 patent.

The Examiner issued a Notice of Allowance on August 10, 2010, explaining that “the claimed glass with the given composition requirement that $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ is greater than unity combined with the narrow and precise representation of the given composition lead to the patentability of the claims. *Applicant has shown*

through [declaration] evidence that the ratio between the alkali earth and aluminum components causes dramatic changes in the glass, which would be unexpected in the art.” EX1002, 19 (emphasis added).

Notably, included in the art considered by the Examiner during prosecution of the '394 patent were both of Petitioner's cited art references—Miwa and Bange. An IDS form citing Bange was filed on June 28, 2006, EX1002, 365, and an IDS form citing Miwa was filed on August 4, 2008. EX1002, 177. The Examiner initialed these forms for the two references, indicating that he considered them, on April 4, 2008, and November 28, 2008, respectively. EX1002, 164, 275. Miwa and Bange were two of a total of 22 applicant-cited references considered by the Examiner, all of which the Examiner judged did not disclose or suggest the narrow and precise representation of claimed glass composition that causes dramatic and unexpected changes in the glass relative to the prior art. *See* EX1002, 19 (Notice of Allowance).

**V. THE PETITION FAILS TO ESTABLISH A REASONABLE
LIKELIHOOD OF PREVAILING ON AN OBVIOUSNESS
CHALLENGE FOR ANY CLAIM IN GROUNDS 1 AND 3.**

Petitioner fails to articulate a sufficient motivation to modify Miwa for both Grounds 1 and 3. Petitioner bases the entirety of its arguments on the overly simplistic proposition that a POSA would have been motivated to substitute one oxide (BaO) with another (SrO) because the two oxides have a similar ionic field

strength. Petitioner fails to appreciate (or even consider) that Miwa's glass compositions are not a simplistic system that allows for independent change of one oxide with little or no material effect on the composition as a whole. EX2027, ¶¶25-26, 40-46. Petitioner does not meaningfully explain, or offer any evidence to explain, why a POSA would have been motivated to modify the mole percentage for a single oxide within a single, isolated embodiment in Miwa's disclosure to arrive at the claimed glass compositions. EX2027, ¶¶56-58.

Ionic field strength alone would not have motivated a POSA to explore modifying Miwa in view of Bange. EX2027, ¶¶31-39. Rather, a POSA would have understood that substituting even a small percentage of one alkaline earth oxide (for example, MgO, CaO, or BaO) for another alkaline earth oxide (for example, MgO, CaO, or BaO) can have significant effects on significant properties of a glass composition. EX2027, ¶¶40-46. Petitioner has not established a link between ionic field strength and a glass property (for example, liquidus viscosity or liquidus temperature) that would have motivated a POSA to modify Miwa's Embodiment 15. Evidence provided by PO's expert, Dr. Brow, highlights significant errors in Petitioner's cursory and unsupported ionic field strength arguments.

Petitioner also fails in (and is truly silent on) establishing a reasonable expectation of success for modifying Miwa to arrive at what is claimed. First, Miwa and Petitioner's own analysis demonstrates that there would not have been a

reasonable expectation of success in modifying Miwa to arrive at the claimed glass compositions. Second, extrinsic evidence shows that different combinations of alkaline earth oxides can have a nonlinear and unpredictable effect (e.g., the “mixed alkaline earth effect”) on glass compositions. EX2027, ¶¶40-46. Third, the objective indicia presented in the Rule 132 declarations submitted during prosecution demonstrate the lack of a reasonable expectation of success in Petitioner’s oxide substitution.

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)).

“An obviousness determination requires finding that [a POSA] 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).

“[O]bviousness 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). The fact that the combination might have been successful does not mean that a POSA would have been motivated to make the combination. *See id.* It is not sufficient “for obviousness that a variation of the prior art would predictably work, but requires consideration of whether, in light of factors such as ‘design incentives and other market forces,’ the hypothetical skilled artisan would recognize the potential benefits and pursue the variation.” *Id.* at 1075 (citing *KSR Int’l v. Teleflex Inc.*, 550 U.S. 398, 417 (2007)).

Petitioner falls far short of carrying its burden of establishing a reasonable likelihood of prevailing to show that the claims challenged in Grounds 1 and 3 are obvious for multiple reasons.

A. Petitioner's arguments in Ground 1 fail to establish that a POSA would have been motivated to modify Miwa as proposed with a reasonable expectation of success.

Ground 1 relies on a modification of Miwa in view of Bange for obviousness of all three independent claims—claims 1, 5, and 8. Pet., 22-30, 33-35. For all three independent claims, Petitioner cites Embodiment 15 of Miwa as the basis for its unpatentability ground. Pet., 24, 29, 34. Petitioner acknowledges that the mol% for BaO in Embodiment 15 is 0.21 mol%, which is above the claimed maximum value of 0.1 mol%. Pet., 24, 29, 34.

In an attempt to cure this deficiency in Miwa's Embodiment 15, Petitioner argues that a POSA would have been motivated to reduce the 0.21 mol% for BaO to 0 mol%. Pet., 24-25, 34-35.¹ To account for the reduction of BaO, Petitioner argues that a POSA would have found it obvious to add 0.21 mol% SrO to the composition of Embodiment 15, thereby increasing the total mol% of SrO from 0.63 mol% to 0.84 mol%. Pet., 24-25, 34-35. Petitioner surmises that only the amount of SrO would be changed, with all the other ten possible oxides listed for

¹ Petitioner does not actually make an obviousness argument for the BaO mol% of claim 5. Page 29 of the Petition simply argues that Miwa and Bange disclose mole percentages for various oxides.

Embodiment 15 on page 10 of EX1004—SiO₂, Al₂O₃, B₂O₃, MgO, CaO, ZnO, ZrO₂, SnO₂, As₂O₃, and Sb₂O₃—remaining unchanged.

Petitioner bases the entirety of this argument on the overly simplistic proposition that a POSA would have been motivated to substitute all 0.21 mol% of the BaO with 0.21 mol% SrO because BaO and SrO have a similar ionic field strength. Pet., 21-22. According to Petitioner, the similarity in ionic field strength suggests that BaO and SrO “play a similar role of network modifier in the silicate glass structure,” presumably meaning that these two oxides can be freely substituted for each other in all instances. Pet., 21. Petitioner cites to the entirety of Exhibit 1006 on page 21 of the Petition, but only a single table on page 60 of Exhibit 1006, listing ionic field strengths, could even potentially support Petitioner’s argument.

Petitioner further attempts to bolster its argument by citing Bange. According to Petitioner, Bange’s disclosure of glass compositions comprising, in terms of mol% on an oxide basis, SiO₂: 60-73, Al₂O₃: 8-14, B₂O₃: 5-17, MgO: 0-5, CaO: 1-13, SrO: 0-8, BaO: 0-14, TiO₂: 0-5, and Ta₂O₅: 0-5 would have motivated a POSA to change the mol% of BaO in Miwa’s Embodiment 15. Pet., 25. Aside from citing Bange as disclosing broad oxide ranges for a glass composition, Petitioner provides no actual reason why Bange would have motivated a POSA to modify Miwa’s Embodiment 15.

Simply put, Petitioner's motivation to combine Miwa and Bange hinges on the proposition that, because both references disclose glass compositions comprising BaO and SrO and because these two oxides have a similar ionic field strength, it would have been obvious to modify Miwa in view of Bange. This kind of cursory speculation falls short of establishing that a POSA would have been motivated to combine Miwa and Bange to arrive at what is claimed.

Nothing in Miwa or Bange suggests that modifying the BaO mol% in Miwa's Embodiment 15 would achieve any of the glass properties touted by Miwa. Indeed, Petitioner does not cite any particular portion of Bange's disclosure as providing that motivation. Obviousness, however, 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 (emphasis added).

Critically, Petitioner also does not establish that a POSA would have been motivated to modify the BaO and SrO in Miwa's Embodiment 15 while preserving the disclosed mole percentages for the other ten possible oxides listed for Embodiment 15. Showing the composition *as a whole* in the prior art is critical to establishing obviousness. First, claims 1, 5, and 8 require specified mole percentages for six additional oxides—SiO₂, Al₂O₃, B₂O₃, MgO, CaO, and SnO₂. EX1001, 21:2-20, 21:32-49, 22:7-22. Second, claims 1, 5, and 8 require that the

ratio of $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ be greater than or equal to 1.00, and claims 1 and 5 require that this ratio be less than or equal to 1.25. EX1001, 21:15, 21:46, 22:20. Petitioner cannot assume, without evidence, that the mole percentages for BaO and SrO can be freely adjusted while preserving both (i) the amount for six additional oxides and (ii) the desired glass characteristics touted by Miwa.

