

2017-2474, -2475, -2476, -2478, -2479, -2480, -2482, -2483,  
2018-1050, -1079, -1080, -1081, -1082

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**United States Court of Appeals  
for the Federal Circuit**

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SAMSUNG ELECTRONICS CO. LTD., MICRON TECHNOLOGY, INC.,  
SK HYNIX, INC.

*Appellants,*

v.

ELM 3DS INNOVATIONS LLC,

*Appellee.*

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*Appeals from the United States Patent and Trademark Office, Patent Trial and  
Appeal Board in Inter Partes Review Nos. IPR2016-00386, IPR2016-00387,  
IPR2016-00388, IPR2016-00390, IPR2016-00391, IPR2016-00393,  
IPR2016-00394, IPR2016-00395, IPR2016-00708, IPR2016-00687,  
IPR2016-00691, IPR2016-00770, and IPR2016-00786*

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**APPELLEE ELM 3DS INNOVATIONS LLC's  
COMBINED PETITION FOR PANEL REHEARING  
AND REHEARING *EN BANC***

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July 12, 2019

**CERTIFICATE OF INTEREST**

Counsel for Appellee Elm 3DS Innovations LLC certifies the following:

**1. The full name of every party represented by me is:**

Elm 3DS Innovations LLC

**2. The name of the real party in interest (if the party named in the caption is not the real party in interest) represented by me is:**

None.

**3. All parent corporations and any publicly held companies that own 10 percent or more of the stock of the party represented by me are:**

None.

**4. The names of all law firms and the partners or associates that appeared for the party now represented by me in the trial court or agency or are expected to appear in this Court (and who have not entered an appearance in this Court) are:**

Robins Kaplan LLP (Cyrus A. Morton and Kelsey Thorkelson).

Carmichael IP, PLLC (James Carmichael).

**5. The title and number of any case known to counsel to be pending in this or any other court or agency that will directly affect or be directly affected by this court's decision in the pending appeal:**

The following cases pending before the Delaware District Court: *Elm 3DS Innovations LLC v. Samsung Electronics Co. Ltd.*, Civil Action No. 1:14-cv-01430-LPS, *Elm 3DS Innovations LLC v. Micron Technology Inc.*, Civil Action No. 1:14-cv-01431-LPS, and *Elm 3DS Innovations LLC v. SK hynix Inc.*, Civil Action No. 1:14-cv-01432-LPS.

Dated: July 12, 2019

/s/ William A. Meunier  
William A. Meunier

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**FEDERAL CIRCUIT RULE 35(b)(2) STATEMENT OF COUNSEL**

Based on my professional judgment, I believe the panel decision is contrary to the following decisions of this Court:

- *Aventis Pharma S.A. v. Hospira, Inc.*, 675 F.3d 1324 (Fed. Cir. 2012);
- *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362 (Fed. Cir. 2012);
- *Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358 (Fed. Cir. 2012);
- *Dealertrack, Inc. v. Huber*, 674 F.3d 1315 (Fed. Cir. 2012);
- *In re Trans Tex. Holdings Corp.*, 498 F.3d 1290 (Fed. Cir. 2007);
- *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005);
- *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973 (Fed. Cir. 1999).

Date: July 12, 2019

/s/ William A. Meunier  
Attorney for Appellee

## I. Summary

In construing “substantially flexible,” the Court properly acknowledged that “ $5 \times 10^8$  dynes/cm<sup>2</sup>” was just an **example** of a sufficiently low dielectric stress, and thus could not be read into the construction. But even though “50 microns” was just an **example** of a sufficient thinness, the Court improperly read “50 microns” into the construction of “substantially flexible.” This resulted in an internal inconsistency, and also contradicted the Federal Circuit’s controlling precedent against treating examples as limiting disavowals.

Therefore, Patent Owner/Appellee Elm 3DS Innovations LLC petitions for a panel or *en banc* rehearing on one narrow issue: whether the Court should amend its “substantially flexible” construction to require only that a semiconductor substrate be thinned (and subsequently polished or smoothed) so that it is largely able to bend without breaking, without further requiring that the substrate be thinned to a specified value of 50 microns or less. This change will not impact the ultimate disposition, as no issue turned on the 50 micron value.

Particularly, Elm requests that the Court amend its June 12, 2019 Opinion and “substantially flexible” construction as follows:

[W]e interpret a substantially flexible semiconductor substrate as a semiconductor substrate that is thinned ~~to 50  $\mu$ m~~ and subsequently

polished or smoothed so that it is able to largely able to bend without breaking.

Op., Doc. 68, at 11 (proposed amendment added).

Elm does not challenge the Court's conclusion that the full scope of "substantially flexible" was disavowed during prosecution to require making the substrate sufficiently thin and subsequently polished such that it is able to bend without breaking. But Elm respectfully submits that there was no clear and unambiguous disavowal requiring the thinness be further limited to 50 microns. Rather, a thinness of 50 microns is merely an **example** of a sufficient thinness that, along with other factors, can make the substrate substantially flexible.

The correct analysis of the "thinned" disclaimer should be consistent with the Court's parallel analysis of the low stress dielectric disclaimer, in which the Court concluded that "[w]e see nothing in the specification or prosecution history that limits the dielectric to a particular stress value. Both merely provide as **an example** that a tensile stress of  $5 \times 10^8$  dynes/cm<sup>2</sup> is sufficient." Op. at 10-11 (emphasis added). Similarly, the intrinsic evidence identified a thinness of 50 microns as an example of a sufficient thinness:

- "A substantially flexible semiconductor substrate may be achieved by grinding until considerably thin, **for example to a thickness of less than**

**50 microns**, and polishing the resulting surface.” J.A. 10313; J.A. 10316 (emphasis added).

- “Two features are required to achieve substantial flexibility. One is that the semiconductor material must be sufficiently thin, **e.g., 50 microns or less.**” J.A. 16038 (emphasis added).

The Court’s reading 50 microns into the construction was thus erroneous and inconsistent with its low stress dielectric analysis.

The deletion of “50 microns” will not affect the Court’s affirmance, which relied solely on the missing low stress dielectric requirement, and not on any 50 microns requirement. Because the 50 microns limitation played no part in the Court’s affirmance, the Court need not even address or resolve the issue of whether thinning the substrate to 50 microns is a necessary part of the “substantially flexible” construction.

However, if the Court does address this issue, the Court should modify its construction to omit this 50 microns requirement.

