

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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INNOSCIENCE AMERICA, INC.,  
Petitioner,

v.

INFINEON TECHNOLOGIES AMERICAS CORP.,  
Patent Owner.

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IPR2025-00175  
Patent 8,686,562 B2

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Before JO-ANNE M. KOKOSKI, CHRISTOPHER M. KAISER, and  
LISA A. MURRAY, *Administrative Patent Judges*.

KOKOSKI, *Administrative Patent Judge*.

DECISION  
Granting Institution of *Inter Partes* Review  
35 U.S.C. § 314

## I. INTRODUCTION

Innoscence America, Inc. (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–17 of U.S. Patent No. 8,686,562 B2 (“the ’562 patent,” Ex. 1001). Paper 1 (“Pet.”). Infineon Technologies Americas Corp. (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

Institution of an *inter partes* review is authorized by statute when “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314 (2018); *see also* 37 C.F.R. § 42.4 (2023). For the reasons discussed below, we determine that Petitioner establishes a reasonable likelihood of prevailing with respect to the patentability of at least one claim of the ’562 patent. Accordingly, we institute an *inter partes* review of claims 1–17 of the ’562 patent.

### A. *Real Parties in Interest*

Petitioner identifies Innoscience America, Inc., Innoscience (Zhuhai) Technology Company, Ltd., and Innoscience (Suzhou) Technology Holding Company, Ltd. as the real parties in interest. Pet. 67. Patent Owner identifies itself as the real party in interest. Paper 3 (Mandatory Notice), 1.

### B. *Related Matters*

The parties indicate that the ’562 patent is asserted in *Infineon Technologies Austria AG v. Innoscience (Suzhou) Tech. Co., Ltd.*, Case No. 3:24-cv-01553 (N.D. Cal.) and U.S. International Trade Commission, Investigation No. 337-TA-1414, *In re Certain Semiconductor Devices and Products Containing the Same*, filed on July 26, 2024. Pet. 67; Paper 3, 1.

*C. The '562 Patent*

The '562 patent, titled “Refractory Metal Nitride Capped Electrical Contact and Method for Fabricating Same,” is directed to “a contact for implementation as an electrode on a semiconductor device, such as a group III-V power semiconductor device.” Ex. 1001, code (54), 2:19–23. The '562 patent explains that “‘group III-V semiconductor’ refers to a compound semiconductor that includes at least one group III element and at least one group V element, such as, but not limited to, gallium nitride (GaN), gallium arsenide (GaAs), aluminum gallium arsenide (AlGaAs), indium gallium nitride (InGaN) and the like.” *Id.* at 1:6–11. “Analogously, ‘III-nitride semiconductor’ refers to a compound semiconductor that includes nitrogen and at least one group III element, such as, but not limited to, GaN, AlGaN, InN, AlN, InGaN, InAlGaN and the like.” *Id.* at 1:11–15.

Figure 1 is reproduced below.

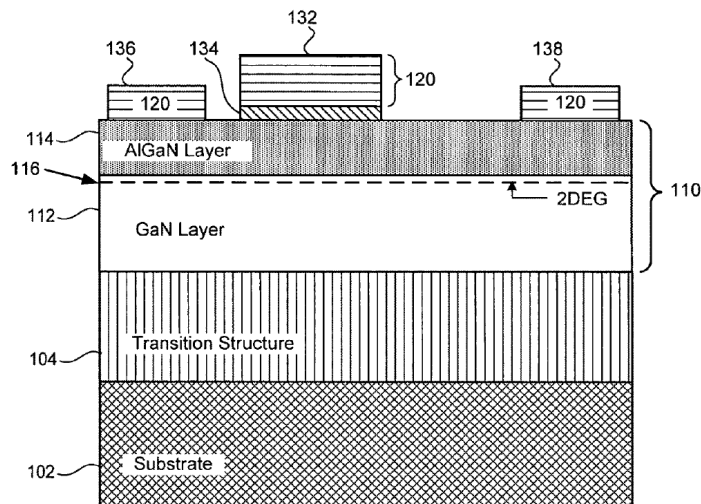


Figure 1 is a block diagram showing a group III-V semiconductor high electron mobility transistor (HEMT) implemented in gallium nitride (GaN). *Id.* at 2:53–55. The semiconductor structure includes substrate 102, transition structure 104, and GaN body 110 comprising GaN layer 112 and

AlGaN layer 114. *Id.* at 2:55–58. Electrode stack 120 comprises source electrode 136, drain electrode 138, and insulated gate electrode 132. *Id.* at 3:23–25. Insulated gate electrode layer 132 includes gate insulator layer 134. *Id.* at 3:28–31. Electrode stack 120 also includes a refractory metal nitride capping layer (not shown), such as a titanium nitride (TiN) capping layer. *Id.* at 3:26–28.