Glass is not like a mechanical device where any individual component may be substituted without affecting (or having only predictable effects on) the device as a whole. Any change to any ingredient of a glass composition has a “stunningly complex” effect—often an unpredictable effect—on the delicate balance of the overall formulation. EX2013, 98. Petitioner does not consider or address the interplay among a multitude of different oxides and oxide ratios in Miwa and the unpredictable affect those oxides have on glass properties.

- 1. The ionic field strength of Sr^{2+} and Ba^{2+} alone would not have motivated a POSA to explore modifying Miwa as proposed by Petitioner because there is no expectation of success of the modification.**

The Board properly denies institution where the petitioner does not show a reasonable expectation of success in arriving at the claimed composition. *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) (finding that a patent challenger in an *inter partes* review had demonstrated a motivation to combine references does not necessarily imply that the challenger

had also met its burden of showing a reasonable expectation of success in achieving a claimed method of treatment). “[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR* 550 U.S. at 418; *see also Qiagen North American Holdings, Inc. v. HandyLab, Inc.*, 2021 WL 5024387 at *2-4 (Fed. Cir. 2021) (affirming Board’s denial of obviousness when “Petitions offered only a single conclusory statement regarding the POSA’s alleged reasonable expectation of success.”). Here, Petitioner does not provide a single meaningful articulation or rational underpinning to support a finding of a reasonable expectation of success.

A POSA would have understood that substituting even a small percentage of one alkaline earth oxide (for example, MgO, CaO, or BaO) for another alkaline earth oxide (for example, MgO, CaO, or BaO) can have profound and unpredictable effects on significant properties of the glass, such as liquidus temperature and CTE. EX2027, ¶¶34, 40-55. Petitioner does not establish a link between ionic field strength and a significant glass property (or any glass characteristic) that would have motivated a POSA to modify Miwa. Indeed, there is no clear link. EX2027, ¶¶33-39.

A POSA would have been aware that ionic field strength is characteristic of metal ions, and that ionic field strength affects the bonding interactions between

oxides in the glass. However, ionic field strength alone does not capture the full effects of different cations on glass properties because it does not account for the effects of network anion charge-balancing and the varying bond configurations with cation valence electrons. EX2027, ¶33. As an example, ZnO and MgO have similar ionic sizes ($\text{Mg}^{2+}(\text{VI}) = 0.72 \text{ \AA}$, $\text{Zn}^{2+}(\text{VI}) = 0.745 \text{ \AA}$), EX2020, 928-29, and therefore similar ionic field strengths ($0.44 \text{ \AA}^{-2}$ and $0.43 \text{ \AA}^{-2}$, respectively), but display wildly different properties as oxides. EX2027, ¶35. The melting point of MgO is almost 40% greater than ZnO (3125 K vs. 2248 K, respectively), so these oxides can have a significantly different effects on glass properties like high temperature viscosities (e.g., melt viscosity) and liquidus temperature. EX2027, ¶35. A second illustrative example is that of CaO and CdO. Ca^{2+} and Cd^{2+} have similar ionic radii ($\text{Ca}^{2+}(\text{VI}) = 1.00 \text{ \AA}$, $\text{Cd}^{2+}(\text{VI}) = 0.95 \text{ \AA}$, EX2020, 928-29), and so have similar ionic field strengths ($0.35 \text{ \AA}^{-2}$ and $0.36 \text{ \AA}^{-2}$, respectively), yet their respective oxides have much different properties. EX2027, ¶35. CaO melts at 2845 K whereas CdO melts between 1173 K and 1273 K, so these oxides would have significantly different effects of the properties of a glass. EX2027, ¶35.

A POSA would also have understood that, when the total concentration of alkali or alkaline earth cations is greater than that of Al_2O_3 (as is the case in Miwa's Embodiment 15), the amount of alkaline earth oxides equal to the amount of Al_2O_3 will be in charge-compensation roles, not network-modifier roles.

EX2027, ¶36. In Miwa's Embodiment 15, the ratio of ΣRO (MgO , CaO , SrO , and BaO) to Al_2O_3 , as calculated by Dr. Ernst, is 1.21:1, EX1003 (replacement), ¶71, meaning that most of the alkaline earth ions, including most of the Ba^{2+} and Sr^{2+} cations in Miwa's Embodiment 15, would be acting as charge-balancing cations, rather than as network modifiers. EX2027, ¶36. Network-modifying cations and charge-balancing cations play different roles in a glass composition. EX2027, ¶37; EX2021, 679 ("[T]he activity of a metal cation such as Ca^{2+} may depend on whether it charge-balances aluminum or it simply forms nonbridging oxygens in the melt."). Dr. Ernst's discussion of the motivation for substituting BaO with SrO is grounded in an argument that assumes a network modifying regime but, as discussed above, this regime is largely inappropriate given the high relative concentration of Al_2O_3 with respect to ΣRO in Miwa's Embodiment 15. EX2027, ¶38. This incorrect assumption provides yet another example of the insufficiency of Dr. Ernst's offered motivation that a POSA would have had in modifying Miwa's Embodiment 15. EX2027, ¶¶38-39.

For at least these reasons, a POSA would not have used ionic field strength as an overriding factor for modifying a glass composition. EX2027, ¶¶32-35, 39. Ionic field strength does not provide enough information to make accurate predictions about resulting glass properties. EX2015, 162 ("[T]he lowering of viscosity by substitution of Ba^{2+} for Sr^{2+} cannot be explained simply in terms of the

field strength or polarisability of the modifier.”); EX2027, ¶34. Despite the ionic field-strength values reported in Exhibit 1006, a POSA would have understood that different amounts of Ba^{2+} cations and Sr^{2+} cations behave differently in glasses. EX2027, ¶¶34-35. Rather than focus on the field strength of cations, a POSA would have evaluated the possibility of substituting two oxides based on tangible factors such as target glass properties and raw material considerations. EX2027, ¶¶35, 51, 55.

Given these shortcomings in the Petition, both Petitioner and Dr. Ernst fail to show that a POSA would have been motivated to modify Miwa with an expectation of success, thereby negating obviousness for Ground 1.

2. The evidence shows that a POSA would not have been motivated to substitute all of the BaO with SrO in Miwa’s Embodiment 15 as there was no expectation of success for the substitution.

Petitioner gives lip service to a reasonable expectation of success only twice in the Petition—once on page 21 and once on page 25. In both instances, Petitioner surmises, without evidence, that combining Miwa and Bange, and replacing BaO with SrO, is “one of a finite number of identified ways” to obtain non-alkali low-density glass for display technologies including the claimed ranges. Pet., 25. This falls well short of establishing a reasonable expectation of success in modifying Miwa as proposed by Petitioner. That is particularly so where the prosecution history contains two Rule 132 declarations that overcame a similar rejection based

on unexpected criticality of the claimed ranges. Contrary to Petitioner's overly simplistic and unsupported arguments, the evidence shows that a POSA would *not* have been motivated to substitute all 0.21 mol% of the BaO with 0.21 mol% SrO in Miwa's Embodiment 15 while simultaneously preserving the amount for the six additional oxides in Miwa's glass.

Not once does Petitioner provide any reason for *why* a POSA would have expected modifying Miwa's Embodiment 15 in view of Bange would retain the glass properties touted by Miwa, much less offer an improvement a POSA would have been motivated to pursue. Indeed, the Board in *Juniper Networks* agreed that the petitioner must "direct us with particularity to ... 'specific explanations' of 'expected results.'" *See Juniper Networks, Inc. v. Correct Transmission, LLC*, IPR2021-00682, Paper 26 at 26 (P.T.A.B. Oct. 3, 2022).

If anything, the evidence shows that a POSA would have expected Petitioner's modification of Miwa to result in a glass composition that does *not* meet the properties touted by Miwa.² Kim and Darwish teach that Petitioner's

² Because the burden of proof is on Petitioner, the literature need not demonstrate an expectation of *failure* in the claimed features. It is enough that the prior art supports no expectations one way or the other. *See Honeywell Int'l Inc. v. Mexichem Amanco Holding S.A.*, 865 F.3d 1348, 1355 (Fed. Cir. 2017) (reversing a PTAB obviousness

substitution of BaO with SrO (i.e., an increased amount of SrO relative to BaO) would tend to increase liquidus temperature and CTE. This directly contradicts Miwa's teachings that both of these properties should remain low. EX2027, ¶¶47-55. Both intrinsic and extrinsic evidence confirm the Petition's failings.

a. The prior art itself contradicts the Petition's arguments and demonstrates lack of expectation of success.

Miwa's disclosure makes it clear that modifying the mole percentage for BaO and/or SrO results in multiple other changes within the glass composition. Tables 1A and 1B below show all 20 embodiments³ from Miwa in terms of mol% on an oxide basis calculated according to Dr. Ernst's methodology in the declaration, along with the ratio of $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ ("RO/Al"). Embodiment 15 is highlighted orange and the embodiments in which BaO is within the claimed range of 0 to 0.1 mol% are highlighted blue.

finding for improperly requiring the 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). Nonetheless, the evidence here actually does suggest an expectation of failure in certain respects.

