

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HANWHA SOLUTIONS CORPORATION,

Petitioner,

v.

MAXEON SOLAR PTE. LTD.,

Patent Owner.

Case No. IPR2024-01198

U.S. Patent No. 11,251,315

PETITIONER'S NOTICE OF APPEAL

Pursuant to 35 U.S.C. §§ 141-144, 319 and 37 C.F.R. § 90.2(a), Petitioner

Hanwha Solutions Corporation (“Hanwha”) hereby notices its appeal to the United States Court of Appeals for the Federal Circuit from the Final Written Decision (“Final Written Decision”) (Paper No. 52), entered by the United States Patent and Trademark Office, Patent Trial and Appeal Board (“Board”) on February 24, 2026, and from all underlying orders, decisions, rulings, and opinions relating to the *inter partes* review of U.S. Patent No. 11,251,315 B2 (“’315 patent”) in Case No.

IPR2024-01198. This Notice is timely under 37 C.F.R. § 90.3(a)(1), having been filed no later than sixty-three days after issuance of the Final Written decision. A copy of the Final Written Decision being appealed is attached hereto as Exhibit A.

In accordance with 37 C.F.R. § 90.2(a)(3)(ii), Hanwha further indicates that the issues on appeal may include, but are not limited to, whether the Board erred in determining that claims 10-20 of the ’315 patent are not shown unpatentable as obvious under 35 U.S.C. § 103, any findings supporting or related to the Board’s determination, and all other issues decided adversely to Hanwha in any order, decision, ruling, and/or opinion, including but not limited to the Board’s failure to properly consider evidence of record, the Board’s legal errors in undertaking the obviousness analyses, and the Board’s findings that conflict with the evidence of record and are not supported by substantial evidence.

Pursuant to 35 U.S.C. §142 and 37 C.F.R § 90.2(a)(1), this Notice is being filed

with the Director of the United States Patent and Trademark Office and a copy of this Notice is being filed concurrently with the Board. In addition, a copy of the Notice of Appeal, along with the required docketing fee, is being filed with the Clerk's Office the United States Court of Appeals for the Federal Circuit via CM/ECF in accordance with 37 C.F.R. § 90.2(a)(2), Federal Rule of Appellate Procedure 15, and Federal Circuit Rule 15.

Dated: March 13, 2026

Respectfully submitted,
/David L. Cavanaugh/
David L. Cavanaugh
Reg. No. 36,476

Counsel for Petitioner

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 90.2(a)(1) and 104.2(a), I hereby certify that, in addition to being filed electronically through the Patent Trial and Appeal Case Tracking System (P-TACTS) system, a true and correct original version of the forgoing Petitioner's Notice of Appeal is being filed by Priority Mail Express on this 13th day of March, 2026, with the Director of the United States Patent and Trademark Office, at the following address:

Director of the U.S. Patent and Trademark Office
c/o Office of the General Counsel
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Pursuant to 37 C.F.R. § 90.2(a)(2) and Federal Circuit Rule 15(a)(1), and Rule 52(a), (e), I hereby certify that a true and correct copy of the foregoing Petitioner's Notice of Appeal is being filed in the United States Court of Appeals for the Federal Circuit using the Court's CM/ECF filing system on this 13th day of March, 2026, and the filing fee is being paid electronically using pay.gov.

I hereby certify that, on March 13, 2026, I caused a true and correct copy of the following materials:

- Petitioner's Notice of Appeal.
- Final Written Decision, IPR2024-01198, Paper 52 (Feb. 24, 2026).

to be served via electronic service on the counsel of record for Patent Owner:

Jeremy D. Peterson, jeremy.peterson@pvuslaw.com

Bradford A. Cangro, bradford.cangro@pvuslaw.com

Jacob A. Snodgrass, jacob.snodgrass@pvuslaw.com

Jing Zhao, jing.zhao@pvuslaw.com

Maxeon_SolarIPRService@pvuslaw.com

/Paul E. Friedman/

Paul E. Friedman

Counsel for Petitioner

EXHIBIT A

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HANWHA SOLUTIONS CORPORATION,
Petitioner,

v.

MAXEON SOLAR PTE. LTD.,
Patent Owner.

IPR2024-01198
Patent 11,251,315 B2

Before JO-ANNE M. KOKOSKI, KRISTINA M. KALAN, and
AVELYN M. ROSS, *Administrative Patent Judges*.

KOKOSKI, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)
Denying Patent Owner's Motion to Exclude
37 C.F.R. § 42.64

I. INTRODUCTION

We have jurisdiction to conduct this *inter partes* review under 35 U.S.C. § 6, and issue this Final Written Decision pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Hanwha Solutions Corporation (“Petitioner”) does not show by a preponderance of the evidence that claims 10–20 (the “challenged claims”) of U.S. Patent No. 11,251,315 B2 (“the ’315 patent,” Ex. 1001) are unpatentable.

A. Procedural Background

Petitioner filed a Petition to institute an *inter partes* review of claims 10–20 of the ’315 patent. Paper 3 (“Pet.”). Maxeon Solar Pte. Ltd. (“Patent Owner”) filed a Preliminary Response. Paper 9. With Board authorization, Petitioner filed a Preliminary Reply and Patent Owner filed a Preliminary Sur-reply. Papers 10, 11.

Pursuant to 35 U.S.C. § 314(a), we instituted an *inter partes* review of claims 10–20 on the grounds advanced in the Petition on February 26, 2025. Paper 17 (“Dec.”). Patent Owner filed a Patent Owner Response (“PO Resp.,” Paper 29), Petitioner filed a Reply (“Pet. Reply,” Paper 36), and Patent Owner filed a Sur-reply (“PO Sur-reply,” Paper 41). Patent Owner also filed a Motion to Exclude Evidence (“Mot.,” Paper 46), Petitioner filed an Opposition (“Mot. Opp.,” Paper 47), and Patent Owner filed a Reply to Petitioner Opposition (“Mot. Reply,” Paper 48).

We held an oral hearing on December 3, 2025, and a transcript is included in the record. Paper 51.

B. Real Parties in Interest

Each party identifies itself as the real party in interest. Pet. 2; Paper 6 (Patent Owner’s Mandatory Notice), 2.

C. Related Matters

The parties indicate that the '315 patent is asserted in *Maxeon Solar Pte. Ltd. v. Hanwha Sol'ns Corp.*, Case No. 2:24-cv-00262 (E.D. Tex.), *Maxeon Solar Pte. Ltd. v. Canadian Solar, Inc.*, Case No. 2:24-cv-210 (E.D. Tex.), and *Maxeon Solar Pte. Ltd. v. REC Solar Holdings AS*, Case No. 2:24-cv-00260 (E.D. Tex.). Pet. 2; Paper 6, 2. The '315 patent was also the subject of the following *inter partes* review proceedings:

Case Name	Case Number	Status
<i>Canadian Solar, Inc. v. Maxeon Solar Pte. Ltd.</i>	IPR2024-01038	Final Decision Determining No Challenged Claims Unpatentable, filed Jan. 12, 2026. IPR2024-01038, Paper 52.
<i>Canadian Solar, Inc. v. Maxeon Solar Pte. Ltd.</i>	IPR2024-01194	Consolidated with IPR2024-01038.
<i>REC Solar Holdings AS v. Maxeon Solar Pte. Ltd.</i>	IPR2025-00594	Institution Denied on August 14, 2025. IPR2025-00594, Paper 8.
<i>REC Solar Holdings AS v. Maxeon Solar Pte. Ltd.</i>	IPR2025-00595	Institution Denied on August 14, 2025. IPR2025-00595, Paper 8.

Paper 21, 2.

D. The '315 Patent

The '315 patent is directed to “solar cell fabrication techniques to improve solar cell lifetime, passivation and/or efficiency” and “example solar cells fabricated according to the disclosed techniques.” Ex. 1001, 3:18–21. Figure 5 is reproduced below.

