

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY, LTD. and
GLOBALFOUNDRIES U.S. INC.,
Petitioners,

v.

GODO KAISHA IP BRIDGE 1,
Patent Owner.

Case No. IPR2016-01376¹
Patent Number 6,197,696

Before JUSTIN T. ARBES, MICHAEL J. FITZPATRICK, and
JENNIFER MEYER CHAGNON, *Administrative Patent Judges*.

**PATENT OWNER'S OPPOSITION TO PETITIONERS' CONSOLIDATED
MOTION TO EXCLUDE EVIDENCE UNDER 37 C.F.R. §§ 42.62 AND 42.64**

¹ GlobalFoundries U.S. Inc., who filed Petition IPR2017-00921, has been joined as
a petitioner in this proceeding.

In response to Petitioner Taiwan Semiconductor Manufacturing Company, Ltd.’s (“Petitioner”) Motion to Exclude Evidence, Patent Owner respectfully submits that the Board, sitting as a non-jury tribunal with administrative expertise, is well-positioned to determine and assign appropriate weight to the evidence presented, without resorting to formal exclusion that might later be held reversible error. *See Corning Inc. v. DSM IP Assets B.V.*, IPR2013-00053, Pap. 66, at 19. But even strictly applying the Rules of Evidence, *cf.* 77 Fed. Reg. 48,612, 48,616 (Aug. 14, 2012) (“42.5(a) and (b) permit [APJs] wide latitude ... to balance the ideal of precise rules against the need for flexibility to achieve reasonably fast, inexpensive, and fair proceedings”), Patent Owner’s evidence here is entirely proper, and Petitioner’s objections to EX2015 and EX2018-EX2019 under FRE 401, 402 and 403 are meritless.

I. Summary of the Law

Evidence is relevant if it has “any tendency to make a fact more or less probable than it would be without the evidence” and “the fact is of consequence in determining the action.” FRE 401. Both the Federal Circuit and the Board have recognized that there is a “low threshold for relevancy.” *OddzOn Prods., Inc. v. Just Toys, Inc.*, 122 F.3d 1396, 1407 (Fed. Cir. 1997); *Laird Techs., Inc. v. GrafTech Int’l Holdings, Inc.*, IPR2014-00025, Pap. 45 at 44.

FRE 403 permits the exclusion of relevant evidence if its probative value is substantially outweighed by, for example, prejudice, confusion or waste of time, but the Board has previously emphasized that because patentability proceedings “before the Board are not jury trials; in the absence of a jury, the risk of unfair prejudice against which Rule 403 guards is diminished, if not eliminated entirely.” *See Neste Oil Oyj v. Reg Synthetic Fuels, LLC*, IPR2013-00578, Pap. 53 at 10-11; *see also SK Innovation Co. v. Celgard, LLC*, IPR2014-00679, Pap. 58, at 50.

II. Argument

Two of the issues in this case are: (1) the proper construction of the term “using the [designated layer] as a mask,” and (2) whether a person of ordinary skill in the art (“POSITA”) would have been motivated to combine Grill and Aoyama in view of Grill’s explicit warning against loss of critical dimension (CD) control caused by photoresist profiles having widely varied thicknesses. As detailed below, the documents that Petitioner seeks to exclude are contrary to Petitioner’s arguments and expert’s testimony regarding the aforementioned issues, and are thus relevant and admissible under FRE 401-403.