³ Embodiments 21 and 22 are not included here because Miwa describes them as comparative embodiments.

Em.	1	2	3	4	5	6	7	8	9	10
SiO ₂	69.45	69.45	69.45	69.45	69.36	69.36	68.77	68.74	68.67	69.38
Al ₂ O ₃	10.39	10.39	10.39	10.39	10.38	10.38	10.29	10.29	10.28	10.22
B ₂ O ₃	10.47	10.46	10.46	10.46	9.50	9.50	11.31	11.30	11.29	10.29
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CaO	8.27	8.27	8.27	8.27	9.44	9.44	9.36	9.35	9.34	9.29
SrO	0.96	0.96	0.96	0.96	0.64	0.64	0.00	0.00	0.00	0.31
BaO	0.22	0.22	0.22	0.22	0.43	0.43	0.00	0.00	0.00	0.04
As ₂ O ₃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sb ₂ O ₃	0.20	0.20	0.20	0.20	0.20	0.20	0.18	0.20	0.17	0.00
SnO ₂	0.04	0.04	0.04	0.04	0.04	0.04	0.09	0.02	0.07	0.09
ZnO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ZrO ₂	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.18	0.37
Fe ₂ O ₃	0.0033	0.0041	0.0050	0.0062	0.0083	0.0104	0.0062	0.0062	0.0082	0.0082
RO/Al	0.91	0.91	0.91	0.91	1.01	1.01	0.91	0.91	0.91	0.94

Table 1A

Em.	11	12	13	14	15	16	17	18	19	20
SiO ₂	67.56	68.47	69.05	67.97	67.19	68.70	66.50	67.96	68.64	69.80
Al ₂ O ₃	10.44	9.76	10.33	10.34	10.22	10.28	11.85	10.98	11.59	9.96
B ₂ O ₃	11.47	8.96	11.35	10.41	10.29	8.94	10.13	9.46	9.21	8.47
MgO	0.00	0.82	0.00	0.00	2.10	0.00	0.00	0.49	0.00	1.14
CaO	8.31	8.28	8.22	9.40	9.29	10.52	9.58	9.98	6.62	7.60
SrO	1.22	2.56	0.64	0.32	0.63	0.63	0.00	0.32	2.28	1.26
BaO	0.43	0.02	0.13	0.64	0.21	0.21	1.31	0.64	0.22	0.00
As ₂ O ₃	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sb ₂ O ₃	0.11	0.16	0.11	0.00	0.02	0.06	0.03	0.00	0.21	0.09
SnO ₂	0.04	0.11	0.07	0.07	0.04	0.07	0.07	0.07	0.04	0.04
ZnO	0.41	0.41	0.00	0.40	0.00	0.40	0.41	0.00	0.83	0.81
ZrO ₂	0.00	0.22	0.00	0.08	0.00	0.00	0.11	0.00	0.16	0.27
Cl	0.00	0.19	0.09	0.37	0.00	0.18	0.00	0.09	0.19	0.55
Fe ₂ O ₃	0.0063	0.0062	0.0062	0.0041	0.0041	0.0041	0.0042	0.0041	0.0063	0.0062
RO/Al	0.95	1.20	0.87	1.00	1.20	1.10	0.92	1.04	0.79	1.00

Table 1B

As shown in Tables 1A and 1B, relative to Embodiment 15, Miwa teaches that reducing the mole percentage for BaO results in numerous other changes within the glass compositions. BaO is not simply replaced with an increased amount of SrO. For example, in each of Embodiments 7-9 where BaO is set to 0 mol%, both MgO and SrO are also set to 0 mol%, which is a significant *reduction* from the corresponding mole percentages for MgO and SrO in Embodiment 15. In Embodiment 10 where BaO is set to 0.04 mol%, MgO is again reduced to 0 mol% and the mole percentage of SrO is *reduced* to 0.31 mol%. In Embodiment 12 where BaO is set to 0.02 mol%, MgO is reduced to 0.82 mol% and SrO is *increased* to 2.56 mol%. And finally, in Embodiment 20 where BaO is set to 0 mol%, the mole percentage of MgO is cut almost in half (2.10 mol% to 1.14 mol%) and the mole percentage of SrO is *doubled* (from 0.63 mol% to 1.26 mol%).

At least these embodiments in Miwa make clear that there is no simplistic one-to-one correlation between oxides. Rather, the embodiments show that modifying even one oxide cascades into numerous changes to other oxides within the compositions. A comparison of all the embodiments, and thus the teaching of Miwa as a whole, shows numerous changes to other oxides relative to Embodiment 15. Notably, the changes to SrO do not follow a simple, predictable pattern. In

Embodiments 7-10, a reduction in BaO results in a reduction of SrO, while in Embodiments 12 and 20, a reduction in BaO results in an increase for SrO.

Furthermore, Miwa's embodiments show that reducing the BaO relative to Embodiment 15 creates a composition that falls outside the claims. In Embodiments 7-10 and 12, the mole percentage for MgO is 0.82 mol% or less, which falls outside the claimed range of 1.0 to 3.0 mol%. In Embodiments 7-10, the ratio of $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ is less than claimed minimum of 1.00. And in Embodiment 12, the amount of SrO exceeds the claimed maximum values of 2.0 mol% (claim 1) and 1.0 mol% (claims 5 and 8).

Petitioner ignores the variability within Miwa's embodiments, and instead focuses on substituting one oxide for another with myopic disregard for how substituting oxides affects the overall composition. Petitioner does not even attempt to explain how increasing SrO and/or reducing BaO would affect the other ten oxides in Miwa's embodiments. This is legal error. "Focusing on the obviousness of substitutions and differences, instead of on the invention as a whole, is a legally improper way to simplify the often difficult determination of obviousness." *Gillette Co. v. SC Johnson & Son, Inc.*, 919 F.2d 720, 724 (Fed. Cir. 1990). It is telling that Petitioner considers only Embodiment 15 in isolation, ignoring the other embodiments and the context of Miwa's disclosure as a whole.

Petitioner also fails to appreciate (or even consider) that glass compositions are not systems that allow for independent change of one oxide with little or no material effect on other oxides and/or glass properties. Miwa even exemplifies the opposite—glass compositions are a system where a change to one oxide must result in numerous changes to other oxides to maintain desired glass properties. The effect Petitioner’s BaO/SrO substitution has on Miwa’s desired glass properties is left entirely unaddressed.

Nor does Petitioner provide any analysis of *how* or *why* a POSA would choose the claimed values from within the broad ranges that Miwa and Bange disclose for at least MgO, CaO, BaO, SrO. Nor does Petitioner provide any guidance on *how* or *why* to choose the mole percentage for MgO, CaO, BaO, and SrO to achieve a $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ ratio of at least 1.00 as claimed. There is therefore no evidence of what modifications or steps a POSA would take to arrive at the claimed composition.

Modifying the prior art cannot be based on a simplistic optimization of one variable in insolation of other variables shown to be dependent on that variable. *See Pfizer Inc. v. Mylan Pharmaceuticals Inc.*, 71 F. Supp. 3d 458, 468-69 (D. Del. 2014), *aff’d* 628 F. App’x 764 (Fed. Cir. 2016) (“The [prior art] did not indicate that these steps would yield better [results], nor is the court convinced that the one skilled in the art would have found these ‘optimization’ steps obvious without

some data to support it.”). “[G]iven the sheer volume of possible combinations and the additional subsequent chemical alterations necessary to arrive at the claimed compound, the court cannot say that one skilled in the art would have had a reason to alter [the prior art]” to arrive at the claim. *Id.*

Indeed, to establish obviousness of claimed ranges, Petitioner must establish that a POSA would have had a reason to attempt to get within the claimed ranges. *See Chemours Co. FC v. Daikin Indus., Ltd.*, 4 F.4th 1370, 1377 (Fed. Cir. 2021) (citing *Procter & Gamble Co. v. Teva Pharm. USA, Inc.*, 566 F.3d 989, 995 (Fed. Cir. 2009)). Petitioner provides no credible reason for *why* a POSA would attempt to modify the BaO mole percentage in Miwa’s Embodiment 15 to get within the claimed range of 0 to 0.1 mol%. Petitioner alludes only to the ionic field strength of SrO and BaO. Petitioner does not explain, or offer evidence, why a POSA would have been motivated to (i) isolate Miwa’s Embodiment 15, (ii) modify the mole percentage for a single oxide within Embodiment 15, and (iii) retain the mole percentages for all the other oxides within Embodiment 15.