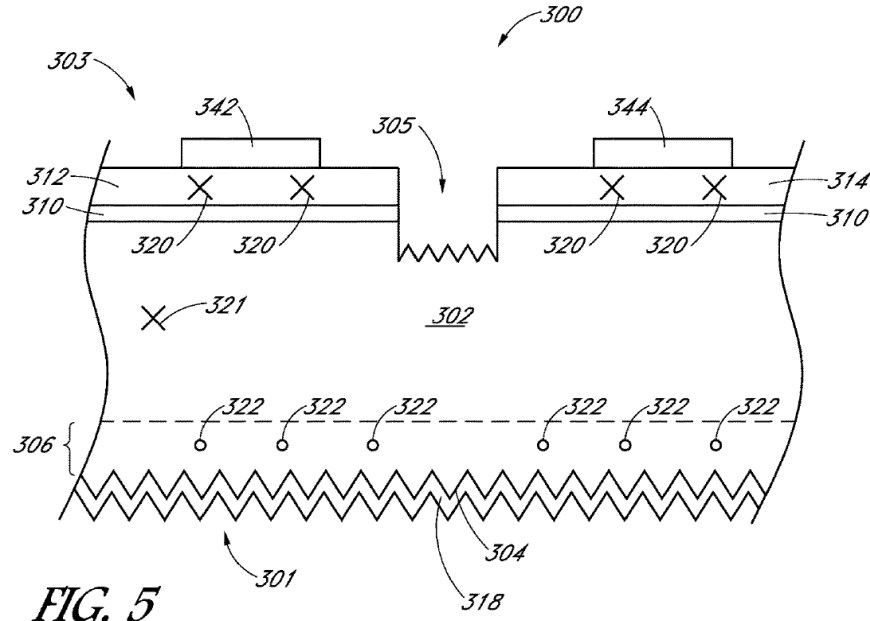


FIG. 5

Figure 5 is a cross-sectional view of a solar cell according to an embodiment described in the '315 patent. *Id.* at 1:49–50. Solar cell 300 has front side 301 that faces the sun during normal operation and back side 303 opposite front side 301. *Id.* at 6:42–44. Silicon substrate 302 can be a N-type silicon substrate, portion 306 of which “can have a doping concentration 322 of approximately less than or equal to $2 \times 10^{18} \text{ cm}^{-3}$.” *Id.* at 6:44–49. Dielectric region 310 is formed over silicon substrate 302, which can be a tunnel oxide or silicon dioxide. *Id.* at 6:50–53. First and second emitter regions 312, 314 are P-type and N-type polysilicon regions, respectively. *Id.* at 6:54–57. Metal impurities 320 are located in first and second emitter regions 312, 314. *Id.* at 6:57–60. Silicon substrate 302 can have impurities 321 remaining after the gettering¹ process. *Id.* at 6:60–62.

¹ “Gettering” is a process for moving metal impurities out of the active regions of semiconductor devices such as solar cells. Ex. 1003 ¶ 89 (citing Ex. 1033, 316–318). Dr. Holman explains that the process includes heating the semiconductor to a high temperature to release metal impurities, which then diffuse through the semiconductor toward a front or back surface of the

First and second metal contacts 342, 344 are formed on first and second emitter regions 312, 314, respectively, with a trench region 305 separating first and second emitter regions 312, 314. Ex. 1001, 6:63–67. Textured surface 304 on front side 301 is a surface that can provide additional light absorption, and portion 306 of silicon substrate 302 is formed above textured surface 304. *Id.* at 7:1–6. Trench region 305 is also textured for additional light absorption from back side 303. *Id.* at 7:6–9. Anti-reflective region 318, which can be silicon nitride, is formed over textured surface 304. *Id.* at 7:9–12.

The '315 patent describes an example “where a surface, or a portion near the surface, of a silicon substrate was doped at approximately less than or equal to $2 \times 10^{18} \text{ cm}^{-3}$ ” and the solar cell was “heated to a temperature above 900 degrees Celsius.” Ex. 1001, 8:40–45. In this example, “gettering in a polysilicon region of the silicon substrate, improved surface passivation at approximately 5 fA/cm^2 , improved lifetime, e.g. typical of approximately $10 \text{ } \mu\text{sec}$, and a $>0.5\%$ efficiency increase as compared to other solar cells.” *Id.* at 8:45–50. In another example, the silicon substrate was doped at approximately less than or equal to $2 \times 10^{18} \text{ cm}^{-3}$ and the solar cell heated to a temperature below 900 degrees Celsius, “resulting in gettering in a non-polysilicon region of the solar cell, good surface passivation at approximately 2 fA/cm^2 , poor lifetime, e.g. typical of approximately $3 \text{ } \mu\text{sec}$ and no considerable, e.g., $<0.5\%$ efficiency increase from the baseline.” *Id.* at 8:51–59.

solar cell as the solar cell cools and are captured at a gettering trap site, where they cause less recombination. *Id.* (citing Ex. 1033, 316–318).

E. Illustrative Claim

Petitioner challenges claims 10–20 of the '315 patent. Pet. 7. Claim 10, the only independent challenged claim, is representative of the challenged subject matter, and is reproduced below.

10. A solar cell, the solar cell having a front side which faces the sun during normal operation and a back side opposite the front side, the solar cell comprising:

- a silicon substrate, wherein a portion of the silicon substrate has a dopant concentration of approximately less than or equal to $2 \times 10^{18} \text{ cm}^{-3}$ and wherein the portion of the silicon substrate is formed at the front side of the solar cell;
- a dielectric region formed over the silicon substrate, wherein the dielectric region is formed over the back side of the solar cell;
- a first emitter region having metal impurities formed over the dielectric region; and
- a first metal contact formed over the first emitter region.

Ex. 1001, 10:48–61 (certificate of correction issued Aug. 8, 2023).

F. Evidence

Petitioner relies on the following evidence.

Name	Patent Document	Exhibit
Cousins	US 8,207,444 B2, published June 26, 2012	1007
Smith	US 2013/0240029 A1, published Sept. 19, 2013	1011
Choi	US 2014/0311567 A1, published Oct. 23, 2014	1006

Petitioner relies on the following non-patent literature evidence.

Name	Non-Patent Literature Title	Author	Exhibit
Marvin	<i>Interdigitated Back Contact Silicon Solar Cell Analysis and Design Recommendations for Space Use</i> , Space Systems Division Air Force Systems Command, Report 88-D-TR-90-04 (1990)	D. C. Marvin	1008
Istratov	<i>Gettering in silicon-on-insulator wafers: experimental studies and modeling</i> , Semicond. Sci. Technol. 20 (2005) 568–575	Andrei A. Istratov	1012
Granek	<i>High-Efficiency Back-Contact Back-Junction Silicon Solar Cells</i> (2009) (Ph.D. dissertation, Alfred Ludwig University of Freiburg)	<i>F. Granek</i>	1010

Petitioner relies on the Declarations of Dr. Zachary Holman in support of its contentions. Ex. 1003; Ex. 1089. Patent Owner relies on the Declaration of E. Fred Schubert, Ph.D. to support its Patent Owner Response. Ex. 2028.

G. Asserted Grounds

Petitioner asserts that claims 10–20 are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
10–17, 19, 20	103 ²	Choi, Granek, Marvin, Istratov

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (2011), revised 35 U.S.C. §§ 102 and 103 effective March 16, 2013. Because the ’315 patent has an effective filing date after March 16, 2013 (Ex. 1001, codes (22), (60)), we refer to the AIA version of Sections 102 and 103.

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
18	103	Choi, Granek, Marvin, Istratov, Smith
10–15	103	Cousins, Granek, Marvin, Istratov

Pet. 7.

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 “an advanced degree in electrical engineering, mechanical engineering, applied physics, chemistry, materials science, or a related discipline” and “at least one year of experience in designing, developing, or researching the design and/or manufacture of solar cells or related technologies.” Pet. 23. Alternatively, Petitioner contends that a POSITA would have had “a bachelor’s degree in one of the aforementioned disciplines” and “at least two years of experience designing, developing, or researching the design and/or manufacture of solar cells or related technologies.” *Id.* Petitioner also states that “[l]ess work experience may be compensated for by a higher level of education, and vice versa.” *Id.* at 23–24 (citing Ex. 1003 ¶¶ 37–41).