Figure 2 is reproduced below.

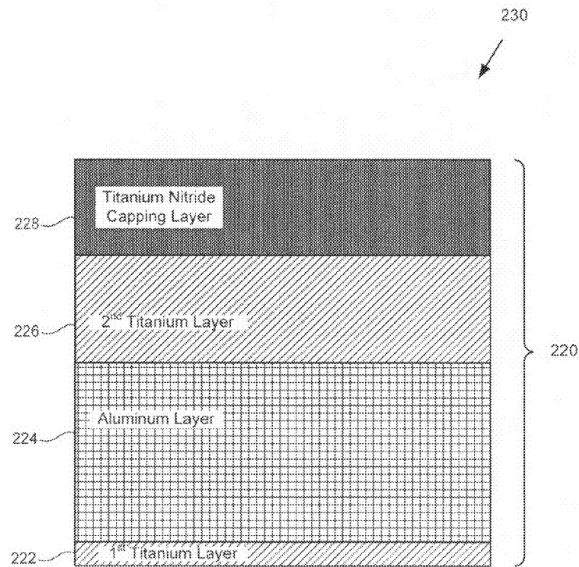


Figure 2 is a block diagram showing one embodiment of a refractory metal nitride capped electrical contact described in the '562 patent.

Ex. 1001, 2:10–13. Electrical contact 230, which corresponds to any of source electrode 136, drain electrode 138, or insulated gate electrode 132 shown in Figure 1, comprises electrode stack 220, which corresponds to electrode stack 120 in Figure 1. *Id.* at 3:39–43. Electrode stack 220 comprises a plurality of metal layers (first titanium (Ti) layer 222, aluminum (Al) layer 224, and second Ti layer 226), and a capping layer comprising a refractory metal nitride (TiN capping layer 228). *Id.* at 3:43–49.

The '562 patent explains that “refractory metal” includes “the elements Ti, zirconium (Zr), and vanadium (Vn), as well as the traditionally recognized refractory metals niobium (Nb), molybdenum (Mo), tantalum (Ta), and tungsten (W).” Ex. 1001, 3:51–56. The '562 patent also teaches that first Ti layer 222 is approximately 100 Å thick, and Al layer 224 is approximately 1300 Å thick, and second Ti layer 228 is approximately 680 Å thick. *Id.* at 4:25–27, 4:51–55, 4:61–67. TiN capping layer 228 has a thickness of approximately 600 Å. *Id.* at 5:13–17. According to the '562 patent, the disclosed refractory metal nitride capped electrical contact “presents significant advantages over the conventional art, such as rendering integration of group III-V and group IV semiconductor devices more efficient and cost effective by posing a reduced contamination risk to silicon, or other group IV semiconductor fabrication process flows.” *Id.* at 5:33–39.

*D. Illustrative Claim*

Claims 1 and 13 are the independent challenged claims. Claim 1 is illustrative of the claimed subject matter, and is reproduced below.

1. An electrical contact for use on a semiconductor device, said electrical contact comprising:
  - an electrode stack including a plurality of metal layers and a capping layer formed over said plurality of metal layers;
  - said capping layer consisting only of a refractory metal nitride, said refractory metal nitride forming a top of said electrical contact and having a thickness greater than that of a bottommost layer of said plurality of metal layers.

Ex. 1001, 5:54–63.

*E. Asserted Grounds*

Petitioner asserts that claims 1–17 would have been unpatentable on the following grounds:

| <b>Claim(s) Challenged</b> | <b>35 U.S.C. §<sup>1</sup></b> | <b>Reference(s)/Basis</b>       |
|----------------------------|--------------------------------|---------------------------------|
| 1, 2, 4–7                  | 102                            | Usui <sup>2</sup>               |
| 3, 8, 12, 19, 17           | 103                            | Usui, Yu <sup>3</sup>           |
| 9, 11, 14, 16              | 103                            | Usui, Yu, Adesida <sup>4</sup>  |
| 10, 15                     | 103                            | Usui, Yu, Sugimoto <sup>5</sup> |
| 1–8, 12, 13, 17            | 103                            | Yu, Usui                        |
| 9, 11, 14, 16              | 103                            | Yu, Usui, Adesida               |
| 10, 15                     | 103                            | Yu, Usui, Sugimoto              |

Pet. 3. Petitioner relies on the Declaration of Yuji Zhao, Ph.D. (Ex. 1002) to support its contentions.