## **II. Points of Law or Fact Overlooked or Misapprehended By The Panel**

The following points of law or fact were overlooked or misapprehended by the Court in its panel decision:

- The issue of whether 50 microns was a requirement of the “substantially flexible” construction was unnecessary to its affirmance of the decisions below and need not be addressed or resolved on appeal;
- the intrinsic record clearly and unambiguously identified 50 microns as merely one example of a sufficient thinness that, along with other factors, can make the substrate substantially flexible;
- the intrinsic record did not clearly and unambiguously disavow substantially flexible substrates that are thicker than 50 microns; and
- it was improper and contrary to this Court’s precedent to construe “substantially flexible” to include a 50 microns requirement where the intrinsic record unambiguously identified 50 microns as merely an example of a sufficient thinness that, along with other factors, can make the substrate substantially flexible, and did not clearly and unambiguously disavow substantially flexible substrates that are thicker than 50 microns.

### **III. The Panel Should Grant Rehearing To Omit The 50 Microns Requirement**

#### **A. The Court Need Not Resolve The 50 Microns Dispute**

The Court’s June 12, 2019 Opinion affirmed each of PTAB’s final written decisions finding that Appellants/Petitioners failed to establish the unpatentability of any of the Challenged Patents and claims. Op., Doc. 68, at 2, 18. This was

based on Appellants'/Petitioners' failure to establish the obviousness of the low stress dielectric limitation required in each claim. Op., Doc. 68, at 18. The Court's affirmance did not turn on "50 microns" and, therefore, will not be affected by deleting the "50 microns" requirement from the Court's "substantially flexible" construction.

Accordingly, the Court need not and should not resolve the issue "50 microns" is a part of the "substantially flexible" construction. "In other cases, this court has limited its claim-construction analysis to go no further than was required to affirm or otherwise rule on the judgment appealed." *Bayer-Cropscience AG v. Dow Agrosciences LLC*, 728 F.3d 1324, 1331-32 (Fed. Cir. 2013); *see also Leo Pharm. Prods. v. Rea*, 726 F.3d 1346, 1352-53 (Fed. Cir. 2013) ("Because it is unnecessary for this court to adopt a specific alternative construction to resolve this appeal, this court declines to do so, leaving that question to a later forum where the issue is determinative."). This is particularly apt here where the construction dispute and evidence focused on whether "substantially flexible" required flexibility versus rigidity, and not on a particular thinness of 50 microns. *See, e.g.*, J.A. 42 ("although [Appellants argue] that the prior art shows a particular thinning of a substrate, [Appellants do] not argue that the combination of [the prior art] who have conveyed to one of ordinary skill in the art a substrate that is (largely) able to bend without breaking").

However, if the Court does address the issue, the Court should modify its construction to omit “50 microns.”

**B. Examples Are Not Clear And Unambiguous Disavowals**

“A statement in the prosecution history can only amount to a disclaimer if the applicant ‘clearly and unambiguously’ disavowed claim scope.” *Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1367 (Fed. Cir. 2012) (internal citations omitted). The Appellants/Petitioners bear the burden of establishing the required clear and ambiguous disavowal. *K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1363 (Fed. Cir. 1999).

In its June 12, 2019 Opinion, the Court correctly acknowledged that providing examples of a sufficient value does not amount to a clear and unambiguous disavowal limiting the claims to that particular value. *See Op.* at 10-11. Specifically, the Court considered whether prosecution language such as the following was a clear and unambiguous disavowal requiring not only that the claimed substantially flexible circuit layer have a sufficiently low stress dielectric material, **but also that this low stress dielectric material have a stress of  $5 \times 10^8$  dynes/cm<sup>2</sup> or less:**

- “For a circuit layer to be substantially flexible, Applicant has found that the dielectric material must have low tensile stress, **for example,  $5 \times 10^8$  dynes/cm<sup>2</sup>.**”

- “[T]he dielectric material used in processing the semiconductor material must be sufficiently low stress. Otherwise, substantial flexibility is defeated. As set forth in the present specification, stress of **5 x 10<sup>8</sup> dynes/cm<sup>2</sup> or less has been demonstrated to satisfy this requirement.**”

Op. at 10, quoting J.A. J.A. 10314 and 6038 (emphasis added).

The Court properly determined that this language was only a disavowal requiring the claimed substantially flexible circuit layer have a sufficiently low stress dielectric material. Op. at 10-11. The disavowal did not also include a requirement that the low stress dielectric material be limited to a particular value—5 x 10<sup>8</sup> dynes/cm<sup>2</sup> or less—because that stated value was **only an example** of a stress value that is sufficiently low enough to achieve the claimed substantial flexibility. In the Court’s words:

Considered in its entirety, the prosecution history clearly and unambiguously demonstrates that a substantially flexible circuit layer, and similar terms, must contain a substantially flexible semiconductor substrate and a **sufficiently low tensile stress dielectric material**. We see nothing in the specification or prosecution history that limits the dielectric to a particular stress value. Both merely provide as **an example** that a tensile stress of 5 x 10<sup>8</sup> dynes/cm<sup>2</sup> is sufficient.

Op. at 10-11 (emphasis added).

The Court's analysis and its rejection of the "5 x 10<sup>8</sup> dynes/cm<sup>2</sup>" example as part of the disavowal is consistent with the Federal Circuit's precedent prohibiting treating exemplary embodiments as disavowals or special definitions limiting the ordinary meaning of a claim term. For example, *Phillips* confirmed this Court's longstanding express rejection of confining claims to exemplary embodiments—even if only one exemplary embodiment is identified—particularly where the patentee is "provid[ing] an example of how to practice the invention." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005). The Court has consistently applied this precedent, stating that any argument that claim scope should be limited to "examples ... conflicts with our decision in *Phillips*." See *In re Trans Tex. Holdings Corp.*, 498 F.3d 1290, 1298-99 (Fed. Cir. 2007); *Dealertrack, Inc. v. Huber*, 674 F.3d 1315, 1322 (Fed. Cir. 2012) (confirming that declining to treat "example[s]" as limiting is "the only reading that does not violate this court's repeated prohibition against importing limitations from the specification"); see also, e.g., *Aventis Pharma S.A. v. Hospira, Inc.*, 675 F.3d 1324, 1330 (Fed. Cir. 2012) ("to disavow claim scope ... it is not enough that the only embodiments, or all embodiments, contain a particular limitation"); *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1366-67 (Fed. Cir. 2012).

**C. “50 Microns” Was An Example Of A Sufficiently Low Value, Not A Clear And Unambiguous Disavowal**

The Court did not follow this same analysis and precedent when it determined that the disavowal requiring a sufficiently thinned substrate should further include the exemplary sufficient thinness of 50 microns. *Op.*, Doc. 68, at 11. Just like the exemplary low stress value of  $5 \times 10^8$  dynes/cm<sup>2</sup>, the prosecution history identified a thinness of 50 microns as a mere **example** of a substrate thinness. Thus, while Elm does not now challenge that the full scope of “substantially flexible” was disavowed so as to require making the substrate sufficiently thin such that it is able to bend without breaking, Elm respectfully submits that there was no clear and unambiguous disavowal requiring that this sufficient thinness be further limited to 50 microns or less.