Patent Owner responds that it “accepts the level of ordinary skill in the art that is proposed in the Petition.” PO Resp. 11 (citing Pet. 23).

In the Institution Decision, we adopted the assessment offered by Petitioner. Dec. 7. Because Petitioner’s definition of the level of skill in the art is consistent with the ’315 patent and the asserted prior art, we maintain Petitioner’s definition for purposes of this Final Written Decision. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir 2001).

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).

Based on our review of the complete trial record and the arguments raised by the parties, we determine that it is necessary to address the claim term “metal impurities.”

1. “metal impurities”

Claim 10 recites, *inter alia*, “a first emitter region having metal impurities formed over the dielectric region.” Ex. 1001, 10:59–60. Patent Owner proposes that “metal impurities” be construed as “undesired foreign metals.” PO Resp. 13. Patent Owner argues that the term “impurities” alone has more than one plain and ordinary meaning. *Id.* at 14. Patent Owner argues that “‘impurities’ can mean either (1) an undesired material within another material or (2) any material within another material.” *Id.* (citing Ex. 2038 ¶ 43). Patent Owner argues that “the ’315 patent uses ‘impurities’ under the first meaning,” i.e., “an undesired material within another material.” *Id.*

In that regard, Patent Owner argues that “[t]he ’315 patent equates ‘impurities’ and ‘contaminants’” when it “states that ‘[a]s referred

throughout, contaminants and/or impurities can be used interchangeably.” PO Resp. 14 (citing Ex. 1001, 5:8–9). Patent Owner also argues that “[t]he term ‘throughout’ means not only the specification, but the claims as well.” *Id.* According to Patent Owner, this understanding “is consistent with a key aspect of the ’315 patent, which is to improve solar cell efficiency by removing contaminants from a substrate and gettering them into an emitter region.” *Id.* at 15. Patent Owner further asserts that the ’315 patent uses the same reference number to designate “contaminants and/or impurities,” “impurities,” and “contaminants.” *Id.* (citing Ex. 1001, 4:66, 5:7, 5:11, 5:17, 5:22, 6:6, 6:9). Patent Owner further argues that “[a] ‘contaminant’ is an undesired material,” i.e., “something that contaminates,” which is also consistent with its proposed construction. *Id.*

Petitioner responds that “[i]mpurities has a single plain and ordinary meaning in the semiconductor/solar field,” which is “any element that is foreign to the element(s) of a host material, including intentionally-introduced dopants.” Pet. Reply 2. Petitioner points to several dictionary definitions as well as publications that “consistently use ‘impurities’ to include intentionally introduced dopants.” *Id.* at 2–3 (citing Ex. 1108, 299; Ex. 1109, 363–364; Ex. 1105, xvi; Ex. 1106, 3–4; Ex. 1107, 81). Petitioner contends that Patent Owner fails to explain why the ’315 patent’s use of “contaminants and/or impurities” “means that ‘impurities’ should be replaced by ‘contaminants,’ and not, for example, the other way around.” *Id.* at 4. Petitioner also contends that “[u]se of ‘A and/or B’ is generally understood to include ‘A alone,’ ‘B alone,’ and ‘both A and B.’” *Id.* at 5 (citing *Cochlear Bone Anchored Sol’ns AB v. Oticon Medical AB*, 958 F.3d 1348, 1359–1360 (Fed. Cir. 2020)).

Petitioner further notes that “[i]t is undisputed that contaminants are a subset of impurities,” and contends that “references to ‘contaminants’ as examples of ‘impurities’ do not demonstrate clear intent to depart from plain and ordinary meaning, and the specification’s inconsistent use of ‘contaminants,’ ‘impurities,’ and ‘contaminants and/or impurities’ confirms the patentee did not intend to redefine ‘impurities’ as contaminants.”

Pet. Reply 5 (citing *Kyocera Senco Indus. Tools Inc. v. Int’l Trade Comm’n*, 22 F.4th 1369, 1378 (Fed. Cir. 2022)). Petitioner contends that dopants are also a subset of impurities, and “Figure 1’s reference to both ‘contaminants’ and ‘dopants’ . . . demonstrates that the patentee knew how to distinguish between impurities that behave as dopants and impurities that may be contaminants when it intended to do so.” *Id.* at 5–6 (citing Ex. 1089 ¶¶ 33–34).

Having reviewed the claim language, the Specification, and the evidence from the complete record now before us, we determine that “metal impurities” means “unintentional foreign metals.” We do not adopt Petitioner’s position that “metal impurities” includes intentionally-introduced dopants.

The '315 patent's Figure 2 is reproduced below.

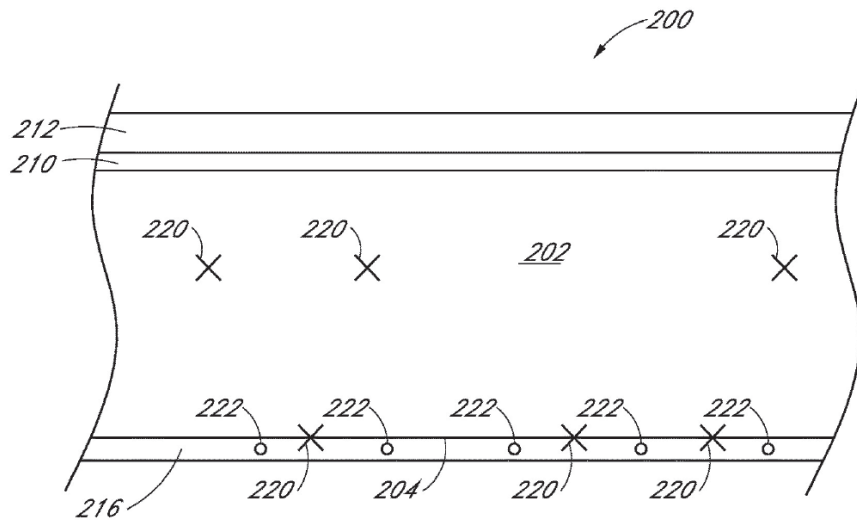


Figure 2 is a cross-sectional view of an example solar cell during one stage of the manufacturing process. Ex. 1001, 1:46–48.

Referring to Figure 2, the Specification teaches that “a dopant region 216 can be formed on a surface 204 of silicon substrate 202” and that “dopant region 216 can be a N-type dopant region, such as phosphorous” or “can have positive or negative type dopants 222.” Ex. 1001, 4:55–64. The Specification teaches that “silicon substrate 202 can have contaminants and/or impurities 220, for example metal contaminants and/or impurities, such as iron, nickel, and/or chromium among others.” *Id.* at 4:65–5:1. The Specification goes on to teach:

Metal impurities can be detrimental to the electrical conduction of the solar cell as these impurities can be sources of recombination, resulting in poor lifetime, surface passivation and/or lower solar cell efficiency. In an embodiment, the impurities 220 can be located at or near a surface 204 of the silicon substrate 202. In an embodiment, the impurities 220 can be located within the silicon substrate 202 as shown. As referred

throughout, contaminants and/or impurities can be used interchangeably.

Id. at 5:1–9.

The Specification further teaches that “emitter regions 212, e.g., polysilicon regions, can be a good sink and/or trap for the metal impurities 220” and “[a] gettering process can be used to trap the metal impurities 220 in the emitter regions 212, reducing recombination within the silicon substrate 202 and improving overall solar cell lifetime.” *Id.* at 5:10–15. The Specification teaches that heating the solar cell at a temperature above 900° C drives the dopants from the dopant region into a portion of the silicon substrate, and getters metal contaminants and/or impurities from the silicon substrate to emitter regions 212. Ex. 1001, 5:26–43; *see also id.* at 5:58–6:10 (same).