In light of Miwa’s disclosure, a POSA would not be motivated to completely remove BaO. EX2027, ¶54. All but four of Miwa’s embodiments (Embodiments 7-9 and 20) contain BaO. Nothing about these four embodiments stands out in terms of glass property performance. EX2027, ¶54. Indeed, Petitioner has not argued that removal of BaO would tend to benefit Miwa’s Embodiment 15 in any way.

In fact, reducing the number of oxide components in a glass composition (e.g., completely removing BaO) often makes the glass melt more prone to crystallization, making it more difficult to produce a defect-free glass. EX2027, ¶52. This concept is referred to as the “principle of ... confusion,” wherein glass melts with greater numbers of oxide components need to undergo more extensive solute redistribution to crystallize. EX2019, 287; EX2027, ¶¶52-53. In other words, additional compositional components “confuse” crystallization, which promotes glass creation. EX2027, ¶¶52-53.

As such, removing all of the BaO in a given glass composition and replacing it completely with SrO, as proposed by Dr. Ernst, would create a less compositionally complex glass. EX2027, ¶53. This less compositionally complex glass, in turn, would reduce the crystallization “confusion” exhibited by the melt, meaning that the melt would be more likely to crystallize and less likely to form a defect-free glass when cooled below the liquidus temperature. EX2027, ¶53. This increased likelihood of crystallization would have discouraged a POSA from making Dr. Ernst’s proposed modification to Miwa’s Embodiment 15. EX2027, ¶53.

Petitioner’s silence on the evident interplay between different oxides in the hypothetical Miwa-Bange glass composition is fatal to the alleged motivation to combine. Simply arguing that a combination of art would have been obvious,

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).

b. PO’s expert and the literature confirms the non-obviousness of the claims.

Extrinsic evidence highlights the non-obviousness of Petitioner’s proposed oxide substitution. A POSA would have understood that a simple substitution of BaO with SrO would tend to at least increase liquidus temperature and increase CTE. EX2027, ¶¶47-51. A POSA would understand both of these things are important considerations for glass sheet forming, and could negatively affect the ability of the glass to form a defect-free sheet. EX2027, ¶47.

As explained by Dr. Brow, “SrO and BaO have distinctly different effects on properties because they have different, not similar, ion properties.” EX2027, ¶44. These different effects are evident in, for example, nonlinear—and often unpredictable—impacts on glass properties. EX2027, ¶44.

Kim (EX2015) teaches that “the liquidus temperature show[s] a continuous decrease with increase of BaO [with respect to SrO]” for a plasma display panel glass composition. EX2015, 164. It shows that the ratio of BaO to SrO can have non-linear effects on the liquidus temperature, which do not necessarily follow a predictable pattern. EX2027, ¶42. Kim’s Figure 3 (reproduced below) shows that

varying the ratio of BaO to BaO+SrO between 0 and 1 creates a non-linear effect on liquidus temperature (T_l). EX2027, ¶42.

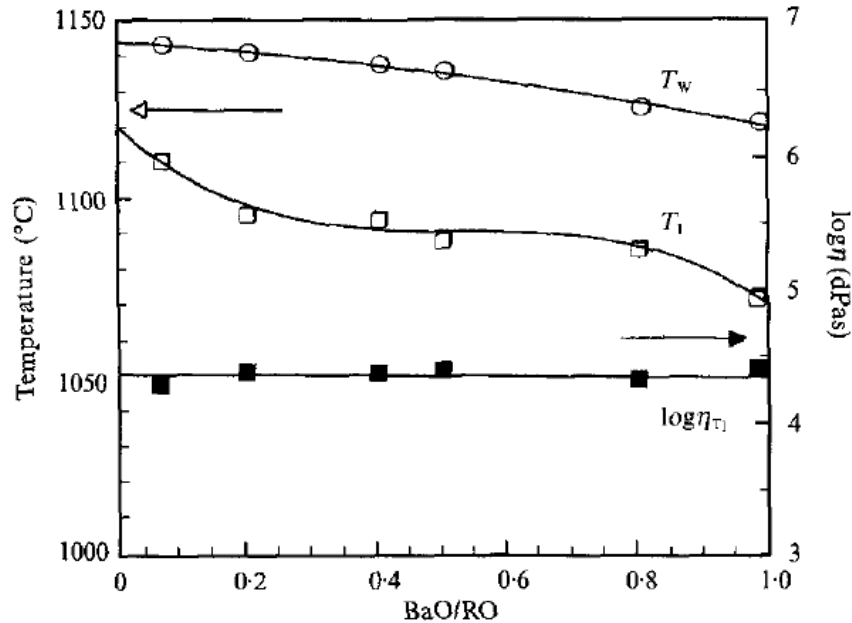


Figure 3. Liquidus temperatures (T_l), working temperature (T_w) and viscosity at liquidus temperature ($\log \eta_{T_l}$) as a function of BaO/RO

EX2015, 162, FIG. 3.

With respect to the alkaline earth oxide MgO, Wallenberger (EX2016) reports data in Figure 1 (reproduced below) that show changing the weight percent for MgO in a SiO-Al₂O₃-CaO-MgO composition space creates non-linear effects on the liquidus temperature of the glass, with the liquidus temperature exhibiting parabolic trend that reaches a minimum at about 2.5 weight percent MgO. EX2027, ¶41.

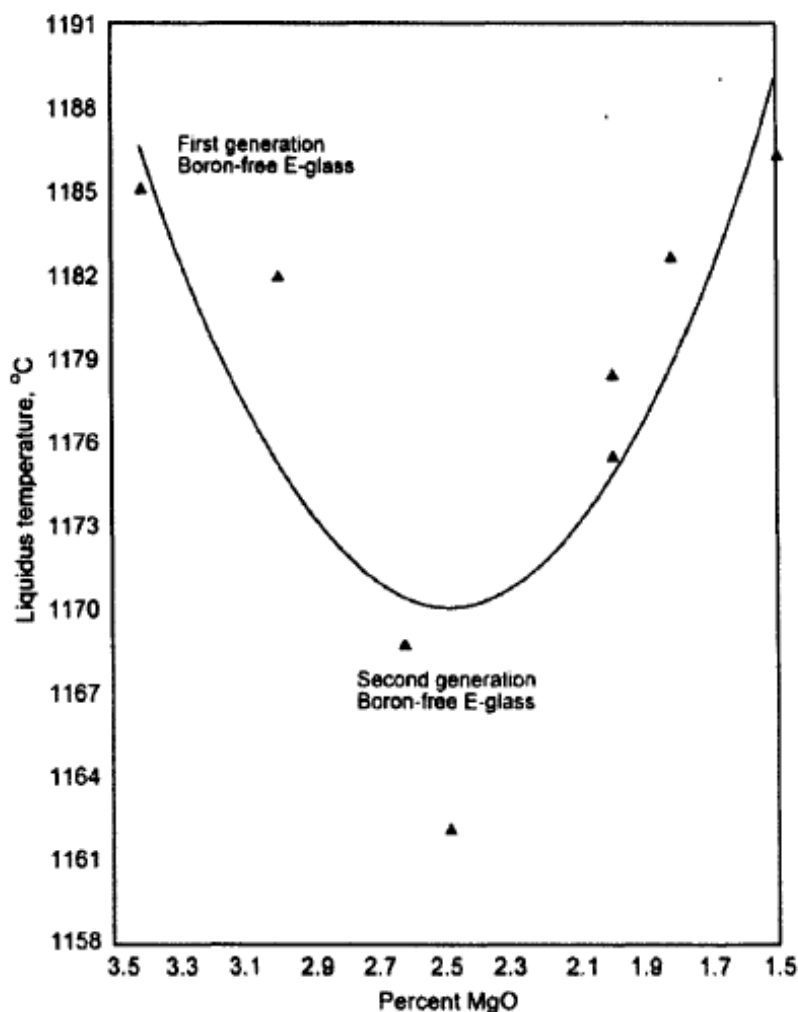
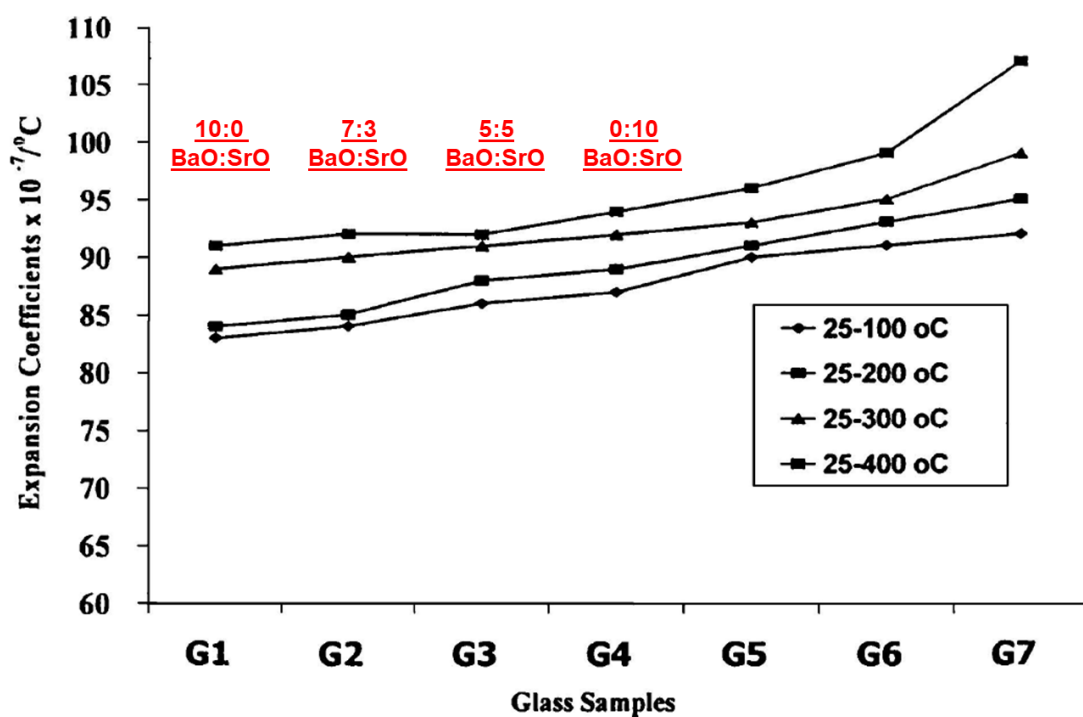