II. ANALYSIS

*A. Level of Ordinary Skill in the Art*

Petitioner contends that a person of ordinary skill in the art (“POSITA”) would have had “at least a four-year degree in electrical engineering or a closely related field, and at least two years of experience in semiconductor device design,” and “[a]dditional education could substitute for professional experience and vice versa.” Pet. 6 (citing Ex. 1002 ¶¶ 80–

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<sup>1</sup> Amendments to 35 U.S.C. §§ 102 and 103 enacted by the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), took effect on March 16, 2013. The ’562 patent issued from an application filed on August 25, 2009. *See* Ex. 1001, code (22). Therefore, we apply the pre-AIA versions of §§ 102 and 103. Neither party, however, argues that the outcome of this case would differ based on applying the pre-AIA or post-AIA versions of these laws.

<sup>2</sup> US 5,943,601, issued Aug. 24, 1999 (Ex. 1004).

<sup>3</sup> US 2010/0052066 A1, published Mar. 4, 2010 (Ex. 1005).

<sup>4</sup> US 2008/0023726 A1, published Jan. 31, 2008 (Ex. 1006).

<sup>5</sup> US 7,777,252 B2, issued Aug. 17, 2010 (Ex. 1007).

82). Patent Owner states that it does not challenge Petitioner’s proposed level of skill in the art for purposes of the Preliminary Response. Prelim. Resp. 17 n.5.

For purposes of this Decision, we adopt Petitioner’s undisputed proposed definition because it appears to be consistent with the cited prior art and the disclosure of the ’562 patent. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding ordinary skill level are not required “where the prior art itself reflects an appropriate level and a need for testimony is not shown” (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985))).

*B. Claim Construction*

We construe each claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b). Under this standard, claim terms are generally given their plain and ordinary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). Only those terms in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Realtime Data LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019).

Neither party proposes any explicit construction of any term. *See* Pet. 7 (“For the purposes of this IPR, the plain meaning of each term can be applied.”). We do not expressly construe any term for purposes of this Decision.

*C. Ground 1: Asserted Anticipation by Usui*

Petitioner contends that claims 1, 2, and 4–7 are anticipated by Usui. Pet. 10–16. Patent Owner disagrees. Prelim. Resp. 10–27.

*1. Overview of Usui*

Usui is directed to a method of fabricating a metallization structure “having an aluminum and/or aluminum alloy layer that exhibits enhanced electromigration characteristics.” Ex. 1004, 1:5–9. Usui seeks “to provide a structure that exhibits enhanced electromigration performance along with being hillock free and without a concomitant loss in the dry etchability characteristic and corrosion resistant characteristic of the structure.” *Id.* at 2:34–39. According to Usui, the fabricated metallization structures “are especially useful for forming electrical connections or wiring such as between active and/or passive devices of an integrated circuit structure.” *Id.* at 1:11–14.

Figure 1 is reproduced below.

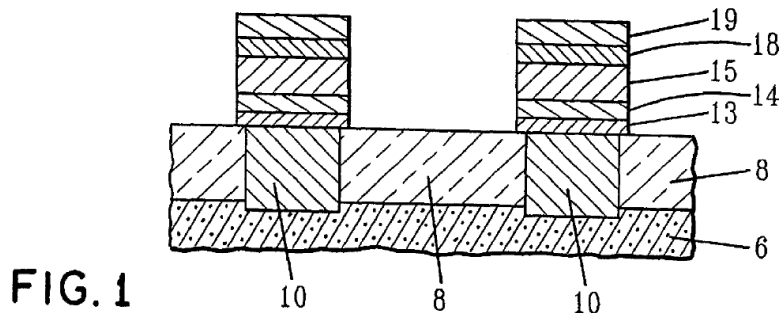


Figure 1 is a cross-sectional view of an embodiment of an interconnect metallurgy structure disclosed in Usui. Ex. 1004, 3:2–4. The interconnect metallurgy structure “preferably comprises a 4 or 5 layer structure over an interplanar stud connection 10 surrounded by an insulator 8 to make connection to a device substrate 6.” *Id.* at 3:24–27. Underlayer 13 is composed of a group IVA metal, preferably titanium, and is about 90 to