These disclosures, taken together, indicate that “metal impurities” are undesirable, and, accordingly, the term “metal impurities” is not meant to include intentionally added dopants. The undesirability of “metal impurities” is also demonstrated by the Specification’s instruction that “contaminants and/or impurities” are used interchangeably throughout. Ex. 1001, 5:8–9. In that regard, “iron, nickel, and/or chromium, among others” are the only exemplary metal impurities and/or metal contaminants identified in the Specification. *Id.* at 4:65–5:1 (“In an embodiment, the silicon substrate 202 can have contaminants and/or impurities 220, for example metal contaminants and/or metal impurities, such as iron, nickel and/or chromium, among others); 5:35–39 (“In an embodiment, the heating can include gettering contaminants, e.g., metal impurities and/or metal contaminants, from the substrate to the emitter region. In an example, the metal impurities and/or metal contaminants can be iron, nickel, and/or

chromium, among others.”); 8:15–20 (“In an example, impurities and/or contaminants 520, e.g. metal impurities and/or contaminants, can be located in the second emitter region 512 . . . the metal impurities 520 can be iron, nickel and/or chromium, among others.”). And metal impurities and metal contaminants are both described as gettering from the silicon substrate to the emitter region. *See id.* at 5:5–9 (“A gettering process can be used to trap the metal impurities 220 in the emitter regions 212, reducing recombination within the silicon substrate 202 and improving overall cell lifetime.”); 5:35–40 (“In an embodiment, the heating can include gettering contaminants, e.g. metal impurities and/or metal contaminant[s], from the substrate to the emitter region. In an example, the metal impurities and/or metal contaminants can be iron, nickel and/or chromium among others.”); 6:5–8 (“In an embodiment, the heating can getter 232 contaminants 220 from, or nearby, the surface 204 of the silicon substrate 202 and/or from within the silicon substrate 202 to the emitter region 212.”)

Accordingly, the Specification conveys that “metal impurities” are metal contaminants that are detrimental to the electrical conduction of solar cells.

Petitioner argues that “contaminants and dopants are both subsets of impurities” and “the patentee knew how to distinguish between impurities that behave as dopants and impurities that may be contaminants when it intended to do so.” Pet. Reply 5 (citing Ex. 1089 ¶¶ 33–34). As described above, the Specification does distinguish impurities that are contaminants from dopants by equating “impurities” and “contaminants” throughout, and by consistently describing metal impurities as contaminants gettering out of the silicon substrate. Dopants, in contrast, are driven into the silicon substrate under the same conditions that result in gettering the metal

impurities out. *See* Ex. 1001, 5:26–39. Defining “metal impurities” as “unintentional foreign metals” is also consistent with the ’315 patent’s goal of providing improved fabrication processes that increase the efficiency of solar cells. Ex. 1001, 1:35–39; *see also id.* at 5:1–5 (stating that metal impurities are detrimental to the electrical conduction of the solar cell, and can result in lower efficiency and poor lifetime).

We are also not persuaded by Petitioner’s argument that the prosecution of the ’315 patent’s great-great-grandparent patent (US 9,520,507 (“the ’507 patent”))³ “demonstrates the patentee did not intend to disclaim dopants from ‘impurities.’” Pet. Reply 6. Petitioner points to the Examiner’s rejection of “claims reciting ‘a first emitter region having metal impurities’ based on Yelundur,^[4] which discloses an emitter doped with the same metallic dopants as Choi.” *Id.* at 6–7 (citing Ex. 1110 ¶¶ 53, 55; Ex. 1036, 39, 79). Petitioner argues that “[t]he patentee did not respond that Yelundur lacks the claimed ‘metal impurities’ but instead added a new claim limitation to avoid prior art.” *Id.* at 7 (citing Ex. 1036, 98; Ex. 1089 ¶ 36).

The record shows that the Applicant disagreed with the Examiner’s rejections based on Yelundur, and requested an Applicant Initiated Interview to discuss the rejections with the Examiner. Ex. 1036, 83. The Interview Summary states that “Examiner and Applicant discussed Figure 7 of

³ The ’315 patent is a continuation of the application that led to US 10,658,525, which is a divisional of the application that led to US 10,170,642, which is a continuation of the application that led to US 9,899,542, which is a continuation of the application that led to the ’507 patent. Ex. 1001, code (60).

⁴ Yelundur, US 2013/0247981 A1, published Sept. 26, 2013 (“Yelundur,” Ex. 1110).

Applicant's specification and Figure 6 of [Yelundur]" and "Applicant and Examiner agreed that the attached amended claims overcome the cited art of record," without any further detail or explanation. *Id.* at 97–98. The amendment added limitations to claim 1 that are directed to a second emitter region and a second metal contact. *Id.* at 98. The Examiner's reasons for allowance in the Notice of Allowability that followed stated that the prior art did not teach

a first emitter region having metal impurities formed over the dielectric region; a second emitter region is formed at least partially over the first emitter region, and the first and second emitter regions are formed on a same side of the solar cell; and in combination with all features/limitations as recited in the independent claim 1.

Id. at 110. The Applicant disagreed with the Examiner's Statement, and submitted Comments on Examiner's Statement of Allowance explaining:

To the extent that there is any implication that the patentability of the claims rests on the recitation of a single feature, Applicants respectfully disagree with the Examiner's Statement because it is the combination of features that makes the claims patentable. Accordingly, Applicants submit that the claims of the present application are allowable because each of the claims recites a combination of features that are not taught or suggested by the prior art.

Id. at 147.

These statements during the '507 patent prosecution do not support Petitioner's contention that the Applicant "did not respond that Yelundur lacks the claimed 'metal impurities.'" Pet. Reply 7 (citing Ex. 1036, 98; Ex. 1089 ¶ 36). While it is clear that the Applicant disagreed with the Examiner's rejection based on Yelundur, there is not enough detail in the record to establish the specifics of the Applicant's disagreement. In particular, the summary of the Applicant Initiated Interview does not provide

detailed information regarding the arguments the Applicant made with respect to Yelundur. The prosecution of the '315 patent's great-great-grandparent patent, therefore, is not helpful in construing "metal impurities" as it is used in the challenged claims.

We note that Petitioner and Patent Owner also cite to extrinsic evidence, such as dictionary definitions and publications, to support their respective positions. *See, e.g.*, Pet. Reply 2–3 (citing Ex. 1108, 299; Ex. 1109, 363–364; Ex. 1105, xvi; Ex. 1106, 3–4; Ex. 1107, 81; Ex. 2030); PO Sur-reply 2–4 (citing Ex. 1047, 489, 492, 501; Ex. 1033, 316; Ex. 1139, 1952; Ex. 1031, 72; Ex. 1105, 8). While extrinsic evidence can shed useful light on the relevant art, it is less significant than the intrinsic record in determining the legally operative meaning of claim language. *Phillips*, 415 F.3d at 1317 (citing *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 862 (Fed. Cir. 2004)); *see also Virginia Innovation Scis., Inc. v. Samsung Elecs. Co.*, 614 Fed. Appx. 503, 510 (Fed. Cir. 2015) (the extrinsic evidence must be consulted in cases where "the intrinsic evidence before us does not provide a complete understanding of the term"). Moreover, extrinsic evidence may be useful only when considered in the context of the intrinsic evidence. *Phillips*, 415 F.3d at 1319.

Here, when read in the context of the Specification and the claims, the extrinsic evidence supports our construction of "metal impurities" as "unintentional foreign metals." For example, one technical dictionary defines "impurity" as "[a] substance whose presence within another reduces or eliminates the purity of the latter," and explains that an impurity "which is introduced into a semiconductor material" that "increases the conductivity of the semiconductor" is also called "dopant" or "semiconductor dopant." Ex. 1109, 363–364; *see also* Ex. 1108, 299 (explaining that "[i]mpurities

have a fundamental effect on the type and amount of conductivity of the semiconductor” and describes “deliberate diffusion of impurities into selected regions of a semiconductor in order to produce the desired characteristics”). The Specification, in contrast, describes metal impurities as being “detrimental to the electrical conduction of the solar cell,” unlike dopants. Ex. 1001, 5:1–5. Similarly, Patent Owner’s declarant, Dr. Schubert, explains in the preface to his textbook that that “[t]he term ‘dopant’ was non-existent in the English language until its introduction in 1963,” and, as a result, “the term ‘impurities’ is used for unintentional as well as intentional foreign atoms in the semiconductor, while the term ‘dopants’ is used exclusively for deliberately added impurities.” Ex. 1105, xv-xvi. As set forth above, the Specification consistently refers to “metal impurities” as contaminants, which are not deliberately added to the silicon substrate.