A. Exhibits 2015 and 2018 and the proper construction of “using the [designated] layer as a mask”

The Eastern District of Texas has previously construed “using [the designated layer] as a mask” to mean using the designated layer “to define areas for etching.” *See* EX3002 22. In contrast, Petitioner argues the proper BRI

construction of the term excludes a designated intermediate layer having “a vertical sidewall ‘in line and flush with an edge of an overlying layer,’” even though this construction adds a negative limitation to, and is narrower than, the construction adopted by the district court. *See* Paper 26 (“Reply”) at 3. As explained by Patent Owner in its Response, Paper 19 (“POR”) at 7-18, Petitioner’s construction is not only inconsistent with the intrinsic evidence and case law, which precludes a “broadest reasonable construction” from being narrower than a Federal Court construction under the *Phillips* standard, but is also inconsistent with the extrinsic evidence, including multiple editions of a textbook *edited by Petitioner’s expert* (EX2017-EX2018)² as well as multiple editions of another reference (EX2015, EX2027).³

² EX2017 includes excerpts of two chapters from a textbook published in 1998 and edited by Petitioner’s expert Dr. Smith. EX2018-EX2019 includes excerpts of the same two chapters from a later edition of the textbook, published in 2007, and also edited by Dr. Smith.

³ Petitioner concedes that EX2027 was properly served as supplemental evidence. *See* Paper 30 (“Motion”) at 2 n.2. EX2027 is being filed in this proceeding concurrently with this paper.

The discussions of the multi-layer resist in EX2015, EX2017, EX2018 and EX2027 are consistent with and relevant to a POSITA's understanding of the phrase "using the [designated layer] as a mask" in the '696 patent, which repeatedly refers to an intermediate layer having an edge that is in line and flush with an overlying layer as a mask. *See* POR 17-18; EX1001 19:50-54, FIGS. 16(c)-16(d), 17:34-40, FIGS. 13(b)-13(c), 26:15-29, FIGS. 28(b)-29(a).

1. **EX2018 belies Petitioner's and its Expert's assertions regarding the meaning of "using the [designated layer] as a mask"**

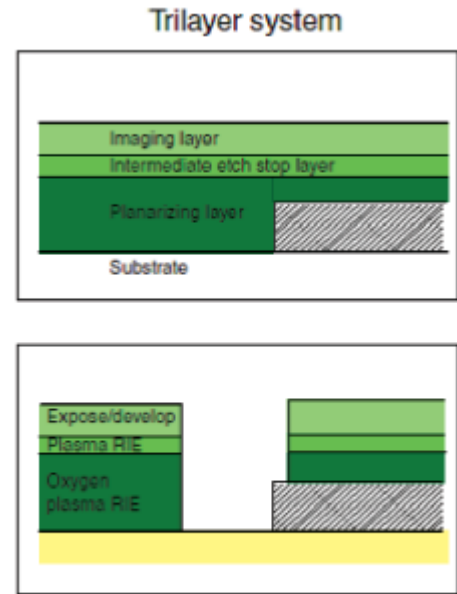
EX2018 is relevant because it demonstrates that Patent Owner's construction of "using the [designated layer] as a mask" is correct and belies Petitioner's and its expert's assertions regarding the proper construction.

In EX2017 (published 1998) and EX2018 (published 2007), Dr. Smith explains that multi-layer resists composed of multiple layers (*e.g.*, including an imaging layer, an intermediate etch stop layer, and a planarizing layer) could be used collectively to etch an underlying substrate layer.⁴ EX2017 at 0061, 0079;

⁴ EX2018 was also used without objection during the deposition of Dr. Smith on March 23, 2017. *See, e.g.*, EX2010 at 49:6-50:9 (introducing EX2018 as Smith Ex. 3), 50:10-52:10, 58:8-59:1, 64:5-65:8.

EX2018 at 0019, 0033. Dr. Smith depicted (Fig. 3(c) in EX2017 and Fig. 12.3(c) in EX2018 (shown to the right)) these multiple layers, having edges in line and flush with each other, being used collectively to define an area for patterning (used as a mask to pattern) an underlying substrate.

EX2017 at 0060; EX2018 at 0018.



Both EX2017 and EX2018 support Patent Owner's construction that an intermediate layer (*e.g.*, intermediate etch stop layer, or planarizing layer) that is in line and flush with an overlying layer (*e.g.*, imaging layer or intermediate etch stop layer, respectively), are used together as a mask to pattern an underlying substrate.