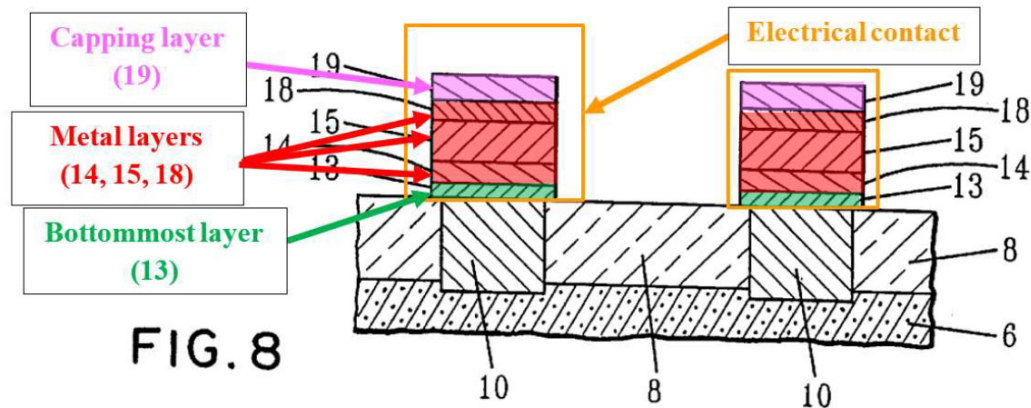
about 110 Å thick. *Id.* at 3:27–32. Layer 15 is an aluminum or aluminum alloy that is in electrical contact with underlayer 13, and typically has a thickness of about 2000 to about 6000 Å. *Id.* at 3:38–40, 3:47–49. Titanium nitride layer 14 is located between underlayer 13 and aluminum or aluminum alloy layer 15, and has a thickness of about 50 to about 500 Å. *Id.* at 3:58–65. Above aluminum or aluminum alloy layer 15 is titanium layer 18 and capping layer 19. *Id.* at 3:67–4:6. Titanium layer 18 is about 50 to about 200 Å thick, and capping layer 19 is typically about 150 to about 800 Å thick. *Id.* at 4:6–9.

Usui teaches that “[c]ritical to the success of the present invention is having the thickness of this underlayer 13 being between about 90 angstroms to about 110 angstroms” because “by limiting the thickness of this underlayer 13, the structure and texture of the subsequently to be applied metallic layers is carefully controlled.” Ex. 1004, 3:29–35. Usui further teaches that controlling the thickness of underlayer 13 is “essential in achieving” the properties of the structure. *Id.* at 3:35–36.

## 2. *Claim 1*

Petitioner contends that Usui discloses all of the limitations of claim 1. Pet. 10–13.

Petitioner provides an annotated version of Usui’s Figure 8, reproduced below, to illustrate its contentions.



Usui's Figure 8, as annotated by Petitioner, is a cross-sectional view of a step of the fabrication process of the preferred interconnect metallurgy structure described in Usui, with Petitioner's addition of colored shading and labels identifying different components of the structure. Pet. 11; Ex. 1004, 3:5–7, Fig. 8.

Referring to annotated Figure 8, Petitioner contends that Usui discloses the “an electrode stack including a plurality of metal layers and a capping layer formed over said plurality of metal layers” limitation of claim 1. Pet. 11. Petitioner contends that Usui's titanium layer 18, aluminum or aluminum alloy layer 15, and titanium nitride layer 14 (all shaded red), and titanium underlayer 13 (shaded green) together form the claimed “plurality of metal layers.” *Id.* (citing Ex. 1004, 3:38–41, 3:58–60, 4:4–5, 5:38, 5:52, Figs. 1, 8; Ex. 1002 ¶ 90). Petitioner then identifies layer 19 (shaded pink) that forms the top of the metallization structure (orange box labelled “Electrical contact”) as the claimed “capping layer formed over said plurality of metal layers.” *Id.* (citing Ex. 1004, Abs., 3:2–8, 5:54–59, Figs. 1, 8; Ex. 1002 ¶ 91).