For these reasons, we construe “metal impurities” to mean “unintentional foreign metals,” which construction expressly does not include intentionally added dopants.

C. Ground 1: Asserted Obviousness over Choi, Granek or Marvin, and Istratov

Petitioner contends that claims 10–17, 19, and 20 would have been obvious over the combination of Choi, Granek or Marvin, and Istratov. Pet. 35–62.

1. Overview of Choi

Choi is directed to “a solar cell which is capable of improving reliability and maximizing efficiency.” Ex. 1006 ¶ 7. Choi’s Figure 1 is reproduced below.

100

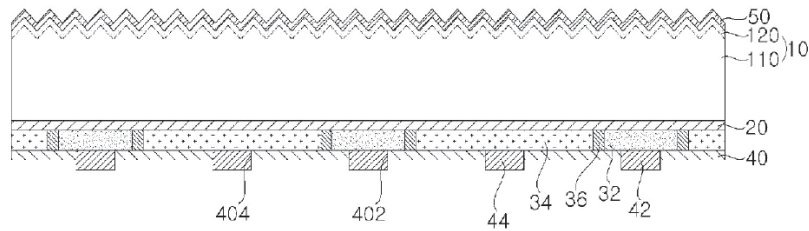


Figure 1 is a sectional view of a solar cell described in Choi. *Id.* ¶ 22. Solar cell 100 includes semiconductor substrate 10 (which includes base area 110 and front surface field layer 120), tunnelling layer 20, first conductive type area 32, and second conductive type area 34. *Id.* ¶¶ 23, 24, 29. First and second conductive type areas 32 and 34 are spaced from each other by barrier area 36. *Id.* ¶ 23. First and second electrodes 42 and 44 are connected to first and second conductive type areas 32 and 34, respectively. *Id.*

Choi teaches that semiconductor substrate 10 may “include a crystalline semiconductor (for example, crystalline silicon) containing a first conductive-type dopant.” Ex. 1006 ¶ 25. “[F]ront surface field layer 120 is an area where the first conductive-type dopant is doped at a concentration higher than the semiconductor substrate 10” and “prevents electrons and holes separated by incident light from being recombined and then decay on the front surface of the semiconductor substrate 10.” *Id.* ¶ 29. “[T]he first conductive-type dopant may be an n-type impurity such as a Group V element including phosphorous (P), arsenic (As), bismuth (Bi), antimony (Sb) or the like,” or “may be a p-type impurity such as a Group III element including boron (B), aluminum (Al), gallium (Ga), indium (In) or the like.” *Id.* ¶ 25. When base area 110 has an n-type impurity as the first conductive-type dopant, “second conductive type area 34 forming a tunnel junction

through the tunneling layer 20 with the base area 110 may be a p-type.” *Id.*
¶ 26. Alternatively, base area 110 and first conductive type area 32 may be a p-type and the second conductive type area 34 may be an n-type. *Id.*

Choi further teaches that barrier area 36 is disposed between, and separates, first conductive type area 32 and second conductive type area 34. Ex. 1006 ¶ 38. “[B]arrier area 36 may include a variety of materials for substantially insulating the first conductive type area 32 from the second conductive type area 34” such as “undoped insulating material (for example, oxide or nitride) or the like.” *Id.* ¶ 39. In addition, insulating layer 40 formed on first conductive type area 32, second conductive type area 34, and barrier layer 36 to prevent “undesired connection between” first and second conductive type areas 32 and 34 “and an improper electrode connection (that is, the second electrode 44 in case of the first conductive type area 32, and the first electrode 42 in case of the second conductive type area 34) and passivates the first and second conductive type areas 32 and 34.” *Id.* ¶ 42. Insulating layer 40 includes first opening 402 and second opening 404, exposing first and second conductive areas 32 and 34, respectively. *Id.*

2. Overview of Granek

Granek analyzes the passivation quality of different phosphorous-doped front surface field diffusion profiles. Ex. 1010, 117. Granek reports that a lowly-doped front surface field “results in high quantum efficiency . . . because the Auger recombination inside the highly doped region and the surface recombination velocity are low.” *Id.* at 120. According to Granek, “for the poorly passivated surfaces, highly doped and deep diffusion profiles are optimal in order to minimize the surface recombination” and, “for the well passivated surfaces, an optimal diffusion profile is lowly doped and shallow.” *Id.* at 122–123. Granek concludes that “[t]he best solar cell

efficiency of 20.8 % was obtained with deep diffused Gaussian profile of the” front surface field. *Id.* at 141. Granek further states that “the distribution of the efficiency of solar cells with the deep diffused [front surface field] was lowest, proving the processing stability of the deep diffused phosphorous profiles.” *Id.* at 141–142. Granek also notes that “[t]he efficiency of the analyzed solar cells decreased to 18.0 % for solar cell with the [front surface field] doping profiles with the lowest sheet resistance.” *Id.* at 142.

3. Overview of Marvin

Marvin reports on studies conducted to assess the utility of Interdigitated Back Contact (IBC) solar cells for space applications. Ex. 1008, 5. Marvin explains that “[a] subset of all the possible design parameters was selected for study in order to have a manageable task,” including “cell thickness, contact width, spacing and thickness, front surface field doping and thickness, and light intensity.” *Id.* at 9. Marvin reports:

In order to regain more of the performance lost by doubling the cell thickness from 25 μm to 50 μm , the use of a graded front surface doping field was investigated. The previous design used a 0.5 μm thick front surface field (FSF) uniformly doped at $5\text{E}18$. It was found that by replacing this with a Gaussian doping profile with a characteristic width of 15 μm and a peak concentration of $1\text{E}18$, the [end of life] efficiency [of the solar cell] was 11.49% with a 10 μm collector region spacing. This feature restored most of the lost performance.

Id. at 17. Marvin concludes that end of life performance is maximized when “[t]he FSF is graded over 15 μm with a peak doping concentration of $1\text{E}17$ to $1\text{E}18\text{ cm}^{-3}$.” *Id.* at 25.

4. Overview of Istratov

Istratov investigates the impact of buried oxide, which separates the device area from the substrate in silicon-on-insulator wafers, on the efficiency of traditional gettering techniques for iron and copper. Ex. 1012, 568. Istratov reports that the solubility of iron in silicon dioxide is 4.5 to 5.5 times less than in silicon at temperatures from 1020° C to 1100° C. *Id.* Istratov also reports that the solubility of copper in silicon dioxide is half of that in silicon at 1150° C and 3.3 times higher than in silicon at 690° C. *Id.*

5. Claim 10

Petitioner contends that Choi teaches most of the limitations of claim 10 except for “a portion of the silicon substrate has a dopant concentration of approximately less than or equal to $2 \times 10^{18} \text{ cm}^{-3}$,” which Petitioner contends is taught by Granek and Marvin. Pet. 47–56. Patent Owner responds that Petitioner does not establish that the asserted prior art teaches the “a portion of the silicon substrate has a dopant concentration of approximately less than or equal to $2 \times 10^{18} \text{ cm}^{-3}$ ” or “a first emitter region having metal impurities formed over the dielectric region” limitations of claim 10. PO Resp. 18, 21–28. We focus our discussion on the “a first emitter region having metal impurities formed over the dielectric region” limitation, as it is dispositive of the controversy between the parties.

a. “a first emitter region having metal impurities formed over the dielectric region”

Petitioner first contends that the recited “first emitter region . . . formed over the dielectric region” corresponds to Choi’s second conductive area 34. Pet. 54. Petitioner contends that “Choi also teaches a first emitter region ‘having metal impurities’” because Choi teaches that semiconductor substrate 10 contains “a first conductive-type dopant” that “may be an

‘n-type impurity’ (e.g., phosphorous, arsenic, bismuth, antimony), or alternatively, a ‘p-type impurity’ (e.g., boron, aluminum, gallium, indium)” which “are Group III and V elements.” *Id.* (citing Ex. 1006 ¶ 25). Petitioner further contends that “Choi teaches that each of the first and second conductive type areas 32, 34 is doped with either p- or n-type impurities in different embodiments,” and “because a POSITA would have understood that at least bismuth, aluminum, gallium and indium are metals, a POSITA would have understood that Choi’s first and second conductive type areas 32, 34 are doped with metal impurities.” *Id.* (citing Ex. 1006 ¶¶ 26, 36, 37; Ex. 1003 ¶¶ 267–268).