There was no such disavowal for at least the following reasons:

- The intrinsic record clearly and unambiguously identified 50 microns as merely an example of a thinness sufficient to achieve “substantial flexibility.”
- The Office Action response did not clearly and unambiguously disavow substantially flexible substrates that are thicker than 50 microns.
- At most, the Office Action response is ambiguous, and, in the context of the other clear and explicit statements that 50 microns is an example and not a requirement, is not a clear and unambiguous disavowal.

- The claim differentiation doctrine confirms there was no disavowal of flexible substrates that are thicker than 50 microns.

The Court's low stress dielectric disavowal analysis is therefore equally applicable here and compels the deletion of "50 microns" from the "substantially flexible" construction.

**1. "50 Microns" Was Merely An Example Of A Sufficiently Low Thinness**

During prosecution, Applicant repeatedly and explicitly stated that 50 microns was just an example of a thinness sufficient to achieve the claimed flexibility. For example, to overcome the *Bertin* reference relied on by Appellants/Petitioners, Applicant stated in numerous different Office Action Responses that:

A substantially flexible semiconductor substrate may be achieved by grinding until considerably thin, **for example to a thickness of less than 50 microns**, and polishing the resulting surface.

*E.g.*, J.A. 10313; J.A. 10316 (emphasis added).

Similarly, in a different Office Action Response, Applicants again made clear that 50 microns was only an example of a sufficiently thin semiconductor substrate, and that the only real requirement was sufficient thinness, not a thinness of precisely 50 microns or less:

Two features are required to achieve substantial flexibility.

One is that the semiconductor material **must be sufficiently thin, e.g., 50 microns or less.**

J.A. 16038 (emphasis added).

These repeated statements that 50 microns was just an example of a sufficiently thin substrate are consistent with the specification, which likewise repeatedly referred to a substantially flexible substrate as thinned, without any mention or requirement that the substrate be thinned to a specific value of 50 microns or less. For example: “The **thinned (substantially flexible)** substrate circuit layers of the 3DS memory circuit are typically ...” and “The **thinned (substantially flexible)** substrate circuit layer are preferably ... .” E.g., J.A. 885 at 8:34-46 (emphasis added).

## **2. The Prosecution History’s Indefiniteness Rejection Response Did Not Clearly And Unambiguously Disavow Substantially Flexible Substrates Thicker Than 50 Microns**

Applicant’s response to an indefiniteness rejection in one of the applications was consistent with these explicit prosecution history statements that 50 microns is merely an example of a thinness sufficient to achieve the claimed flexibility. In response to the indefiniteness rejection, Applicant cited to the following specification passage describing an example of how a “substantially flexible” substrate may be achieved in one embodiment:

2A. Grind the backside or exposed surface of the second circuit substrate to a thickness of less than 50  $\mu\text{m}$  and then polish or smooth the surface. The thinned substrate is now a substantially flexible substrate.

J.A. 1159 at 9:14-17; J.A. 10275. Consistent with the foregoing prosecution history statements, nothing in this passage “clearly and unambiguously” states that 50 microns or less is the only thinness sufficient to achieve the claim flexibility; it merely describes an embodiment in which the utilized sufficient thinness was 50 microns or less. J.A. 1159 at 9:14-17.

And in citing this passage to overcome the indefiniteness rejection, Applicant did not “clearly and unambiguously” require that the sufficient thinness be limited to 50 microns. Rather, the Applicant restated this passage’s description of an embodiment in which the sufficient thinness was 50 microns or less and, critically, did not state that it was limiting the meaning of “substantially flexible” to the precise values used in this embodiment, but instead explicitly stated that the meaning of “substantially flexible” is **consistent with** this description in the specification:

As described in this passage, a semiconductor substrate is caused to be substantially flexible by thinning it to 50 microns or less and polishing or smoothing the thinned semiconductor

substrate to relieve stress. The phrase “**substantially flexible**”  
**is used in the claims consistent with this description**, which  
is unambiguous.

J.A. 10275 (emphasis added). A substrate that is sufficiently thinned enough (and then polished or smoothed) to make it substantially flexible is “consistent with” the specification’s description, regardless of whether that sufficient thinness is the “50 microns or less” used in the described exemplary embodiment. This indefiniteness rejection response thus does not “clearly and unambiguously” disavow flexible substrates that are thicker than 50 microns because “[t]here is no ‘clear and unmistakable’ disclaimer if a prosecution argument is subject to more than one reasonable interpretation, one of which is consistent with the proffered meaning of the disputed term.” *SanDisk Corp. v. Memorex Prods., Inc.*, 415 F.3d 1278, 1287 (Fed. Cir. 2005).

This §112 rejection response is thus analogous to the one addressed in *Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358 (Fed. Cir. 2012). In *Toshiba*, the Court found that the identification of a specification’s example as a “recording plane” in response to a §112 rejection did not necessarily limit the meaning of “recoding plane” to the identified example and, therefore, “is not a clear and unambiguous disavowal of claim scope.” *Id.* at 1370-71. The same is true here – explaining that thinning a substrate to 50 microns is sufficient to make the

substrate substantially flexible does not necessarily mean that a thinness greater than 50 microns could not also be sufficiently thin enough to achieve the described substantial flexibility.

**3. There Is No Evidence That A POSITA Would Understand That Substantially Flexible Substrates Thicker Than 50 Microns Were Disavowed**

*Phillips* recognized that “persons of ordinary skill in the art rarely would confine their definitions of terms to the exact representations depicted in the embodiments,” *Phillips*, 414 F.3d at 1323, and Appellants/Petitioners identified no evidence that a POSITA would understand that, based on this “consistent with” office action response, a substrate must be thinned to 50 microns or less in order to be sufficiently thin enough to achieve substantial flexibility. Indeed, despite bearing the burden of proving disavowal, Appellants/Petitioners provided **no** expert testimony or evidence of how a POSITA would understand this office action response at all, much less testimony and evidence showing that a POSITA would understand it to disavow any substrate that was thinned to achieve substantial flexibility but was thicker than 50 microns. There could be no such evidence because a POSITA would understand that the thickness required to achieve substantial flexibility is not a constant value (of 50 microns or otherwise), but is variable calculated based on, among other things, the substrate’s material and its given surface area. *See, e.g.*, J.A. 44-46.

At most, the current record establishes only that the foregoing “consistent with” argument is ambiguous, which is not sufficient to be the required “clear and unambiguous” disavowal of all substantially flexible substrates thicker than 50 microns. This Court has repeatedly held that the standard for disavowal is “exacting” and “stringent,” while also noting that the prosecution history often lacks the clarity necessary for claim construction purposes “because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of the negotiation.” *Aventis*, 675 F.3d at 1330; *Thorner*, 669 F.3d at 1366; *Phillips*, 414 F.3d at 1329. This at-most ambiguous statement on which Appellants/Petitioners provided no evidence does not meet an “exacting” and “stringent” standard of a clear and unambiguous disavowal.