Petitioner also contends that Usui discloses the “said capping layer consisting only of a refractory metal nitride forming a top of said electrical

contact and having a thickness greater than that of a bottommost layer of said plurality of metal layers” limitation of claim 1. Pet. 12–13. In particular, Petitioner contends that “capping layer 19 is formed only of titanium nitride,” which a POSITA would have known is a refractory metal nitride, and “forms a top of the metallization structure (electrical contact).” *Id.* at 12 (citing Ex. 1004, 5:54–59; Ex. 1002 ¶¶ 71–73, 92). Petitioner identifies underlayer 13 (shaded green) comprising a thickness of about 90–110 Å as the recited “bottommost layer of said plurality of metal layers.” *Id.* at 12–13 (citing Ex. 1004, 3:29–35). Petitioner further contends that capping layer 19 “has a thickness of about 150–500 Å . . . which is greater than the thickness of underlayer 13 (bottommost layer of plurality of metal layers).” *Id.* at 13 (citing Ex. 1004, 5:38, 5:52, Figs. 1, 8; Ex. 1002 ¶ 94).

On this record, we are persuaded that Petitioner adequately establishes that Usui discloses all of the limitations of claim 1. Usui discloses that aluminum or aluminum alloy layer 15 is in electrical contact with titanium underlayer 13, and titanium nitride layer 14 is located “intermediate the [titanium underlayer] 13 and the aluminum or aluminum alloy layer 15” to prevent “reaction between the aluminum layer 15 and underlayer 13.” Ex. 1004, 3:27–29, 3:38–41, 3:58–63. Usui further discloses that “a capping layer is provided above layer 15,” and that “[p]referred capping layers are titanium nitride and combinations of as layer 18 of a group IVA metal, preferably titanium with a titanium nitride layer 19.” *Id.* at 3:67–4:6. Usui teaches that titanium nitride layer 19 is about 150 to 800 Å thick, and that the thickness of titanium underlayer 13 is between about 90 to 110 Å. *Id.* at 3:31–33, 4:6–8. Usui also teaches that the interconnect metallurgy structures described therein “exhibit[] enhanced electromigration characteristics” and “are especially useful for forming electrical connections

or wiring such as between active and/or passive devices of an integrated circuit structure.” *Id.* at 1:8–14.

Usui’s description of a plurality of metal layers (layers 13–18) and a capping layer formed over the plurality of metal layers (layer 19), along with its description of the structure’s usefulness for forming electrical connections in an integrated circuit structure, is sufficient, on this record, to establish that Usui discloses “an electrode stack including a plurality of metal layers and a capping layer formed over said plurality of metal layers” as recited in claim 1. Usui’s teaching that the capping layer is a refractory metal nitride (titanium nitride) that has a thickness (150–800 Å) greater than the bottommost layer of the plurality of metal layers (layer 13, 90–110 Å), sufficiently establishes, on this record, that Usui discloses the “said capping layer consisting only of a refractory metal nitride, said refractory metal nitride forming a top of said electrical contact and having a thickness greater than that of a bottommost layer of said plurality of metal layers” limitation of claim 1.

We have considered Patent Owner’s arguments and do not find them convincing on this record. *See* Prelim. Resp. 10–26. For example, Patent Owner argues that the Petition does not explain “what Petitioner alleges to be the ‘plain meaning’ of ‘electrode’ or ‘electrode stack’” and therefore “fails to have the required (‘must’) content identifying ‘how the challenged claim is to be construed’ and [h]ow the **construed** claim is unpatentable.” *Id.* at 12–13 (citing 37 C.F.R. § 42.104(b)(3)–(4)). Although we acknowledge that our regulations require that a petition must set forth “[h]ow the challenged claim is to be construed,” a petitioner is not required to provide an express construction if it does not believe one is required; instead, “a petitioner may include a statement that the claim terms require no

express construction.” 37 C.F.R. § 42.104(b)(3); Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019),<sup>6</sup> 44. Here, Petitioner’s statement that “the plain meaning of each term can be applied” is sufficient to meet the requirements of 37 C.F.R. § 42.104(b)(3). Pet. 7.

Patent Owner also argues that the Petition does not include a detailed explanation of how Usui’s interconnect metallurgy structure is the claimed electrode stack, and, in any event, Petitioner’s assertion that Usui’s interconnect metallurgy structure is an electrode stack is inconsistent with how a POSITA would have understood the term. Prelim. Resp. 14–26. We find that Patent Owner’s arguments in this regard raise issues of fact that are best resolved on a full trial record.

We invite the parties to develop these arguments further at trial, to the extent permitted by our rules.