Figure 1. Eutectic with Regard to MgO for Second Generation Boron- and Fluorine-Free E-Glass

EX2016, 184, FIG. 1.

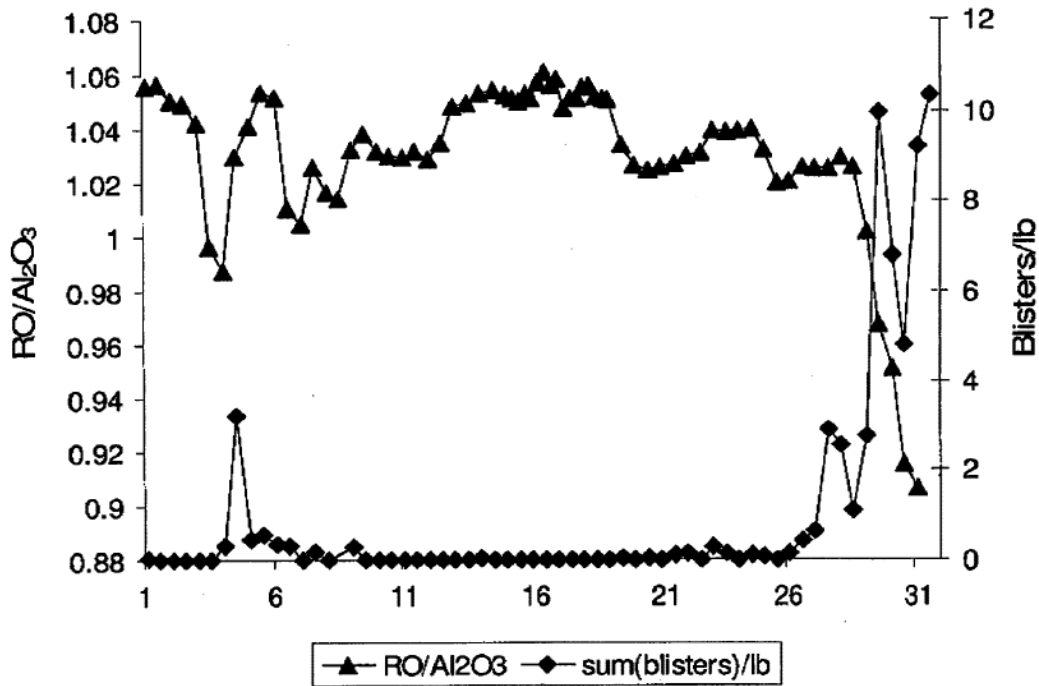
Darwish (EX2017) also teaches that “the addition of SrO or MgO at the expense of BaO or Al₂O₃, respectively, result[s] in an increase in the thermal expansion coefficients (i.e., α -values) and a decrease in both the glass transition (T_g) and softening (T_s) temperature values” for an alkali-alumino borosilicate glass composition space. EX2017, 38. Darwish’s Figure 2 (reproduced below) shows that the impact on CTE can be nonlinear in some instances. EX2027, ¶43.



EX2017, 38, FIG. 2 (annotated).

What is more, the Rule 132 declarations submitted during prosecution demonstrate the significant effect even a small oxide substitution can have on glass properties. The $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ ratio data reported in the Rule 1.132 declarations (reproduced below) show the sensitivity of the claimed glass composition space to an $\Sigma[\text{RO}]/[\text{Al}_2\text{O}_3]$ of greater than 1.00. EX1002, 121-125. The data reported show that “a RO/ Al_2O_3 ratio of 1.00 or above leads to successful tin fining (assuming $\text{MgO} \geq 1.0$), while a RO/ Al_2O_3 ratio below 1.00 does not work, in that the number of blisters per pound in the glass rises to commercially unacceptable levels.” EX1002, 122. Petitioner ignores and fails to rebut how the Rule 132 declarations

the Examiner relied upon to overcome rejections during prosecution would also not demonstrate non-obviousness of Ground 1.



EX1002, 125.

For at least these reasons, a POSA would not have been motivated to simply substitute all of the BaO with SrO in Miwa's Embodiment 15 as proposed by Petitioner. If anything, the evidence would have left a POSA skeptical of making Petitioner's proposed modification. Kim specifically teaches that full replacement of SrO by BaO—the opposite of Petitioner's proposed modification—"is desirable from the viewpoint of raw material cost and practical glass production." EX2015, 161; EX2027, ¶51. Further, as explained in more detail below, Kim teaches that increasing the amount of SrO relative to BaO can *increase* liquidus temperature,

and Darwish's data show that increased SrO *increases* CTE. EX2027, ¶¶47-51.

Both of these trends are directly contrary to Miwa's disclosure that these two properties should be kept low. EX2027, ¶47.

Accordingly, a POSA would not have been motivated to simply substitute BaO with SrO in Miwa's Embodiment 15 to arrive at the claimed compositions. On its face, the evidence shows that such a modification would have been most likely detrimental to glass formation and glass properties discussed in Miwa's disclosure, while also being less beneficial from a cost and glass production standpoint. Petitioner's reference to ionic field strength, divorced from concrete technical evidence or rationale, would not have motivated a POSA to modify the prior art to arrive at what is claimed.

Petitioner submitted no evidence supporting the notion that increasing the amount of SrO relative to BaO would improve or benefit Miwa's Embodiment 15 in any way. Petitioner has not even considered how the relative amounts of SrO and BaO would affect Miwa's glass. But, to establish obviousness of claimed ranges, Petitioner must establish that a POSA would have had a reason to attempt to get within the claimed ranges. *See Chemours*, 4 F.4th at 1377. Petitioner's arguments thus fail to establish a likelihood of prevailing on an obviousness challenge as, without this required evidence or considerations for obviousness, the Petition relies on impermissible hindsight.

Ultimately, the Examiner was correct in concluding that “the [claimed] ratio between the alkali earth and aluminum components causes dramatic changes in the glass, which would be unexpected in the art.” EX1002, 19.

Given these shortcomings in the Petition, both Petitioner and Dr. Ernst fail to show that a POSA would have been motivated to modify Miwa with an expectation of success, thereby negating obviousness for Ground 1.

3. Petitioner’s argument is based on a hindsight selection of Miwa’s Embodiment 15 and a hindsight reconstruction of the claims divorced from Miwa’s disclosure.

Petitioner cherry-picks Embodiment 15 from Miwa’s disclosure and, for some unidentified reason, isolates the SrO and BaO amounts in Embodiment 15 for modification. Petitioner does not explain why a POSA would have selected Miwa’s Embodiment 15 as a starting point for Ground 1, nor does Petitioner explain why a POSA would have been motivated to modify only the SrO and BaO amounts in Embodiment 15. This lack of credible rationale and evidence indicates that Petitioner’s Ground 1 is based on impermissible hindsight.

The Board has repeatedly rejected an analysis based on nothing but such hindsight. *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); *Solus Advanced Materials Co., Ltd. v. SK nexilis Co., Ltd.*, IPR2025-00005, Paper 14 at 47 (P.T.A.B. May 19, 2025) (explaining “Petitioner provides no convincing argument as to why a skilled artisan would have selected sample 15 for combination with [the secondary references]”).