In contrast, in this IPR proceeding Dr. Smith's testimony that an intermediate layer having an edge that is in line and flush with an overlying layer cannot act as a mask even when exposed to etchant, and more specifically that "multi-layer resist processes" as depicted in his publications are not "examples of buried layers acting as masks because they have flush interior sidewalls," are inconsistent with his prior statements and depictions as illustrated, for example, in Fig. 3(c) of EX2017 and Fig. 12.3(c) of EX2018, respectively. EX1049 ¶¶11, 16-17. Dr. Smith attempts to rewrite his earlier statements, provided years before his

retainer by Petitioner TSMC, to comport with the Petitioner's arguments. *Id.* Dr. Smith's need to cite other extrinsic evidence, outside of his own publications, in attempting to rewrite and reconcile his prior statements in his publications underscores the glaring inconsistencies of his testimony. *See, e.g.*, EX1049 ¶¶18-19, citing to EX1044, EX1045, EX1046.

Petitioner, clearly recognizing the inconsistencies between Dr. Smith's testimony in this IPR proceeding and his prior statements in EX2017 and EX2018, is moving to exclude as much of this evidence as possible, even though the relevant information is unchanged across the versions of Dr. Smith's textbook dating back to 1998.

Accordingly, EX2018 is relevant and not cumulative at least because it (1) evidences inconsistencies between Dr. Smith's testimony in this IPR proceeding and his prior statements; (2) demonstrates how Dr. Smith consistently considered (for at least a nine year period) each layer of a multi-layer resist to be part of the mask used to pattern an underlying substrate even though the intermediate layers had edges that were in line and flush with overlying layers; and (3) was used without objection as an exhibit during Dr. Smith's deposition.

2. **EX2015 further demonstrates that Patent Owner's construction is correct**

Similar to EX2017 and EX2018, EX2015 is relevant because it demonstrates that Patent Owner's construction of "using the [designated layer] as a mask" is correct. EX2015 shows that multiple layers of a multi-layer resist process are referred to collectively as a layer used to pattern (used to mask) an underlying substrate. For example, EX2015 states that "[m]ultilayer processing techniques, where layers of radiation sensitive (top), non-photosensitive organic, and/or inorganic materials [are] sandwiched together to become the *total patterning layer*"—*i.e.*, multiple layers are referred to collectively as a single patterning mask. EX2015 0007.⁵

While EX2015 is dated 2001, it is relevant to what a POSITA would have known in 1998, circa the priority date of the '696 patent, both because it is close in time to that earlier timeframe, and because EX2017-EX2018 demonstrate that this field had not changed significantly with respect to the meaning of a patterning layer or mask. This is confirmed by EX2027, a 1991 version of EX2015, which contains *this same disclosure*—further demonstrating that this concept remained unchanged in the field for at least a decade. EX2027 0113. Indeed, Dr. Smith has never asserted that the field changed in this respect—nor could he, given that this

⁵ All emphasis added unless otherwise indicated.

portion of his textbook remained relatively unchanged during this time period as discussed in §II.A.1. “It is well settled that references that have publication dates after the critical date may be cited to show that the state of the art at or around the time of the invention.” *Liberty Mutual v. Progressive*, CBM2012-00002, Pap. 66, at 64, *citing Eli Lilly and Co. v. Barr Labs., Inc.*, 251 F.3d 955, 969-70 (Fed. Cir. 2001), *In re Wilson*, 311 F.2d 266, 268-269 (CCPA 1962). Thus, EX2015 is relevant and not cumulative because it demonstrates that a POSITA would have understood that around the time of invention of the ’696 patent, and between the 1998 and 2007 publication dates of Dr. Smith’s EX2017 and EX2018, multiple layers having edges that were in line and flush could be used collectively as a mask to pattern an underlying substrate.