Indeed, the Court must assess disavowal “based on the **totality** of the prosecution history.” *Elkay Mfg. Co. v. EbcO Mfg. Co.*, 192 F.3d 973, 979 (Fed. Cir. 1999) (emphasis added). Here, in addition to the foregoing at-most ambiguous “consistent with” argument, the totality of the prosecution history also includes explicit and clear statements that the 50 microns was **only an example of a sufficient substrate thinness**, statements that were made both two months before (J.A. 10313) and three-four months after (J.A. 10316; J.A. 16038) the “consistent with” statement.

Thus, Appellants/Petitioners have not proven the at-best ambiguous “consistent with” argument is a clear and ambiguous disavowal of substrates that are sufficiently thin enough to achieve the claimed substantial flexibility but are thicker than 50 microns, particularly in light of all of the statements in the intrinsic evidence explicitly informing a POSITA that 50 microns or less is only an example of a sufficient substrate thinness.

**4. The Claim Differentiation Doctrine Confirms There Was No Disavowal Of Sufficiently Thinned Substrates That Are Thicker Than 50 Microns**

The doctrine of claim differentiation confirms that there was no disavowal of sufficiently thinned substrates that were thicker than 50 microns. Although not dispositive, the “doctrine is at its strongest ‘where the limitation sought to be read into an independent claim already appears in a dependent claim.’” *Seachange Int’l, Inc. v. C-COR, Inc.*, 413 F.3d 1361, 1368-69 (Fed. Cir. 2005), quoting *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004).

Here, construing “substantially flexible” to include a 50 microns or less requirement would render numerous other claim limitations and dependent claims superfluous. For example, challenged ’499 Patent claim 1 requires a “substantially flexible ... semiconductor layer,” while its dependent claim 5 further requires that this substantially flexible semiconductor layer also “has a thickness of 50 microns or less.” J.A. 1130-1131 at claims 1 and 5; *see also, e.g.*, J.A. 1165 at claims 58

and 86. If “substantially flexible” means “50 microns or less,” then there is no need to specify that the claimed semiconductor layer is both “substantially flexible” **and** “has a thickness of 50 microns or less.” Construing “substantially flexible” have a “50 microns or less” requirement would thus render dependent claim 5 and other similar claims and limitations entirely superfluous.

While claim differentiation is not per se dispositive, such dependent claims and limitations are further intrinsic evidence that a POSITA would not understand that the full scope “substantially flexible” was clearly and unambiguously disavowed to include only substrates/layers that are 50 microns or less, particularly in light of the prosecution history’s repeated express statements to the contrary.

#### **IV. The En Banc Court Should Grant Rehearing To Consider and Modify Its “Substantially Flexible” Construction To Omit The 50 Microns Requirement**

If the panel does not grant a rehearing and amend its “substantially flexible” construction to omit the 50 microns requirement, then Elm respectfully submits that the *en banc* Court should grant a rehearing and do so. For the reasons discussed above, the inclusion of a 50 microns requirement is contrary to this Court’s precedent, including its precedent:

- Requiring that a purported disavowal must be clear and unambiguous based on the totality of the prosecution history (*see, e.g., Aventis Pharma S.A. v. Hospira, Inc.*, 675 F.3d 1324, 1330 (Fed. Cir. 2012));

*Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1366-67 (Fed. Cir. 2012); *Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1367 (Fed. Cir. 2012); *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 979 (Fed. Cir. 1999);

- Prohibiting a claim construction limiting claims to exemplary embodiments, even if only one exemplary embodiment is identified (see, e.g., *Dealertrack, Inc. v. Huber*, 674 F.3d 1315, 1322 (Fed. Cir. 2012); *Aventis Pharma S.A. v. Hospira, Inc.*, 675 F.3d 1324, 1330 (Fed. Cir. 2012); *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1366-67 (Fed. Cir. 2012); *In re Trans Tex. Holdings Corp.*, 498 F.3d 1290, 1298-99 (Fed. Cir. 2007); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005)); and
- Limiting its claim-construction analysis to go no further than was required to affirm or otherwise rule on the judgment appealed. *Bayer-Cropscience AG v. Dow Agrosciences LLC*, 728 F.3d 1324, 1331-32 (Fed. Cir. 2013).

## **V. Conclusion**

For the reasons stated herein, Elm respectfully requests that the Court grant this petition for a panel rehearing or *en banc* rehearing on the foregoing limited

claim construction issue and amend its “substantially flexible” construction to omit the 50 microns requirement.

Dated: July 12, 2019

Respectfully submitted,

/s/ William A. Meunier

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# **Addendum**

# United States Court of Appeals for the Federal Circuit

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SAMSUNG ELECTRONICS CO., LTD., MICRON  
TECHNOLOGY, INC., SK HYNIX INC.,  
*Appellants*

v.

ELM 3DS INNOVATIONS, LLC,  
*Appellee*

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2017-2474, 2017-2475, 2017-2476, 2017-2478, 2017-2479,  
2017-2480, 2017-2482, 2017-2483, 2018-1050, 2018-1079,  
2018-1080, 2018-1081, 2018-1082

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Appeals from the United States Patent and Trademark  
Office, Patent Trial and Appeal Board in Nos. IPR2016-  
00386, IPR2016-00387, IPR2016-00388, IPR2016-00390,  
IPR2016-00391, IPR2016-00393, IPR2016-00394,  
IPR2016-00395, IPR2016-00687, IPR2016-00691,  
IPR2016-00708, IPR2016-00770, IPR2016-00786.

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Decided: June 12, 2019

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WILLIAM MEUNIER, Mintz, Levin, Cohn, Ferris, Glovsky  
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resented by KEVIN AMENDT, SANDRA BADIN, MATTHEW  
STEPHEN GALICA, MICHAEL NEWMAN, MICHAEL TIMOTHY  
RENAUD, JAMES M. WODARSKI.

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Before MOORE, REYNA, and CHEN, *Circuit Judges*.

MOORE, *Circuit Judge*.

Samsung Electronics Co., Ltd., Micron Technology, Inc., and SK Hynix Inc. (collectively, “Petitioners”) appeal from the final written decisions of the Patent Trial and Appeal Board in thirteen inter partes reviews holding that they did not establish the unpatentability of 105 claims across eleven patents (“Challenged Patents”). Given that each challenged claim requires a low-tensile-stress dielectric, and substantial evidence supports the Board’s finding that a person of ordinary skill in the art would not have reasonably expected success in combining the prior art to meet this limitation, we affirm.