In fact, when looking at Miwa’s 20 embodiments, there is no readily identifiable reason a POSA would have picked Embodiment 15 for modification absent impermissible hindsight. EX2027, ¶¶56-58. Table 2 below shows measured glass properties reported by Miwa for each embodiment. Values highlighted green mean the glass property is better than Embodiment 15 (according to Miwa’s teachings). Values highlighted red mean the glass property is worse than Embodiment 15. Values highlighted yellow indicate the value is the same as that reported for Embodiment 15.

Em.	Transmittance (%)				Density (g/cm ³)	CTE (10 ⁻⁷ °C ⁻¹)	Strain Point (°C)	Log 10 ^{2.5} (°C)	Liquidus Temperature (°C)
	300 nm	400 nm	600 nm	800 nm					
1	74	92	92	92	2.38	32	675	1610	1095
2	71	91	91	92	2.38	32	675	1610	1095
3	69	91	91	92	2.38	32	675	1610	1095
4	66	91	91	92	2.38	32	675	1610	1095
5	60	90	90	91	2.4	33	674	1595	1105
6	55	90	91	91	2.4	33	676	1595	1105
7	72	91	92	92	2.35	31	670	1590	1080
8	61	91	91	92	2.35	31	668	1590	1080
9	63	91	91	92	2.35	31	671	1595	1080
10	67	91	92	92	2.37	32	670	1600	1110
11	65	91	92	92	2.4	34	665	1555	1105
12	72	91	92	92	2.44	33	671	1560	1055
13	70	91	92	92	2.35	31	668	1605	1090
14	74	92	92	92	2.4	33	669	1565	1085
15	70	91	92	92	2.39	34	673	1560	1120
16	72	91	92	92	2.42	34	677	1585	1095
17	71	91	92	92	2.43	34	680	1520	1115
18	71	91	92	92	2.4	33	682	1585	1100
19	66	91	91	92	2.43	31	686	1560	1115
20	65	91	91	92	2.41	30	685	1605	1045

Table 2

As shown in Table 2, Embodiment 15 displayed the highest liquidus temperature, performing the worst out of all 20 embodiments. Miwa teaches that “[increased] liquid phase temperature ... mak[es] the glass difficult to mold.” EX1004, ¶25; EX2027, ¶57. Table 2 also shows that Embodiment 15 had a CTE of 34×10^{-7} °C, which was tied for worst out of all 20 embodiments. EX2027, ¶57. Miwa teaches that “coefficient of thermal expansion must be small in order to

improve thermal shock resistance and reduce damage during the heat treatment process.” EX1004, ¶5; EX2027, ¶57.

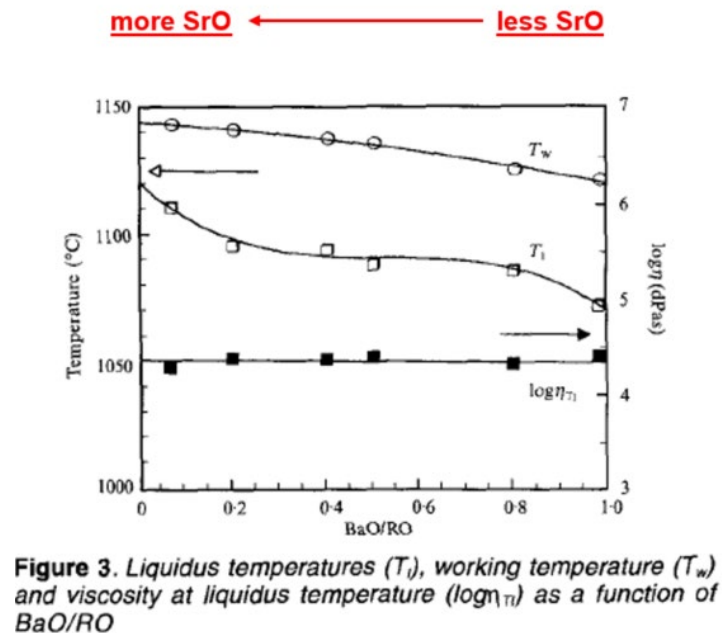
Petitioner does not even attempt to explain *why* a POSA would have selected the worst-performing embodiment in terms of CTE and liquidus temperature as a starting point for the proposed modification. Nor does Petitioner attempt to explain *why* a POSA would have attempted to improve these properties in Embodiment 15 by substituting BaO with SrO. Embodiment 15 has middling density and strain point values, and it generally performs well in the temperature corresponding to $10^{2.5}$ poise. That said, Petitioner fails to address *how* a POSA would have balanced each of these performance metrics or *why* a POSA would have looked past the poor liquidus temperature and CTE when cherry-picking Embodiment 15 from the other 19 embodiments. EX2027, ¶58.

The evidence actually shows that Petitioner’s cherry-picking is a hindsight reconstruction of the claims devoid of technical merit and based solely on a failed attempt to create the claimed compositions using the ’394 patent as a roadmap.. For example, Miwa discloses the following preferences for liquidus temperature and CTE.

- “[T]he liquid phase temperature is 1120 °C or *less*, so [the glass] also has excellent fusibility and formability.” EX1004, ¶47 (emphasis added).

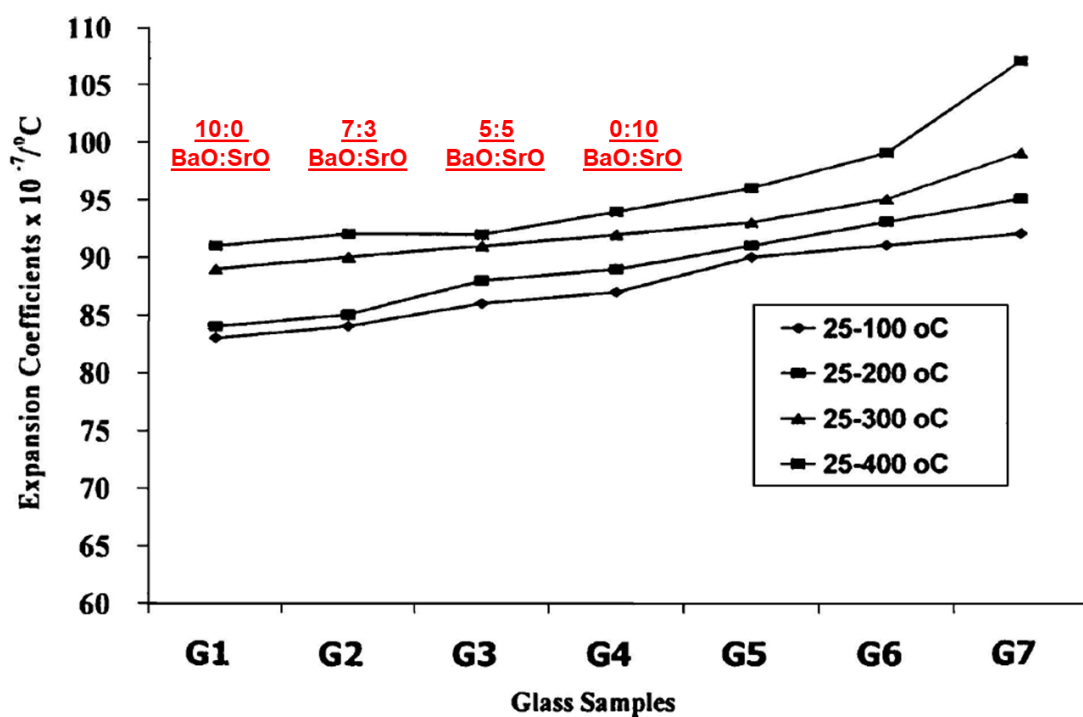
- “The coefficient of thermal expansion must be *small* in order to improve thermal shock resistance and reduce damage during the heat treatment process.” EX1004, ¶5 (emphasis added).

Kim and Darwish teach that Petitioner’s reconstruction of the claimed compositions by increasing the amount of SrO relative to BaO could directly contradict both of these preferences in Miwa. EX2027, ¶¶47, 51. Specifically, the data reported in Kim’s Figure 3 (reproduced and annotated below) show that, as the amount of SrO increases relative to BaO (i.e., to the left), the liquidus temperature (T_l in Figure 3) tends to *increase*. EX2027, ¶49.



EX2015, 162, FIG. 3 (annotated).

Similarly, the data reported in Darwish’s Figure 2 shows that increased SrO tends to *increase* CTE of an alkali-alumino borosilicate glass. EX2027, ¶50.



EX2017, 38, FIG. 2 (annotated).

4. The Petition ignores 132 Declaration evidence showing criticality of claimed ranges for Ground 1.

The Petition does not address the criticality of certain oxide ranges or the stunningly complex interaction of oxides within a boroaluminosilicate glass despite original prosecution Rule 132 declarations providing criticality of the claimed ranges. “[T]o have a reasonable expectation of success, one must be motivated to do more than merely to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful.” *Medichem, S.A. v. Rolabo*,

S.L., 437 F.3d 1157, 1165 (Fed. Cir. 2006) (cleaned up). Petitioner does not offer any evidence to show that a POSA would have been guided to modifying Miwa in view of Bange to arrive at the claimed glass compositions.