Patent Owner responds that “[u]nder the proper construction of ‘metal impurities,’ Choi fails to disclose a first emitter region having metal impurities.” PO Resp. 21.

As set forth above, we construe “metal impurities” to mean “unintentional foreign metals.” *See* § II.B.1, *supra*. Thus, Petitioner must show that Choi’s first emitter region contains unintentional foreign metals. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (stating that it is Petitioner’s burden to show with particularity why a challenged claim is unpatentable); *see also* 37 C.F.R. § 42.104(b)(4) (A petition “must specify where each element of the claim is found in the prior art patents or printed publications relied upon.”). Petitioner identifies dopants intentionally added to Choi’s device as the recited “metal impurities.” Pet. 54. Because Petitioner identifies metal dopants intentionally added to Choi’s solar cell as the recited “metal impurities,” Petitioner has not shown that Choi’s first emitter region contains unintentional foreign metals..

Petitioner alternately contends that Choi combined with Istratov teaches a first emitter region having metal impurities because “Istratov teaches the accumulation of iron and copper in the polysilicon layer during a heating step, and Istratov’s figures show higher iron and copper concentrations in the polysilicon layer than in the silicon substrate and oxide layers after heating.” Pet. 55 (citing Ex. 1012, 570–571, Figs. 2, 4, 5). Petitioner contends that “[u]pon identifying detrimental levels of metal impurities in a solar cell substrate, a POSITA would have been motivated to add Istratov’s gettering process to the Choi-Granek or Choi-Marvin cell to trap impurities in the polysilicon layer—i.e., an emitter—thereby reducing recombination.” *Id.* at 43.

Patent Owner responds that “Petitioner fails to explain why a person of ordinary skill in the art would have been prompted to modify Choi to include gettering, much less that disclosed by Istratov.” PO Resp. 22. Patent Owner argues that “Choi does not disclose that its substrate has metal impurities, and Petitioner did not argue that the substrate of Choi inherently would have metal impurities.” *Id.* at 22–23. According to Patent Owner, “[i]n the absence of a problem of metal contamination in Choi’s substrate, a person of ordinary skill in the art would not have searched for a potential solution to that problem, such as gettering. *Id.* at 23.

Having considered the complete trial record, we determine that Petitioner fails to sufficiently demonstrate by a preponderance of the evidence that a POSITA would have been motivated to look to Istratov’s gettering process to improve Choi’s solar cell.

Although Petitioner argues that a POSITA would have been motivated to look to Istratov’s gettering process upon identifying detrimental levels of metal impurities in Choi’s substrate, neither Petitioner nor Dr. Holman

adequately explain why a POSITA would have been concerned with the levels of metal impurities in Choi’s substrate, what level of metal impurities would be “detrimental,” or what detriment the metal impurities would cause. In that regard, Petitioner does not direct us to, nor do we discern, any teachings in Choi regarding the presence of metal impurities in the silicon substrate, let alone iron and/or copper impurities such as those described in Istratov.

In the Reply, Petitioner argues that metal impurities “were a pressing industry concern,” and it was not surprising that Choi did not mention metal impurities “given the problem was well-known.” Pet. Reply 11. Petitioner argues that “[i]ron was particularly prevalent and described as a ‘lifetime killer[]’ due to its effects on carrier lifetime,” which “is why Istratov evaluated gettering for iron.” *Id.* (citing Ex. 1119, 94–96; Ex. 1012, 568). Petitioner further argues that “[m]etal impurities could be introduced from dozens of sources on the production line, and iron was known to be particularly ‘difficult to eliminate.’” *Id.* at 12 (citing Ex. 1047, 489, 491; Ex. 1089 ¶¶ 46, 47, 58–62).

Petitioner’s proffered motivation to combine Choi with Istratov is premised on a POSITA identifying “detrimental levels of metal impurities” in Choi’s solar cell. *See* Pet. 43 (“*Upon identifying detrimental levels of metal impurities in a solar cell substrate, a POSITA would have been motivated to add Istratov’s gettering process to the Choi-Granek or Choi-Marvin cell to trap impurities in the polysilicon layer—i.e., an emitter—thereby reducing recombination.*” (emphasis added)). That metal impurities may have been a “pressing industry concern,” or the fabrication process could introduce metal impurities, however, does not establish that a POSITA reading Choi would have identified the detrimental levels of metal

impurities that Petitioner contends would prompt a POSITA to look at Istratov to improve Choi. Pet. 43. At best, it shows there is a *possibility* that Choi contains metal impurities, but says nothing about the amount of such metal impurities or the effect such metal impurities would have had on Choi's solar cell. Therefore, we are determine that Petitioner has not sufficiently shown that a POSITA would have combined Istratov with Choi as proposed. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1075 (Fed. Cir. 2015) (Obviousness “concerns whether a skilled artisan not only could have made but would have been motivated to make the combinations or modifications of prior art to arrive at the claimed invention.”).

For these reasons, after considering Petitioner's and Patent Owner's positions, as well as their supporting evidence, we determine that Petitioner does not show, by a preponderance of the evidence, that claim 10 would have been obvious over the combined teachings of Choi, Granek or Marvin,⁵ and Istratov.

6. Claims 11–17, 19, and 20

Petitioner also contends that the combined teachings of Choi, Granek or Marvin, and Istratov teach the limitations of claims 11–17, 19, and 20. Pet. 56–58, 60–62. Claims 11–17, 19, and 20 depend, directly or indirectly, from independent claim 10. Ex. 1001, 10:62–11:20. Thus, for the same reasons set forth above with respect to Petitioner's challenge of claim 10, we also conclude that Petitioner does not demonstrate by a preponderance of the evidence that claim 11–17, 19, and 20 would have been obvious over the combined teachings of Choi, Granek or Marvin, and Istratov.

⁵ Petitioner does not rely on Granek or Marvin with respect to the “first emitter region having metal impurities” limitation of claim 10.

7. Conclusion

Based on the current record, and for the reasons set forth above, we determine that Petitioner does not establish by a preponderance of the evidence that claims 10–17, 19, and 20 would have been obvious over the combined teachings of Choi, Granek or Marvin, and Istratov.

D. Ground 2: Asserted Obviousness over Choi, Granek or Marvin, Istratov, and Smith

Petitioner contends that claim 18 would have been obvious over the combination of Choi, Granek or Marvin, Istratov, and Smith. Pet. 62–67.

1. Overview of Smith

Smith describes a solar cell in which a trench structure separates the P-type doped region from the N-type doped region, “thereby preventing recombination in a space charge region where the doped regions would have touched.” Ex. 1011, code (57). Smith’s Figure 2 is reproduced below.