### 3. *Claims 2 and 4–7*

Petitioner also contends that Usui anticipates claims 2 and 4–7, which ultimately depend from claim 1. Pet. 13–16. At this stage of the proceeding, Patent Owner does not address Petitioner’s contentions with respect to claims 2 and 4–7. *See* Prelim. Resp. We have reviewed Petitioner’s contentions with regard to claims 2 and 4–7, and are persuaded that Petitioner establishes a reasonable likelihood of showing that Usui discloses the limitations of these dependent claims as well. Pet. 13–16.

### 4. *Conclusion*

Based on the current record, and for the reasons set forth above, we determine that Petitioner establishes a reasonable likelihood of showing that claims 1, 2, and 4–7 are anticipated by Usui.

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<sup>6</sup> Available at: [www.uspto.gov/TrialPracticeGuideConsolidated](http://www.uspto.gov/TrialPracticeGuideConsolidated).

In an effort to guide the parties, we note that, on the current record, neither party has taken an explicit position on the appropriate construction of “electrode stack,” and it appears that such a construction may impact the ultimate determination of whether Usui teaches the limitation. We accordingly direct the parties to take specific positions during the trial on the appropriate construction of “electrode stack” and whether the claims are unpatentable for anticipation or obviousness under such a specific construction.

*D. Asserted Obviousness over Usui, Yu, Adesida, and Sugimoto*

Petitioner contends that (1) claims 3, 8, 12, 13, and 17 would have been obvious over the combined teachings of Usui and Yu; (2) claims 9, 11, 14, and 16 would have been obvious over the combined teachings of Usui, Yu, and Adesida; and (3) claims 10 and 15 would have been obvious over the combined teachings of Usui, Yu, and Sugimoto. Pet. 16–33. At this stage of the proceeding, Patent Owner does not address Petitioner’s specific contentions with respect to limitations of claims 3 and 8–17. *See* Prelim. Resp. 27–28. Based on the record before us, we are persuaded that Petitioner’s discussion of the particular structures in Usui, Yu, Adesida, and Sugimoto establishes a reasonable likelihood of showing that (1) claims 3, 8, 12, 13, and 17 would have been obvious over the combined teachings of Usui and Yu; (2) claims 9, 11, 14, and 16 would have been obvious over the combined teachings of Usui, Yu, and Adesida; and (3) claims 10 and 15 would have been obvious over the combined teachings of Usui, Yu, and Sugimoto. Pet. 16–33.

*E. Asserted Obviousness over Yu and Usui*

Petitioner contends that claims 1–8, 12, 13, and 17 would have been obvious over the combined teachings of Yu and Usui. Pet. 33–55. Patent

Owner disagrees. Prelim. Resp. 28–61. Having already determined that Petitioner establishes a reasonable likelihood of establishing that claims 1, 2, and 4–7 are anticipated by Usui, and claims 12, 13, and 17 would have been obvious over the combined teachings of Usui and Yu, we need not address this ground in full. We offer the following comments in response to the parties’ arguments and evidence to provide guidance to the parties.

*1. Overview of Yu*

Yu relates to “semiconductor devices having doped-conducting metal oxide and methods for forming such semiconductor devices.” Ex. 1005 ¶ 6. Yu explains that “[t]he doped-conducting metal oxide can provide desired work function values and thermal stability.” *Id.*

Figure 2E is reproduced below.

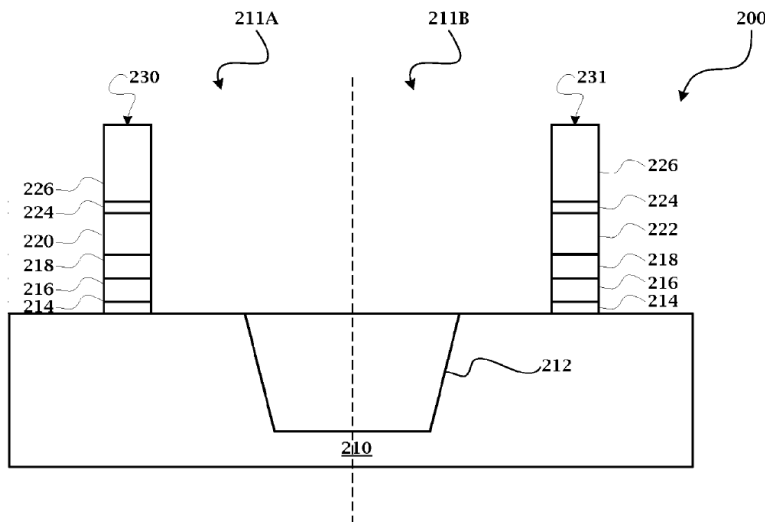


FIG. 2E

Figure 2E is a cross-sectional view of one embodiment of a semiconductor device described in Yu during a fabrication stage. Ex. 1005 ¶ 8.