B. Petitioner’s arguments in Ground 3 fail for similar reasons as Ground 1, and they also fail to establish that it would have been obvious to modify Miwa as proposed.

Petitioner’s obviousness arguments for Ground 3 are deficient for at least the same reasons as discussed above for Ground 1.

1. The Petition lacks the required “rational underpinning” for any of its blanket conclusion of obviousness for Ground 3.

In Ground 3, Petitioner cites a combination of Miwa’s Embodiments 15 and 20 as the basis for its unpatentability ground.⁴ Pet., 47-51, 54-58. Petitioner acknowledges that the mol% for BaO in Embodiment 15 is 0.21 mol%, which is above the claimed maximum value of 0.1 mol%. Pet., 57. In an attempt to cure this deficiency in Miwa’s Embodiment 15, Petitioner makes two arguments.

For claim 5, Petitioner argues that Miwa discloses BaO and SrO mole percent ranges that overlap the claimed ranges, and that SrO+BaO can be optimized to obtain a glass composition. Pet., 49. Petitioner cites no evidence to

⁴ Without explanation, Petitioner also cites Bange for Ground 3 on pages 49, 50, 51, 57, and 58 of the Petition.

support this argument, and instead relies generally on an alleged reference to something “discussed earlier” in the Petition. Pet., 49.

For claim 8, Petitioner argues it would have been obvious to modify Embodiment 15 by reducing the 0.21 mol% for BaO to 0 mol%. Pet., 57-58.⁵ To account for the reduction of BaO, Petitioner argues a POSA would have found it obvious to add 0.21 mol% SrO to the composition of Embodiment 15, thereby increasing the total mol% of SrO from 0.63 mol% to 0.84 mol%. Pet., 57-58. Petitioner surmises that only the amount of SrO would be changed, with all the other ten possible oxides listed for Embodiment 15 on page 10 of EX1004—SiO₂, Al₂O₃, B₂O₃, MgO, CaO, ZnO, ZrO₂, SnO₂, As₂O₃, and Sb₂O₃—remaining unchanged. Petitioner bases the entirety of this argument on the overly simplistic proposition that a POSA would have been motivated to substitute all 0.21 mol% of the BaO with 0.21 mol% SrO because BaO and SrO “play[] the same role in the

⁵ In the paragraph bridging page 57 and 58 of the Petition, Petitioner suggests modifying Embodiment **20** to adjust the amount of BaO from 0.21 mol% to 0 mol%. This is clearly a mistake because Embodiment 20 does not have any BaO (the BaO is 0 mol% in Embodiment 20). For purposes of this brief, PO assumes Petitioner intended to cite Embodiment **15** because Embodiment 15 is shown on page 57.

glass compositions.” Pet., 58. Petitioner cites no evidence to support this argument, and instead relies generally on an alleged explanation “above in relation to limitation 1[a].” Pet., 58.

Simply put, Petitioner’s motivation to combine Miwa’s Embodiments 15 and 20 hinges on the proposition that, because the two embodiments are similar, it would have been obvious to modify Embodiment 15 to arrive at the claimed compositions. This kind of cursory analysis falls well short of establishing that a POSA would have been motivated to modify Miwa with a reasonable expectation of success as discussed above with respect to Ground 1. Petitioner does not offer a credible reason for why a POSA would have been motivated to modify Miwa as proposed, much less does Petitioner consider or address the interplay among a multitude of different oxides and oxide ratios in Miwa and the affect those oxides have on glass properties.

2. The Petition fails to establish “expectation of success” for Ground 3.

At *no* point does Petitioner even attempt to show a reasonable expectation of success in modifying Miwa to arrive at the claimed glass compositions for Ground 3. Petitioner only mentions a reasonable expectation of success in the combination of Miwa and Bange on pages 21 and 25 of the Petition. Petitioner does not argue a reasonable expectation of success in modifying Miwa’s Embodiment 15 in view of Embodiment 20 as proposed in Ground 3. Without any explanation, Petitioner

must be presupposing an expectation of success based on the broad oxide ranges disclosed in Miwa. This falls well short establishing obviousness. “[T]o have a reasonable expectation of success, one must be motivated to do more than merely to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful.” *Medichem*, 437 F.3d at 1165 (cleaned up).

C. Grounds 1 and 3 fail *Graham* factor four based on substantial objective indicia of non-obviousness.

“The objective indicia of non-obviousness play an important role as a guard against the statutorily proscribed hindsight reasoning in the obviousness analysis.” *WBIP, LLC v. Kohler Co.*, 829 F. 3d 1317, 1328 (Fed. Cir. 2016). Indeed, as noted by the court in *WBIP*, “evidence of secondary considerations may often be the most probative and cogent evidence in the record.” *Id.* (citing *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983)).

Obviousness is a question of law based on underlying findings of fact. *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1372 (Fed. Cir. 2019) (quoting *In re Gartside*, 203 F.3d 1305, 1316 (Fed. Cir. 2000)) Those underlying findings of fact include: (1) the scope and content of the prior art, (2) differences between the prior art and the claims at issue, (3) the level of ordinary skill in the pertinent art, and (4) the presence of evidence of secondary considerations, such as commercial success,

long felt but unsolved needs, failure of others, and unexpected results. *Id.* (cleaned up). In the present case, objective indicia of non-obviousness includes evidence of at least long-felt need, commercial success, and industry praise.

1. Nexus

To accord substantial weight to secondary considerations, “the evidence of secondary considerations must have a ‘nexus’ to the claims, *i.e.*, there must be ‘a legally and factually sufficient connection’ between the evidence and the patented invention.” *Fox Factory*, 944 F. 3d at 1373 (*quoting Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019)). A patentee is entitled to a presumption of nexus for objective considerations when the patentee shows that the asserted objective evidence is tied to a specific product and that product is the invention disclosed and claimed in the patent. *See WBIP*, 829 F. 3d at 1329.

In the present case, PO’s EAGLE XG Glass embodies the claimed glass compositions comprising the mole percentages and oxide ratios recited in at least independent claims 1, 5, and 8 of the ’394 patent. EX2023, 8, EX2024, 2, 4. Further, there is a nexus between the claimed compositions, the commercial success of EAGLE XG Glass, and the long-felt need for a defect-free LCD panel glass made without the use of toxic arsenic (As) or antimony (Sb) for glass fining. As discussed above in Section IV, the claimed glass compositions, with precisely recited ranges for magnesium oxide (MgO) and the ratio of divalent metal oxides

(RO) to aluminum oxide (Al_2O_3), allowed a small amount of tin oxide (SnO_2) to function as an effective fining agent—a result that no one in the industry expected would achieve a viable glass for LCD panels, solved the long-felt need for an LCD panel glass made without arsenic (As) or antimony (Sb), and lead directly to commercial success and industry praise of EAGLE XG Glass. EX2025; EX2026.

2. Long-felt Need

“Evidence of a long felt but unresolved need tends to show non-obviousness because it is reasonable to infer that the need would have not persisted had the solution been obvious.” *WBIP*, 829 F.3d at 1332. In the present case, the claimed glass compositions embodied by EAGLE XG Glass solved an industry wide decade-plus long search for an LCD panel glass made without arsenic (As) or antimony (Sb). Starting in the early 1990s, with the introduction of Corning’s Code 1737 glass, panel makers were yearning for a defect-free, lightweight glass made without arsenic or antimony. It was only after Corning’s introduction of EAGLE XG Glass in 2006 that this need was met. EX2025; EX2026. In 2007, “EAGLE XG [was] the first liquid crystal display substrate to contain no added heavy metals such as arsenic, antimony and barium ... making it the most environmentally friendly LCD glass on the market.” EX2011, 1.

3. Commercial Success

“Demonstrating that an invention has commercial value, that it is commercially successful, weighs in favor of its non-obviousness.” *WBIP*, 829 F.3d at 1337. In the present case, the claimed glass compositions embodied by EAGLE XG Glass are wildly commercially successful. Since its introduction in 2006, EAGLE XG Glass has become the industry standard among the world’s leading LCD panel makers. EX2025; EX2026. PO Corning has produced more than 25 billion square feet of EAGLE XG Glass—enough to pave the Great Wall of China 25 times, or cover nearly 390,000 football fields—to meet the needs of its customers. EX2014.

4. Industry Praise

“Evidence that the industry praised a claimed invention or a product which embodies the patent claims weighs against an assertion that the same claim would have been obvious. Industry participants, especially competitors, are not likely to praise an obvious advance over the known art.” *WBIP*, 829 F.3d at 1334. After its introduction, the industry immediately praised the uniqueness and importance of EAGLE XG Glass. In 2007, Eagle XG Glass won the Display Component of the Year; Gold Award, and the Advanced Display of the Year (ADY) Award. EX2010, 0014; EX2011, 1.