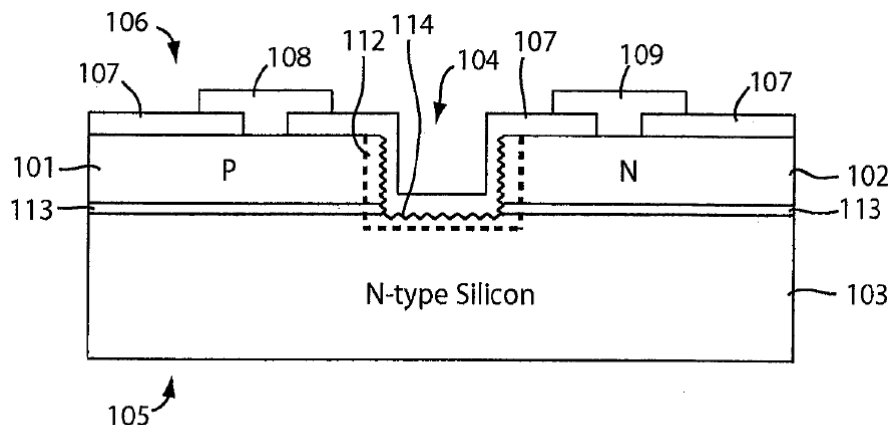


FIG. 2

Figure 2 is a sectional view of a solar cell structure described in Smith. *Id.* ¶ 9. Doped regions 101 and 102 are on backside 106 opposite front side 105. *Id.* ¶ 16. Doped regions 101 and 102 are formed on thin dielectric layer 113; doped region 101 is a P-type doped region and doped region 102 is an N-type doped region. *Id.* ¶¶ 16–17. Substrate 103 is an N-type silicon

wafer. *Id.* ¶ 17. Trench 104 with randomly textured surface 114 and passivation region 112 separates doped regions 101 and 102. *Id.* ¶¶ 19, 21. Dielectric silicon nitride 107 is deposited in trench 104. *Id.* ¶ 22. Interdigitated metal contact fingers 108 and 109 are formed through silicon nitride 107 to make an electrical connection to doped regions 101 and 102, respectively. *Id.* ¶ 24.

Smith explains that the described trench structure addresses issues relating to polysilicon parasitic space charge recombination because “trench 104 separates the doped regions 101 and 102 so they are not physically in contact,” which “prevents the space charge region from existing in either polysilicon film.” Ex. 1011 ¶ 25. Additionally, “the resulting accumulation layer under the trench 104 repels minority carriers to improve surface passivation” and “the textured surface 114 in the trench 104 increases solar radiation collection.” *Id.* According to Smith, “[t]hese advantageously help increase solar cell efficiency.” *Id.*

2. Claim 18

Claim 18 depends from claim 16, which depends from claim 10, and additionally recites “wherein a trench region separates the first emitter region from the second emitter region.” Ex. 1001, 11:12–14. Petitioner relies on the arguments it made in Ground 1 regarding the limitations of claims 10 and 16 and the combinations of Choi, Granek or Marvin, and Istratov, and then argues that “[a] POSITA would have found it obvious to use a trench, as taught by Smith, to isolate the P-type and N-type emitter regions in the Choi-Granek-Istratov or Choi-Marvin-Istratov cell.” Pet. 62–63, 66 (citing Ex. 1003 ¶¶ 335–338). Petitioner’s arguments with respect to dependent claim 18 do not remedy the deficiencies identified above with respect to independent claim 10. *Id.* at 62–67. Accordingly, for the reasons

set forth above with respect to claim 10, we determine that Petitioner does not establish, by a preponderance of the evidence, that claim 18 would have been obvious over the combined teachings of Choi, Granek or Marvin, Istratov, and Smith.

E. Ground 3: Asserted Obviousness over Cousins, Granek or Marvin, and Istratov

Petitioner contends that claims 10–15 would have been obvious over the combined teachings of Cousins, Granek or Marvin, and Istratov. Pet. 67–78.

1. Overview of Cousins

Cousins is directed to “structures for a relatively efficient and cost-effective front contact solar cell and processes for manufacturing same.” Ex. 1007, 1:38–41. Figure 1 is reproduced below.

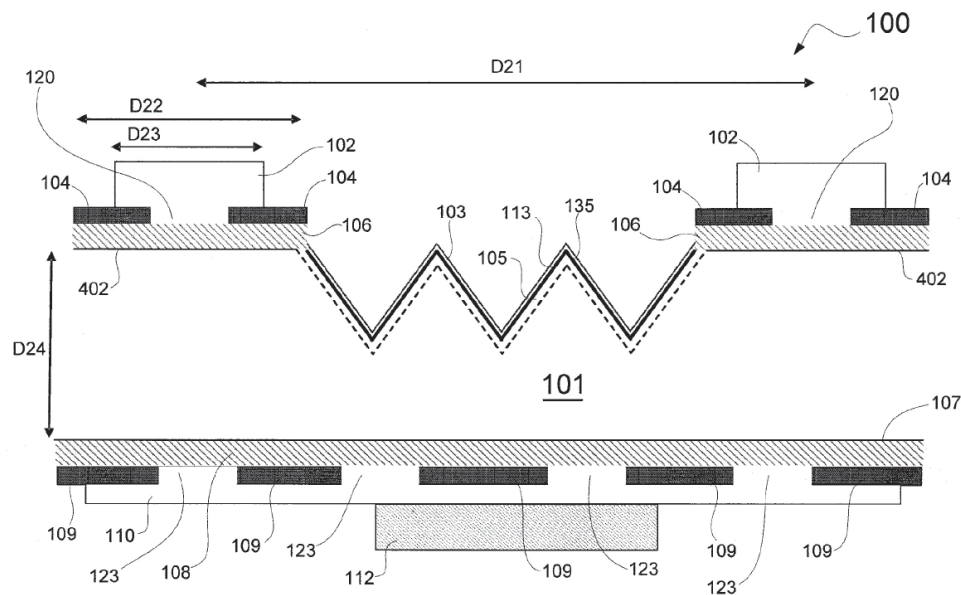


FIG. 1

Figure 1 is a schematic cross-section of an embodiment of a solar cell described in Cousins. *Id.* at 1:66–67. Solar cell 100 has a front side with metal contacts 102 and a backside on the same side as metal contacts 110.

Id. at 2:31–33. Solar cell 100 also includes P-type doped polysilicon layer 108 serving as a P-type diffusion region and N-type silicon substrate 101 serving as an N-type diffusion region. *Id.* at 2:39–42. The front surface of substrate 101 includes N-type doped region 105 that “provides low front surface recombination and improves lateral conductivity whilst not compromising the blue response of the solar cell.” *Id.* at 2:49–54. N-type doped polysilicon layer 106 “provides low contact resistance and minimizes contact recombination.” *Id.* at 2:56–58. Polysilicon layer 106 is formed on thin dielectric layer 402, and polysilicon layer 108 is formed on thin dielectric layer 107. *Id.* at 2:63–65, 3:12–13. Silicon dioxide layer 109 may serve as a dopant source in the diffusion of dopants into polysilicon layer 108, and silicon dioxide layer 104 may serve as a dopant source in diffusing dopants to polysilicon layer 106. *Id.* at 3:28–30, 3:50–52.

2. Claim 10

Petitioner argues that the combination of Cousins, Granek or Marvin, and Istratov teaches “a first emitter region . . . formed over the dielectric region” because Cousins teaches that “polysilicon layer 108 is P-type doped and ‘formed on a thin dielectric layer 107,’ as shown in Figure 1, and ‘has an emitter saturation current of about $10 \text{ fA}\cdot\text{cm}^{-2}$.’” Pet. 74–75 (citing Ex. 1007, 3:39–44, 3:12–13, Fig. 1). Petitioner argues that Cousins also teaches that “polysilicon layer 108 ‘serv[es] as a P-type diffusion region’ and forms a back side junction with the silicon substrate 101.” *Id.* at 75 (citing Ex. 1007, 1:44–46, 2:39–42).