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## BACKGROUND

Appellee Elm 3DS Innovations LLC (“Elm”) is the owner of the Challenged Patents,<sup>1</sup> which share a specification and all relate to “stacked integrated circuit memory.”<sup>2</sup> ’672 patent at 1:7–8. The Challenged Patents are the subject of co-pending litigation between Elm and Petitioners.

The Board instituted inter partes review based on thirteen petitions filed by Petitioners. Among others not at issue on appeal, the petitions challenged the following claims: claims 17–18, 22, 84, 95, 129–32, 145–46, and 152 of the ’672 patent (IPR2016-00386); claims 1–2, 8, 14, 31–32, 44, 46, and 52–54 of the ’778 patent (IPR2016-00387); claims 10–12, 18–20, 60–63, 67, 70–73, and 77 of the ’239 patent (IPR2016-00388 and IPR2016-00393); claims 1–3, 30–31, 33, 40–41, and 44 of the ’542 patent (IPR2016-00390); claims 30, 34, 36, 135–138, and 147 of the ’862 patent (IPR2016-00391); claims 36 and 51 of the ’617 patent (IPR2016-00394); claims 1, 10–11, and 13–14 of the ’732 patent (IPR2016-00395); claims 1, 7, 17–18, and 33 of the ’119 patent (IPR2016-00687); claims 1 and 20–23 of the ’004 patent (IPR2016-00691); claims 1, 12–13, 24, 36–38, 53, 83, 86–87, and 132 of the ’499 patent (IPR2016-00708 and IPR2016-00770); and claims 58, 60–61, and 67 of the ’570 patent (IPR2016-00786). Each ground challenging the claims was based on obviousness and asserted either U.S. Patent No. 5,202,754 (“Bertin”) or a 1996 article by Kee-Ho Yu, et. al., titled “Real-Time Microvision System with Three-Dimensional Integration Structure” (“Yu”) as the

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<sup>1</sup> The patents at issue are U.S. Patent Nos. 8,653,672; 8,841,778; 7,193,239; 8,629,542; 8,796,862; 8,410,617; 7,504,732; 8,928,119; 7,474,004; 8,907,499; and 8,933,570.

<sup>2</sup> For simplicity, this opinion cites only to the specification of the ’672 patent.

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primary reference in combination with, relevant here, U.S. Patent No. 5,354,695 (“Leedy”).<sup>3</sup>

The Board held that Petitioners had not met their burden of demonstrating that the claims were unpatentable. Specifically, it found that the prior art did not disclose the “substantially flexible” limitation. It also found that Petitioners did not demonstrate a motivation to combine Bertin or Yu with Leedy or a reasonable expectation of success in doing so. Petitioners timely filed notices of appeal, and the appeals were consolidated. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(4)(A).

## DISCUSSION

### I. Claim Construction

“We review the Board’s constructions based on intrinsic evidence de novo and its factual findings based on extrinsic evidence for substantial evidence.” *HTC Corp. v. Cellular Commc’ns Equip., LLC*, 877 F.3d 1361, 1367 (Fed. Cir. 2017). The Board construes claims in an unexpired patent according to their broadest reasonable interpretation in light of the specification. 37 C.F.R. § 42.100(b) (2017).<sup>4</sup> Claims of an expired patent are construed according to the standard applied by district courts. *See In re CSB-Sys. Int’l, Inc.*, 832 F.3d 1335, 1341 (Fed. Cir. 2016) (referencing *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed.

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<sup>3</sup> Claim 1 of the ’499 patent was challenged based on U.S. Patent No. 5,731,945, which contains the same disclosure as Bertin and adds details not relevant to this appeal.

<sup>4</sup> The Board’s decisions issued prior to the effective date of the U.S. Patent and Trademark Office’s change to the claim construction standard applied in inter partes review. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018).

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Cir. 2005) (en banc)). While some patents were expired at the time of the Board's final written decision and others were not, the parties agree that the different claim construction standards do not impact the outcome. Appellants' Br. 44; Appellee's Br. 41. The parties have not contested the Board's application of the *Phillips* claim construction standard.

All challenged claims except for claims 1 and 14 of the '778 patent use "substantially flexible" in at least one of two ways. The first is to modify the term "semiconductor substrate." Claim 129 of the '672 patent illustrates the use in this context (emphasis added):

An integrated circuit structure comprising:

a first substrate comprising a first surface supporting interconnect contacts;

*a substantially flexible semiconductor second substrate* comprising a first surface and a second surface at least one of which supports interconnect contacts, wherein the second surface is opposite the first surface and wherein the second surface of the second substrate is formed by removal of semiconductor material from the second substrate and is smoothed or polished after removal of the semiconductor material; and

conductive paths between the interconnect contacts supported by the first surface of the first substrate and of the interconnect contacts supported by the second substrate;

wherein the first substrate and the second substrate overlap fully or partially in a stacked relationship; and

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wherein the integrated circuit structure further comprises a low-stress silicon-based dielectric material having a stress of  $5 \times 10^8$  dynes/cm<sup>2</sup> tensile or less.

“Substantially flexible” is also used to modify “circuit layers,” and other similar terms.<sup>5</sup> Claim 30 of the ’862 patent illustrates how “substantially flexible” is used in this context (emphasis added):

A stacked circuit structure comprising:

a plurality of stacked, thin, *substantially flexible circuit layers* at least one of which comprises a thinned, substantially flexible monocrystalline semiconductor substrate of one piece;

wherein at least one of the substantially flexible circuit layers comprises at least one memory array comprising memory cells and a low stress silicon-based dielectric material; and

at least one vertical interconnection that passes through at least one of the plurality of stacked, thin, substantially flexible circuit layers.

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<sup>5</sup> See, e.g., ’239 patent at Claim 60 (“substantially flexible” die); ’004 patent at Claim 1 (“substantially flexible integrated circuits”); ’732 patent at Claim 1 (“substantially flexible integrated circuit layer”). The parties do not treat this difference in terminology as affecting the construction of “substantially flexible.” Accordingly, our construction of “substantially flexible” applies across all its uses.

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In each context, the Board relied on a general-purpose dictionary to construe “substantially flexible” to mean “largely able to bend without breaking.” *E.g.*, J.A. 31.

“Claim terms generally are construed in accordance with the ordinary and customary meaning they would have to one of ordinary skill in the art in light of the specification and the prosecution history.” *Aventis Pharma S.A. v. Hospira, Inc.*, 675 F.3d 1324, 1329 (Fed. Cir. 2012) (citing *Phillips*, 415 F.3d at 1312). Extrinsic evidence may also be considered in construing a claim, though “it is less significant than the intrinsic record in determining the legally operative meaning of claim language.” *Phillips*, 415 F.3d at 1317 (internal quotation marks omitted). We will deviate from a claim term’s ordinary meaning “when a patentee sets out a definition and acts as its own lexicographer” or “when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Aventis*, 675 F.3d at 1330 (quoting *Thorner v. Sony Computer Entm’t Am. L.L.C.*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)).