Semiconductor device 200 includes semiconductor substrate 210, isolation region 212, first metal gate stack 230 in active/NMOS region 211A, and second metal gate stack 231 in active/PMOS region 211B. *Id.* ¶¶ 22, 37.

Metal gate stacks 231, 232 comprise interfacial dielectric layer 214, high-k dielectric layer 216, diffusion barrier/protection layer 218, first metal layer 220 (in first metal gate stack 230), second metal layer 222 (in second metal gate stack 231), diffusion barrier layer 224, and capping layer 226. *Id.* ¶¶ 38–39.

Yu teaches that “capping layer 226 may include metal (e.g., an aluminum-based, tungsten, or copper material)” that “comprise[s] a thickness between about 50 Å and about 1,000 Å, preferably about 200 Å.” Ex. 1005 ¶ 36. Yu further teaches that, “[i]n alternate embodiments, the capping layer 226 may comprise any suitable thickness.” *Id.* Yu further teaches that diffusion barrier/protection layer 218 may comprise titanium, titanium nitride, tantalum, tantalum nitride and/or combinations thereof. *Id.* ¶ 29. Yu describes an embodiment wherein diffusion barrier/protection layer 218 comprises titanium nitride at a thickness of approximately 20 Å. *Id.* According to Yu, “in alternate embodiments, the diffusion barrier layer 218 comprises any suitable thickness.” *Id.*

## 2. Claim 1

With respect to the “an electrode stack including a plurality of metal layers and a capping layer formed over said plurality of metal layers” limitation of claim 1, Petitioner points to Yu’s metal gate stacks 230, 231. Pet. 42. Specifically, Petitioner contends that metal gate stacks 230, 231 are “electrode stacks” that include “plurality of metal layers” diffusion barrier/protection layer 218, metal layers 220, 222, diffusion barrier layer 224, and capping layer 226 formed over the metal layers. *Id.* (citing Ex. 1005 ¶¶ 29, 35, 36). Petitioner also contends that Yu teaches “said capping layer consisting only of a refractory metal nitride” because it discloses that capping layer 26 is titanium nitride or tantalum nitride, which

a POSITA would have known “are each a ‘refractory metal nitride.’”

Pet. 42–43 (citing Ex. 1005 ¶ 36; Ex. 1002 ¶¶ 71–73, 163).

With respect to the “said refractory metal nitride forming a top of said electrical contact and having a thickness greater than that of a bottommost layer of said plurality of metal layers” limitation of claim 1, Petitioner contends that capping layer 226 comprising titanium nitride or tantalum nitride forms a top of metal gate stacks 230, 231. Pet. 43 (citing Ex. 1005 ¶¶ 36, 40, Fig. 2E). Petitioner identifies diffusion barrier/protection layer 218 as the recited “bottommost layer of said plurality of metal layers.” *Id.* at 43 (citing Ex. 1005 ¶ 29, Fig. 2E). Petitioner contends:

While Yu discloses the capping layer is *preferably* 600 Å and the bottommost layer 20 Å (i.e., the capping layer is *preferably* thicker than the bottommost layer), this disclosure is made with respect to the capping layer being polysilicon, which is not a refractory metal nitride as stated in claims 1 and 13. However, Yu teaches the capping layer may be titanium nitride and tantalum nitride, which are refractory metal nitrides. A POSITA would have been motivated to replace Yu’s polysilicon with either its disclosed titanium nitride or tantalum nitride using the same disclosed thickness because the benefits of refractory metal nitrides are well-known and this would have been an obvious design alternative as explained by Dr. Zhao.

*Id.* at 38 (citing Ex. 1005 ¶¶ 36, 40; Ex. 1002 ¶¶ 71–73, 155) (internal citations omitted).