**VI. THE PETITION FAILS TO ESTABLISH A REASONABLE
LIKELIHOOD OF PREVAILING ON THE ANTICIPATION
CHALLENGE IN GROUND 2.**

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). 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); *Magnum Oil*, 829 F.3d at 1375. And the Board makes its determination regarding institution based on what the Petition actually presents and not what it could have reasonably contained had it been drafted differently. *Id.* at 1381 (holding that the Board is not “free to adopt arguments on behalf of petitioners that could have been, but were not, raised by the petitioner during [a post-grant proceeding]”). The Board cannot “deviate from the grounds in the petition and raise its own” theories of invalidity. *Sirona Dental Sys. GmbH v. Institut Straumann AG*, 892 F.3d 1349, 1356 (Fed. Cir. 2018).

In the present case, the Petition and Dr. Ernst fail to consider required factors to assess whether Miwa’s Example 20 anticipates claim 1, including which Cl source is used. EX2027, ¶59. This fatal defect of the Petition demonstrates that Miwa does not necessarily anticipate, either explicitly or inherently, the glass composition of claim 1. EX2027, ¶59.

Miwa's Embodiment 20 provides concentrations, in mass percent, of raw batch materials. EX2027, ¶60 (citing EX1004, ¶¶36, 45). Miwa does not disclose the raw material source(s) of Cl. EX2027, ¶60. The Petition and Dr. Ernst fail to address that Cl could be added through multiple different material sources, including salt forms. EX2027, ¶60. When making glass compositions with added chlorine, as disclosed by Miwa, elemental chlorine (Cl_2), which is a gas, is generally not added to the mixture of oxides before melting because the Cl_2 gas would diffuse away. EX2027, ¶61.

Therefore, a POSA would have understood that a solid chloride salt would have been added to the batch as the Cl source before melting in Miwa. EX2027, ¶61. For example, Bange explicitly teaches that "Cl was added as CaCl_2 at a level of 0.2 weight percent in excess of the batch, resulting in about 0.087 weight percent Cl retained in the resultant glass." EX1005, 7:16-19. Yet this kind of information is missing from Miwa, and the Petition ignores this defect.

The Petition fails to address that Miwa does not disclose this important piece of information—the solid chloride salt source. Dr. Ernst and the Petition should have addressed this missing information when determining the oxide mole percentages in Miwa's Embodiment 20 because a solid chloride salt affects the glass batch and the glass composition during and after melting. EX2027, ¶62.

In failing to discuss or even consider that Miwa does not disclose the solid chloride salt used for Embodiment 20, the Petition and Dr. Ernst fail to address how different potential salts would affect Miwa's batch composition. EX2027, ¶62. For example, the Petition and Dr. Ernst should have discussed that potential alkaline earth chloride salts a POSA could have used include CaCl_2 , BaCl_2 , MgCl_2 , and SrCl_2 , each of which would require a different adjustment to one or more batch oxides to account for the added cation source (Ca^{2+} , Ba^{2+} , Mg^{2+} , or Sr^{2+}) in the batch. EX2027, ¶62.

This is an issue because, as taught by Bange, about 60% of CaCl_2 added to a batch reacted to form Ca byproducts and Cl_2 gas, which was subsequently released, and about 40% of the Cl was retained in the resultant glass. EX2027, ¶63.

Crucially, Dr. Ernst and the Petition do not discuss the extent to which these chloride salts would react during melting and solidification to form byproducts, whether these byproducts would be alkaline earth oxides that would alter [RO], or even what the identity of these byproducts would be, when forming Cl_2 gas.

EX2027, ¶63. This insufficiency in Petition's and Dr. Ernst's analysis is fatal to establishing anticipation because an appropriate analysis of the chloride salt source is needed to support calculations for mole percentages of oxides in Miwa's glass. Despite this, the Petition and Dr. Ernst do not explain how a POSA might adjust the batch composition in light of the need to incorporate chlorine in the form of

one or more possible salts, nor do they address how the different potential salts would behave during and after melting of the glass. EX2027, ¶62-63

The uncertainty created by the lack in addressing the chloride salt source in the Petition is fatal to anticipation Ground 2. This uncertainty results in a failure to show that Miwa's Embodiment 20 explicitly or necessarily anticipates the metal oxide ranges and ratios for an alkali-free glass composition as recited in claim 1 of the '394 patent. EX2027, ¶64. For at least this reason, the Petition falls short of carrying its burden of establishing a reasonable likelihood of prevailing to show that the claims challenged in Ground 2 are anticipated as this is not curable during trial since the Petition cannot be corrected or enhanced during trial. *Magnum Oil*, 829 F.3d at 1375; *Sirona Dental*, 892 F.3d at 1356.

VII. THE PETITION FAILS TO SUPPORT ITS ARGUMENTS WITH COMPETENT EVIDENCE

The Petition relies on a parroted, unsupported expert declaration from an expert, Dr. Ernst, who lacks the required expert qualifications to offer credible testimony in support of the Petition. Petitioner's obviousness arguments are largely conclusory and rely heavily on the say-so of Petitioner's supporting expert declaration. For example, the Petition states that one of skill in the art would combine Bange with Miwa and modify Miwa to arrive at the challenged claims, but provides no analysis as to why the POSA would be motivated to change Miwa, or why he would look to Bange to do so. *See, e.g., Pet.*, 25, 29. Petitioner's expert

purports to fill in the gaps with allegations regarding what one of skill in the art would know and be motivated to do. *See, e.g.*, EX1003(replacement) ¶¶36, 46, 53, 59, 67. There are significant problems with Petitioner’s approach.

First, aside from Petitioner’s expert’s *ipse dixit*, the Petition has no evidentiary support for a POSA’s alleged knowledge and motivation to combine. The Federal Circuit has made clear that the *ipse dixit* of an expert is not sufficient to support obviousness challenges at the PTAB. *See, e.g., TQ Delta, LLC v. Cisco Sys., Inc.*, 942 F.3d 1352 (Fed. Cir. 2019) (reversing PTAB obviousness finding regarding motivation to combine based only on conclusory expert testimony as not supported by substantial evidence). The PTAB has also made clear that an expert declaration that merely parrots the petition without providing additional technical detail, analysis, or evidentiary support is entitled to little if any weight. *See Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 12 (P.T.A.B. Feb. 10, 2023). The Petition therefore fails to cite evidence sufficient to warrant institution.

Second, Petitioner’s expert does not meet Petitioner’s own definition of a POSA. Dr. Ernst is a ceramic engineer and metallurgist. He identifies no significant experience with glass chemistry or material science specifically dealing with glass for LCD displays. He does not have “5-10 years of experience with design, synthesis and characterization of silicate, borosilicate, aluminosilicate, and boroaluminosilicate glasses,” Petitioner’s defining credential of a POSA. Pet., 15-

16. Indeed, the description of Dr. Ernst’s background credentials in his expert report does not describe *any* years of experience with design, synthesis, and characterization of silicate, borosilicate, aluminosilicate, and boroaluminosilicate glasses. *See* EX1003(replacement) ¶¶5-7 (describing experience in ceramic engineering, ceramic/metal interfaces, and microscopy). Tellingly, Dr. Ernst deleted Petitioner’s glass-focused experience from his initial declaration’s definition of a POSA—which was inconsistent with the definition offered by Petitioner in the Petition—because he does not satisfy it. *Compare* EX1003(substitute), *with* Pet., 15-16; *see also* EX2001, ¶36. Dr. Ernst then reverted back to the Petitioner’s glass-focused experience definition in the replacement declaration submitted on May 19, 2025. *Compare* EX1003(replacement), ¶36 *with* EX1003(substitute), ¶36.

The Federal Circuit has made clear that “to be qualified to offer expert testimony on issues from the vantage point of an ordinarily skilled artisan in a patent case, an expert must at a minimum possess ordinary skill in the art.” *Kyocera Senco Indus. Tools Inc. v. Int’l Trade Comm’n*, 22 F.4th 1369, 1377 (Fed. Cir. 2022). Petitioner’s expert does not have, and does not even claim to have, what the Petition has identified as the level of ordinary skill in the relevant art. Without a qualified expert, the Petition has no competent evidentiary support and

the PTAB cannot render a FWD granting the Petition that would be supported by substantial evidence. *See id.*

VIII. CONCLUSION

For at least the above reasons, 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's Preliminary Response complies with the type-volume limitation of 14,000 words, comprising 12,390 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'S PRELIMINARY RESPONSE UNDER 37 C.F.R. § 42.107(a)** and associated Exhibits 2013-2027 were served in their entireties on June 10, 2025, upon the following parties via electronic mail:

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