The parties dispute the meaning of “substantially flexible.” “Where multiple patents derive from the same parent application and share many common terms, we must interpret the claims consistently across all asserted patents.” *SightSound Techs., LLC v. Apple Inc.*, 809 F.3d 1307, 1316 (Fed. Cir. 2015) (internal quotation marks omitted). The parties do not argue that the definition of “substantially flexible” depends on the patent or claim in which it is used. Because the Challenged Patents derive from the same parent application and use “substantially flexible” throughout, we construe that term the same way for each Challenged Patent.

Petitioners argue the intrinsic record supports a construction of “substantially flexible” substrate as a “substrate that has been thinned to a thickness of less than 50  $\mu\text{m}$  and subsequently polished or smoothed.” Appellants’

Br. 36. Specifically, they rely on the specification's disclosure of step "2A" in a fabrication sequence for a "3DS memory circuit," which states: "Grind the backside or exposed surface of the second circuit substrate to a thickness of less than 50  $\mu\text{m}$  and then polish or smooth the surface. The thinned substrate is now a substantially flexible substrate." '672 patent at 9:3–6; *see also id.* at 2:66–67, 3:5–8 (stating that a feature of the stacked circuit assembly technology includes "[t]hinning of the memory circuit to less than about 50  $\mu\text{m}$  in thickness forming a substantially flexible substrate"). Though these disclosures refer to the substrate being substantially flexible, Petitioners argue they apply with equal force to the claims reciting "substantially flexible" circuit layers, and similar limitations, because the prosecution history requires that a substantially flexible circuit layer includes a substantially flexible substrate.

Elm responds that the Board's construction is consistent with the ordinary meaning of "substantially flexible" and the specification's distinction between flexible and rigid substrates. It criticizes Petitioners' proposed construction as departing from the ordinary meaning, since the flexibility of a material depends on more than how thin and polished it is. Citing the declaration of Petitioners' expert Dr. Paul Franzon, Elm argues the flexibility of a semiconductor substrate depends on the substrate's elastic modulus, crystal orientation, and dimensions. Appellee's Br. 48–49 (citing J.A. 2191–92 ¶ 71).

Neither party's construction is quite right. We begin our analysis with the claim language. The claims indicate that, at least in some situations, thinning and polishing a substrate is one way of forming a substantially flexible substrate. For example, claim 31 of the '778 patent recites "the semiconductor substrate is thinned and polished or smoothed such that the semiconductor substrate is substantially flexible." *See also* '862 patent at Claim 147 (reciting "the polished or smoothed backside [of a thinned, monocrystalline semiconductor substrate] enables the . . .

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substrate to be substantially flexible, and the polished or smoothed backside reduces the vulnerability of the . . . substrate to fracture as a result of flexing”). But that does not mean this is the only way to achieve substantial flexibility. The claim on which claim 31 depends recites “the semiconductor substrate is substantially flexible,” ’778 patent at Claim 2, implying that it covers substantially flexible substrates formed in ways other than the one recited in claim 31, *Clearstream Wastewater Sys., Inc. v. Hydro-Action, Inc.*, 206 F.3d 1440, 1446 (Fed. Cir. 2000) (“Under the doctrine of claim differentiation, it is presumed that different words used in different claims result in a difference in meaning and scope for each of the claims.”). Claim 51 of the ’617 patent recites “the bottomside of the first substrate is polished to make the substrate substantially flexible,” with no specific “thinned” limitation. Conversely, claim 8 of the ’778 patent lacks a polishing limitation, reciting a substrate that “is formed from a semiconductor wafer and is thinned and substantially flexible.” The claims alone do not support limiting “substantially flexible” to Petitioners’ proposed construction.

The prosecution history, on the other hand, shows that “substantially flexible” is narrower than the Board’s construction of “largely able to bend without breaking.” *E.g.*, J.A. 31. During prosecution of the application that led to the ’499 patent, the examiner objected to the use of the term “substantially flexible” because it rendered the claim’s scope unclear. J.A. 10260. Elm responded that “the meaning of [substantially flexible] as used in the claims is clearly explained in the specification,” citing to step 2A in the fabrication sequence. J.A. 10275. “As described in this passage,” Elm continued, “a semiconductor substrate is caused to be substantially flexible by thinning it to 50 microns or less and polishing or smoothing the thinned semiconductor substrate to relieve stress. The phrase ‘substantially flexible’ is used in the claims consistent with this description, which is unambiguous.” *Id.* To overcome

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the examiner's objection, Elm clearly and unambiguously disclaimed claim scope. For a semiconductor substrate to be "substantially flexible" according to the claims, it must be thinned to 50 microns or less and polished or smoothed.

This definition of "substantially flexible" applies to all its uses. In response to a rejection of claims reciting a substantially flexible circuit layer in an application related to the Challenged Patents, Elm stated that "a substantially flexible semiconductor substrate is a *necessary* but not a *sufficient* condition for a substantially flexible circuit layer." J.A. 10316 (emphasis in original). Reinforcing this point, Elm in a response involving another related application explained:

Two features are *required* to achieve substantial flexibility. One is that the semiconductor material must be sufficiently thin, e.g., 50 microns or less. . . . The other is that the dielectric material used in processing the semiconductor material must be sufficiently low stress. Otherwise, substantial flexibility is defeated. As set forth in the present specification, stress of  $5 \times 10^8$  dynes/cm<sup>2</sup> or less has been demonstrated to satisfy this requirement.

J.A. 16038 (emphasis added). *See also* J.A. 10314 ("[A] circuit layer requires one or more dielectric layers. . . . For a circuit layer to be substantially flexible, Applicant has found that the dielectric material must have low tensile stress, for example,  $5 \times 10^8$  dynes/cm<sup>2</sup> tensile."). Considered in its entirety, the prosecution history clearly and unambiguously demonstrates that a substantially flexible circuit layer, and similar terms, must contain a substantially flexible semiconductor substrate and a sufficiently low tensile stress dielectric material. We see nothing in the specification or prosecution history that limits the dielectric to a particular stress value. Both merely provide as an

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example that a tensile stress of  $5 \times 10^8$  dynes/cm<sup>2</sup> is sufficient.