Patent Owner responds that Petitioner does not establish that the combination of Yu and Usui teaches the recited “said refractory metal nitride forming a top of said electrical contact and having a thickness greater than that of a bottommost layer of said plurality of metal layers.” Prelim. Resp. 41–61. In particular, Patent Owner argues that Yu does not disclose that capping layer 226 is thicker than diffusion barrier/protection layer 218

when capping layer 226 is formed from a refractory metal nitride as required by claim 1. *Id.* at 41–44. Patent Owner asserts that “[t]he 600 Å thickness is the only thickness of the capping layer 226 that Petitioner cites and it is for a capping layer made of polysilicon which Petitioner admits does not meet any Challenged Claim.” *Id.* at 43–44 (citing Pet. 38; Ex. 1005 ¶ 36) (footnote omitted). Patent Owner also argues that Petitioner’s assertion that a POSITA “would have been motivated to ‘us[e] the same disclosed thickness’ that Yu teaches for a polysilicon capping layer when making the capping layer from a refractory metal nitride is entirely unsupported.” *Id.* at 45.

Based on the current record, we find that Patent Owner’s arguments regarding the “said refractory metal nitride forming a top of said electrical contact and having a thickness greater than that of a bottommost layer of said plurality of metal layers” limitation of claim 1 have merit. Petitioner does not adequately explain why a POSITA would have replaced Yu’s polysilicon capping layer with a titanium nitride or tantalum nitride layer *with the same thickness* as the polysilicon layer. Petitioner points to Dr. Zhao’s testimony with respect to the benefits of using refractory metal nitrides in general, and of refractory metal nitride capping layers in particular, but this testimony does not address the thickness of the beneficial refractory metal nitride capping layers.<sup>7</sup> Pet. 38 (citing Ex. 1002 ¶¶ 71–73). And Dr. Zhao’s testimony that a titanium nitride or tantalum nitride capping layer in Yu would have the same thickness as Yu’s polysilicon capping layer

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<sup>7</sup> We note that Patent Owner does not dispute Petitioner’s assertion that a POSITA had reason to use titanium nitride or tantalum nitride in Yu’s capping layer, or that refractory metal nitrides had known benefits. Prelim. Resp. 44–45 (citing Pet. 38).

mirrors the statements in the Petition without providing further technical explanation or additional evidence in support thereof. Ex. 1002 ¶ 155; *see also Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022) (precedential) (expert declaration that “merely repeats, *verbatim*, the conclusory assertion for which it is offered to support” is entitled to little weight).

Petitioner alternatively argues that Usui would have motivated a POSITA “to apply known techniques of limiting the thickness of Usui underlayer 13 (bottommost metal layer) to diffusion barrier/protection layer 218 (bottommost layer) in Yu’s known device.” Pet. 39. Petitioner does not explain, on this record, why limiting the thickness of Yu’s diffusion barrier/protection layer 218 would result in a titanium nitride or tantalum nitride capping layer 226 in Yu having a greater thickness than diffusion barrier/protection layer 218 if the thickness of the titanium nitride or tantalum nitride capping layer is not known.

We invite the parties to develop these arguments further at trial, to the extent permitted under our rules.

*F. Remaining Grounds*

Petitioner also contends that dependent claims 9, 11, 14, and 16 would have been obvious over the combined teachings of Yu, Usui, and Adesida, and dependent claims 10 and 15 would have been obvious over the combined teachings of Yu, Usui, and Sugimoto. Pet. 55–64. At this stage of the proceeding, Patent Owner does not separately address Petitioner’s contentions with respect to these dependent claims. *See* Prelim. Resp. 61–62 (“Grounds 6–7 inherit all the above-discussed flaws with Ground 5 and fail for the same reasons.”). Having determined that Petitioner establishes a reasonable likelihood of showing that at least one of the challenged claims is

unpatentable as set forth above, we institute an *inter partes* review based on these grounds as well. *See* 37 C.F.R. § 42.108(a) (“When instituting *inter partes* review, the Board will authorize the review to proceed on all of the challenged claims and all grounds of unpatentability asserted for each claim.”).

### III. CONCLUSION

Based on the arguments in the Petition and the Preliminary Response, and the evidence of record, we determine that Petitioner establishes a reasonable likelihood that it will prevail on its challenge to at least one claim of the ’562 patent. Accordingly, we institute an *inter partes* review of all the challenged claims on all the challenged grounds.

The factual findings set forth in this Decision are preliminary and provided for the sole purpose of deciding whether to institute a review. Any final findings will be based on the full trial record, including any information presented in a timely filed response to the Petition. *See Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (noting that “there is a significant difference between a petitioner’s burden to establish a ‘reasonable likelihood of success’ at institution, and actually proving invalidity by a preponderance of the evidence at trial”) (quoting 35 U.S.C. § 314(a); comparing *id.* with § 316(e)).

### IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that an *inter partes* review is instituted with respect to all of the grounds asserted in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which shall commence on the entry date of this Decision.

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