B. Exhibit 2019 and Grill’s warning against loss of critical dimension control caused by photoresist profiles having widely varied thicknesses

Petitioner has proposed combining Grill’s fabrication process with Aoyama’s wider via opening resist pattern to attempt to render obvious the challenged claims of the ’696 patent. Paper 2 (“Petition”) at 54-56. In doing so, Petitioner asserted that “[n]othing about the width of the via pattern in *Aoyama* affects the dual-hard mask structure of *Grill*, and nothing about the dual-hard mask structure of *Grill* affects the width of the via pattern in *Aoyama*.” Petition at 56 (emphasis in original).

Patent Owner has identified several flaws in Petitioner's argument regarding the compatibility of Grill and Aoyama's processes, including Grill's explicit warning against photoresist profiles having widely varied thicknesses. POR at 71-73. For example, Grill warns against using techniques that result in a thicker resist layer over via areas as problematic because such thicker resist requires "higher dose exposures, with consequent loss in CD [critical dimension] control." *See* EX1005, 5:29-35. These problematic photoresist profiles include both (1) the profile in FIG 18B of Aoyama, which Petitioner proposes to combine with Grill, and (2) the profile of the Petitioner's proposed combination of Grill and Aoyama. POR at 71-73; Reply at 29-31.

EX2019 is relevant because it demonstrates that a POSITA would not have combined the Grill and Aoyama references in view of Grill's teachings to the contrary. Just as Grill warned against using photoresist profiles having widely varied thickness of photoresist because such profiles caused dose exposure variations that could lead to loss of critical dimension control (EX1005 5:29-35), Dr. Smith described this same concern about loss of critical dimension control in 1998 (EX2017) and again in 2007 (EX2019). EX2017 0025-0026; EX2019 0033-0034; *see also* POR at 71-73.

As Patent Owner explained, a POSITA would not have been motivated to modify Grill to incorporate the teachings associated with Aoyama's FIG. 18B

because, *inter alia*, Grill's express warning against such profiles would lead a POSITA away from such a combination. POR at 71-73. Dr. Smith's statements in EX2019 that the "adverse influence of overexposure" can result in a "large amount of energy in shadow areas" that would degrade an intended pattern support this explanation advanced by Patent Owner. POR at 71-73; EX2009 ¶¶161, 180-183. Although Petitioner and its expert, Dr. Smith, are now attempting to downplay the significance of Dr. Smith's own statements in EX2019 by citing to multiple examples of new extrinsic evidence (Reply at 29-31; EX1049 ¶¶69-74), those statements are nevertheless relevant to support Patent Owner's argument.

As with the prior inconsistent testimony regarding multi-layer resists discussed above in §II.A, Petitioner is trying to exclude as many versions of Dr. Smith's prior textbook as possible, even though the relevant statements are unchanged across the versions of the textbook.

Accordingly, EX2019 is relevant and not cumulative because it belies Dr. Smith's testimony in this IPR proceeding, and demonstrates how Dr. Smith consistently described the problems of resist thickness variation on critical dimension control prior to this IPR proceeding.

III. Conclusion

EX2015, EX2018 and EX2019 demonstrate that from at least 1998 to 2007, a POSITA would have understood that (1) multiple layers can act collectively as a

mask even if one of the layers is an intermediate layer having a sidewall or edge that is in line and flush with another one of the multiple layers; and (2) that dose exposure and resist thickness variations caused loss of critical dimension control.

See Liberty Mutual, CBM2012-00002, Pap. 66, at 64. Indeed, despite his submission of another declaration after the POR (*see* EX1049), Dr. Smith never testified that the relevant technology of multi-layer resists or problems with dose exposure and resist thickness variation as depicted and described in his publications had changed after the 1998 publication date of his edited chapters in EX2017 such that EX2015 and EX2018-EX2019 would not be relevant at the earlier 1998 date. As noted above and recognized by the Board, because the risk of unfair prejudice against which Rule 403 guards is diminished, if not eliminated entirely in non-jury tribunals, there is no reason the Board cannot properly consider the relevance of EX2015, EX2018 and EX2019.

For at least the above reasons, Petitioner's motion to exclude should be denied.

Respectfully submitted by:

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that this OPPOSITION TO
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