This is not, however, the end of the construction. The prosecution history makes clear that “substantially flexible” cannot be read to cover rigid substrates and circuit layers. See J.A. 15397 (criticizing the prior art substrate because it is “rigid”); J.A. 16039 (stating the prior art “describe[s] a stacked integrated circuit formed on a *rigid* carrier . . . , suggesting that the stacked integrated circuit is in fact *inflexible*” (emphasis in original)). Based on expert testimony from Dr. Franzon, the Board found that “there are a number of factors that, within the context of semiconductor processing, determine the flexibility of a semiconductor substrate,” including the type of semiconductor substrate, the crystal orientation of the material, and the physical dimensions of the substrate. *E.g.*, J.A. 27 (citing J.A. 2191–92 ¶ 71). This suggests thinning the semiconductor substrate to 50 μm and subsequently polishing or smoothing it is necessary but not necessarily sufficient to make the substrate substantially flexible. To ensure that the construction of “substantially flexible” cannot be read to cover a rigid substrate or circuit layer, we interpret a substantially flexible semiconductor substrate as a semiconductor substrate that is thinned to 50 μm and subsequently polished or smoothed such that it is largely able to bend without breaking. Likewise, we interpret a substantially flexible circuit layer as a circuit layer that is largely able to bend without breaking and contains a substantially flexible semiconductor substrate and a sufficiently low tensile stress dielectric material.

## II. Obviousness

We review the Board’s legal determinations de novo and its underlying factual findings for substantial evidence. *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2013). Obviousness is a question of law based on underlying facts. *Id.* Whether there was a motivation to

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combine references and a reasonable expectation of success in doing so to meet the limitations of the claimed invention are questions of fact. *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016).

Each ground of unpatentability relied on either Bertin or Yu in combination with Leedy, along with other references not relevant on appeal. Bertin discloses “[a] fabrication method and resultant three-dimensional multichip package having a densely stacked array of semiconductor chips interconnected at least partially by means of a plurality of metallized trenches.” J.A. 1206 at Abstract. “[P]rocessing begins with a semiconductor device 50 (preferably comprising a wafer) having a substrate 52 and an active layer 54, which is typically positioned at least partially therein.” J.A. 1216 at 3:50–53. A dielectric layer is grown over the active layer. *Id.* at 3:60–62.<sup>6</sup> Yu discloses a fabrication process for a 3D integration structure in which a silicon wafer is glued to quartz glass, thinned and polished, and bonded to a thick wafer. The structure includes a “field oxide,” depicted in two figures as silicon dioxide. J.A. 1350. Leedy discloses a method of fabricating “integrated circuits from flexible membranes formed of very thin low stress dielectric materials, such as silicon dioxide or silicon nitride, and semiconductor layers.” J.A. 1229 at Abstract.

Regarding the Bertin-Leedy combinations, Petitioners proposed depositing a low-stress dielectric material using plasma-enhanced chemical vapor deposition (“PECVD”), as disclosed in Leedy, instead of growing the dielectric layer, as disclosed in Bertin. The Board found that a person of ordinary skill in the art would not have been motivated to make such a combination and would not have had a reasonable expectation of success in doing so. It credited the

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<sup>6</sup> A dielectric is an insulator used in electric circuits. J.A. 2375 ¶ 33.

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testimony of Elm's expert Dr. Alexander Glew that PECVD was incompatible with Bertin's integrated circuit. Given the complexity involved in integrated circuit fabrication, it found Dr. Franzon's testimony that PECVD had certain benefits and that Leedy and Bertin are in the same technological field was insufficient to meet Petitioners' burden. As a result, it found Petitioners failed to adequately explain "how [Bertin's] fabrication process would be changed to use [Leedy's] dielectric material, which is formed in a quite different manner than [Bertin's] dielectric layer." J.A. 77. The Board's finding as to a lack of reasonable expectation of success is supported by substantial evidence.

Bertin discloses that "[a] dielectric layer 60, for example, [silicon dioxide], is grown over active layer 54 of device 50." J.A. 1216 at 3:60–62. Dr. Glew testified that a silicon dioxide dielectric that is grown directly over circuit components must be high-purity to not damage the circuit components. J.A. 2415 ¶ 128. As a result, one of ordinary skill in the art would have known from Bertin's description that the dielectric layer 60 "was grown at high temperatures using thermal oxidation." J.A. 2415–16 ¶ 128; *see also* J.A. 1527 (acknowledging in the Petition that Bertin discloses "thermally grown oxides"). Thermal oxidation is a process in which silicon at the surface of a wafer is converted to high-purity silicon dioxide by exposing it to oxygen at high temperatures, typically between 900 °C and 1200 °C. J.A. 2387–88 ¶¶ 66–67.

Substantial evidence supports the Board's finding that Petitioners did not adequately explain how Bertin's fabrication process would be changed to use Leedy's dielectric material. The Petition asserted that Leedy's dielectric material could "easily be used in place of" Bertin's dielectric using PECVD. J.A. 1527. In support of this argument, Dr. Franzon testified that PECVD "was a commonly available deposition technique that could have been used in place of" Bertin's technique for growing dielectrics. J.A. 2207 ¶ 101. He also testified that Leedy explains that

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“its dielectric deposition processes are compatible with conventional integrated circuit fabrication methods.” J.A. 2206–07 ¶ 101. For example, Leedy states that “[t]he dielectric membrane is compatible with most higher temperature [integrated circuit] processing techniques.” J.A. 1296 at 5:32–33.

Evidence shows that selecting a dielectric and a method of forming that dielectric is more complicated than Petitioners suggest. A specific dielectric, like silicon dioxide, can have “vastly different characteristics and behaviors” depending on how it is made. J.A. 2386 ¶ 63. Dr. Glew identified eighteen factors to be considered when selecting a dielectric and method of formation. Those factors include:

- (1) dielectric constant,
- (2) breakdown field strength,
- (3) leakage,
- (4) surface conductance,
- (5) moisture absorption or permeability to moisture,
- (6) stress,
- (7) adhesion to aluminum,
- (8) adhesion to dielectric layers above or below,
- (9) stability,
- (10) etch rate,
- (11) permeability to hydrogen,
- (12) amount of incorporated electrical charge or dipoles,
- (13) amount of impurities,
- (14) quality of step coverage,
- (15) the thickness and uniformity of the film,
- (16) ability to provide good doped uniformity across a wafer,
- (17) defect density, [and]
- (18) amount of residual constituents that outgas during later processing.

J.A. 2421 ¶ 139. Dr. Glew stated that most of these factors are unknown here with respect to Leedy’s dielectric, so a person of ordinary skill in the art could not conclude that it would have been obvious to make the proposed substitution. In light of the complexity of semiconductor fabrication, the Board found Petitioners’ explanation lacking.

The Board’s finding that PECVD is “quite different” from thermal oxidation is supported by substantial evi-

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dence. J.A. 77. As the name suggests, PECVD is a deposition process, unlike thermal oxidation, which is a growth process. PECVD is performed at 400 °C or less and uses plasma to create a reaction between the surface of a wafer and chemical vapors that include the atoms or molecules to be deposited. In contrast to thermal oxidation, which yields a high-purity dielectric, Dr. Glew testified that dielectrics deposited using PECVD “include impurities that make them unusable for a variety of applications requiring higher purity.” J.A. 2392 ¶ 77. According to Dr. Glew, this creates a problem when attempting to implement Leedy’s dielectric into Bertin using PECVD because the dielectric layer of Bertin must be highly pure to not damage the circuit components. J.A. 2415–16 ¶ 128. The dielectric produced using PECVD would not be sufficiently pure. J.A. 2416 ¶ 130. He also testified that PECVD “cannot be used because positive ions present in the plasma can strike and damage the wafer and the exposed active components in and on its surface.” J.A. 2423 ¶ 142.

Petitioners argue the Board erred when it declined to resolve a dispute about front-end-of-line and back-end-of-line processing steps, especially when it relied on Dr. Glew’s testimony that assumed Bertin’s dielectric was grown during the front-end-of-line phase of the fabrication process. Dr. Glew’s testimony was that if Leedy’s dielectric replaced Bertin’s at the same phase in the fabrication process, PECVD could not be used “because the resulting dielectric would not (1) be sufficiently pure; (2) have the ability to adhere sufficiently to the semiconductor wafer; and (3) be able to withstand high temperatures of the remaining [front-end-of-line] steps,” which generally occur at higher temperatures than the back-end-of-line steps, “without changing its form.” J.A. 2422–23 ¶ 142. We see no legal error in the Board’s decision. First, the Board found that even assuming Petitioners’ contentions were accurate, their explanation was lacking. Second, we understand the Board’s opinion as finding it unnecessary to

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decide this issue because, at least as to Dr. Glew's first two points, the timing would not matter. Though Petitioners disputed these facts in their Reply below, they did so based on attorney argument without premising that argument on the timing of applying PECVD. J.A. 1811–12. Moreover, “[t]he possibility of drawing two inconsistent conclusions from the evidence does not prevent an administrative agency’s finding from being supported by substantial evidence.” *In re Applied Materials, Inc.*, 692 F.3d 1289, 1294 (Fed. Cir. 2012).

Petitioners also argue the Board improperly required proof that unclaimed elements were combinable. “It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements.” *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012). “What matters in the § 103 nonobviousness determination is whether a person of ordinary skill in the art, having all the teachings of the references before him, is able to produce the structure defined by the claim.” *Orthopedic Equip. Co., Inc. v. United States*, 702 F.2d 1005, 1013 (Fed. Cir. 1983). The Board did not require unclaimed elements be combinable. Rather, it repeatedly stated that integrated-circuit technology is complex and, as such, looked for specific evidence that a person of ordinary skill in the art would have reasonably expected success in combining Bertin’s fabrication process and Leedy’s dielectric material. Petitioners specifically argued in its Petition that “PECVD . . . could have been used in place of the dielectric growing techniques described in Bertin to obtain the predictable result of stacked [integrated circuits] having low tensile stress dielectrics.” J.A. 1528. The Board ultimately determined that Petitioners’ evidence in support of that combination was insufficient. We will not fault the Board for analyzing Petitioners’ obviousness grounds in the way presented in the Petition.

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Finally, Petitioners argue there was a reasonable expectation of success because the Challenged Patents incorporate Leedy by reference. The patents state that “dielectrics in low stress . . . such as low stress silicon dioxide and silicon nitride . . . are discussed at length in [Leedy], incorporated herein by reference.” ’672 patent at 8:46–53. Petitioners argue that the failure to mention any technical problems with using Leedy’s dielectrics indicates that doing so was trivial. The Board considered this argument and rejected it. We find the Petitioners’ argument too speculative to warrant a conclusion that the Board’s factual finding lacked substantial evidence.

The arguments related to the Yu-Leedy combinations were substantially similar to the Bertin-Leedy combinations. According to the Petition, it would have been obvious to replace Yu’s silicon dioxide and processes for forming it with the dielectric and deposition process taught by Leedy. “Using [Leedy’s] dielectric materials and deposition techniques in the manufacture of Yu’s 3D LSI results in” the combination disclosing the low-tensile-stress-dielectric limitation. J.A. 1558. Dr. Franzen’s testimony in support of this combination was identical to the combination in the Bertin-Leedy grounds. *See* J.A. 2206–08 ¶¶ 99–103. The Board found that Petitioners failed to meet their burden for substantially the same reasons.

The evidence discussed as to why a person of ordinary skill in the art would not have reasonably expected success in making the proposed combination applies equally here. Dr. Glew testified that Yu identifies its dielectric as a “field oxide,” which one of ordinary skill in the art would have understood is a highly pure dielectric grown directly on the silicon substrate at high temperatures using thermal oxidation. J.A. 2418–19 ¶¶ 134–35 (citing J.A. 1350). His testimony about why a person of ordinary skill in the art would not have reasonably expected success using PECVD to deposit Leedy’s dielectric was likewise the same. Petitioners raise no argument on appeal that distinguishes the

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Bertin-Leedy grounds from the Yu-Leedy grounds. Substantial evidence supports the Board's finding of a lack of reasonable expectation of success.

This issue is dispositive as to all challenged claims. All claims except claims 60, 67, 70, and 77 of the '239 patent; claims 1 and 44 of the '542 patent; claim 1 of the '119 patent; and claim 58 of the '570 patent explicitly require a low tensile stress dielectric. These claims recite either a substantially flexible die or integrated circuit, meaning they too require a low tensile stress dielectric under the proper claim construction. We thus affirm the Board's finding as to a lack of reasonable expectation of success and need not reach Petitioners' remaining arguments.

#### CONCLUSION

Because we hold that substantial evidence supports the Board's finding of a lack of reasonable expectation of success, we need not address the Board's separate findings that the prior art does not teach the "substantially flexible" limitation or that a person of ordinary skill in the art would have lacked a motivation to combine. For the foregoing reasons, we affirm.

**AFFIRMED**

### CERTIFICATE OF SERVICE

I, Melissa Pickett, being duly sworn according to law and being over the age of 18, upon my oath depose and say that:

Counsel Press was retained by MINTZ LEVIN COHN FERRIS GLOVSKY AND POPEO PC, Attorneys for Appellee ELM 3DS Innovations, LLC to print this document. I am an employee of Counsel Press.

On **July 12, 2019**, Counsel for Appellant has authorized me to electronically file the foregoing **APPELLEE ELM 3DS INNOVATIONS LLC's COMBINED PETITION FOR PANEL REHEARING AND REHEARING EN BANC** with the Clerk of Court using the CM/ECF System, which will send notice of such filing to the following registered CM/ECF users, including the following principal counsel for the other parties.

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On the same day as above, 18 paper copies will be filed with the Court.

Dated: July 12, 2019

/s/ Melissa Pickett  
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/s/ William A. Meunier  
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