Petitioner also argues that “Istratov teaches the accumulation of iron and copper (metal impurities) in the polysilicon layer during a heating step.” Pet. 75. Petitioner argues that a POSITA would have been motivated “to add Istratov’s gettering process to the Cousins-Granek or Cousins-Marvin

cell to trap impurities in the emitter and thus reduce recombination for the same reasons explained” with respect to the combination of Choi, Granek or Marvin, and Istratov. *Id.* at 70 (citing Ex. 1003 ¶¶ 370–371). Thus, Petitioner’s arguments with respect to the combination of Cousins with Istratov have the same shortcomings as discussed above with respect to the combination of Choi and Istratov. *See* § II.C.5.a, *supra*. In particular, neither Petitioner nor Dr. Holman adequately explains why a POSITA would have been concerned with the levels of metal impurities in Cousins’s substrate, what level of metal impurities would be detrimental, or what detriment the metal impurities would cause. Accordingly, because Petitioner’s arguments with respect to Cousins do not remedy the deficiencies identified above with respect to the combination of Choi and Istratov, and for the reasons set forth above with respect to Petitioner’s proposed combination of Choi with Istratov, we determine that Petitioner does not establish by a preponderance of the evidence that claims 10–15 would have been obvious over the combined teachings of Cousins, Granek or Marvin, and Istratov. *Id.*

III. PATENT OWNER’S MOTION TO EXCLUDE

Patent Owner moves to exclude Exhibits 1018, 1031, 1034, 1054, 1081, 1082, 1091, 1092, 1107, 1116, 1120, 1130, 1132, 1135, and 1136.⁶ Mot. 2–3. Patent Owner, as the moving party, has the burden of proof to establish that it is entitled to the requested relief. 37 C.F.R. § 42.20(c).

⁶ Patent Owner’s Motion includes a challenge to Exhibit 1090, which it withdrew after Petitioner overcame the objection. Mot. 14–15; Mot. Opp. 15; Mot. Reply 5. Accordingly, we do not address Exhibit 1090.

A. Student Theses (Exs. 1018, 1034, and 1120)

Patent Owner argues that Exhibits 1018, 1034, and 1120 should be excluded because they “are purportedly theses that have not been shown to qualify as prior art,” and “Petitioner fails to show that any of Exhibits 1018, 1034, and 1120 were cataloged, indexed, or shelved such that an interested member of the public exercising reasonable diligence could have located them.” Mot. 3–4. Petitioner responds that “[t]hese exhibits were provided to support Dr. Holman’s testimony regarding the technical background and knowledge of a POSITA” and are not relied on as prior art, and, accordingly, “whether each was publicly available as a printed publication is immaterial.” Mot. Opp. 2–3. Petitioner also argues that a challenge to the sufficiency of evidence used to demonstrate that an exhibit qualifies as a printed publication is not properly presented in a motion to exclude. *Id.* (citing *Chicago Mercantile Exch., Inc. v. 5th Mkt., Inc.*, CBM2014-00114, Paper 35 at 51 (PTAB Aug. 18, 2015)).

We agree with Petitioner. As the Board indicated in *Chicago Mercantile Exchange*, whether a document qualifies as a printed publication requires a legal determination based upon evidence and “the issue of whether there is sufficient evidence in the record . . . should be presented in the patent owner response—not a motion to exclude.” *Chicago Mercantile Exchange*, Paper 35 at 52. Although addressing the admissibility of evidence (authenticity or hearsay) underlying the factual determinations of whether Exhibits 1018, 1034, and 1120 may be the subject of a motion to exclude, Patent Owner’s arguments in the Motion address whether there is sufficient evidence to establish that these exhibits are prior art, not the general admissibility of the documents. *See* Mot. 3–6; *Chicago Mercantile Exchange*, Paper 35 at 52.

Thus, we are not persuaded that Exhibits 1018, 1034, and 1120 should be excluded. These exhibits, for the most part, are offered to support Dr. Holman’s testimony regarding the background of the technology (Ex. 1003 ¶¶ 42, 43, 45–52, 56, 57 (citing Ex. 1018), 55, 67 (citing Ex. 1034)) or what the ordinarily skilled artisan would have understood (Pet. Reply 11 (citing Ex. 1120); Ex. 1089 ¶¶ 46–48, 56, 59, 60, 69 (citing Ex. 1120)). Furthermore, Exhibit 1018 was authored by Dr. Holman, and is identified in the curriculum vitae appended to Dr. Holman’s declaration in support of the Petition. Ex. 1003, 224 (App’x. A).

Accordingly, we deny Patent Owner’s motion to exclude Exhibits 1018, 1034, and 1120.

B. Authentication and Hearsay (Exs. 1031, 1054, 1081, 1082, 1107, 1116, 1128, 1130, 1132, 1135)

Patent Owner also moves to exclude Exhibits 1031, 1054, 1081, 1082, 1107, 1116, 1128, 1130, 1132, and 1135. Mot. 6–11. These exhibits include technical papers, press releases, news articles, company information, and a market report.

Patent Owner alleges that Exhibits 1031, 1054, 1081, 1082, 1107, and 1128 do not include any indication of when they were published or otherwise made available to the public, or are not prior art. Mot. 6–8, 10. Patent Owner further alleges that Exhibits 1116, 1130, 1132, and 1135 lack authentication and are hearsay. *Id.* at 9–11. Petitioner argues that these exhibits “are not relied on as themselves being pieces of prior art, and it is thus immaterial whether they were publicly available” and “are indisputably relevant, as they corroborate Dr. Holman’s testimony.” Mot. Opp. 5–6. Petitioner argues that “these exhibits are not hearsay because they are being offered as evidence of what they describe, not for the truth of the matters

asserted,” and “they may still be relied on by Dr. Holman in forming his opinions” even if they were hearsay. *Id.* at 6–8 (citing Fed. R. Evid. 703, 801(c)). Petitioner also argues that the authenticity of these exhibits is supported by declarations submitted by Mr. Gilbert T. Smolenski (Ex. 1140; Ex. 1141 (collectively, “Smolenski Declarations”)), one of the attorneys representing Petitioner in this proceeding. *Id.* at 8–10

We are not persuaded that Exhibits 1031, 1054, 1081, 1082, 1107, 1116, 1128, 1130, 1132, and 1135 should be excluded. These exhibits, for the most part, are offered to support Dr. Holman’s testimony of what the ordinarily skilled artisan would have understood, not as prior art. *See, e.g.*, Ex. 1003 ¶¶ 86, 87, 92, 205; Ex. 1089 § 57; Pet. 17, 18 (all citing Ex. 1031); Ex. 1003 ¶ 203 (citing Ex. 1081; Ex. 1082). First, we are not persuaded that these exhibits lack authentication. Authentication is a low bar, requiring only a rational basis that the exhibits are what they are asserted to be. *See Caterpillar, Inc. v. Wirgen Am., Inc.*, IPR2018-01091, Paper 49 at 72 (PTAB Nov. 27, 2019) (quoting *United States v. Turner*, 934 F.3d 794, 798 (8th Cir. 2019)). For example, FRE 901(b)(1) explains that testimony of a witness with knowledge “that an item is what it is claimed to be” may satisfy the authentication requirement. Fed. R. Evid. 901(b)(1). Here, Petitioner provides the Smolenski Declarations, in which Mr. Smolenski attests that the facts to which he testifies were known to him personally, and that each of the challenged exhibits is a true and accurate copy of what it purports to be. Ex. 1140 ¶¶ 1, 2, 15, 44, 45, 49; Ex. 1141 ¶¶ 1, 2, 11, 28, 38. We find no reason to question the veracity of his testimony, and Patent Owner does not show otherwise.

As noted above, Exhibits 1031, 1054, 1081, 1082, 1107, 1116, 1128, 1130, 1132, and 1135 are offered to support Dr. Holman’s testimony of what

the ordinarily skilled artisan would have understood. In that regard, Dr. Holman considered Exhibits 1031, 1054, 1081, 1082, 1107, 1116, 1128, 1130, 1132, and 1135, along with others, for the declarations submitted in this proceedings, and these exhibits show the basis for the testimony in the declarations. Ex. 1003 ¶ 35, App’x B; Ex. 1089 ¶¶ 5–6, App’x D. An expert may rely on hearsay in forming an opinion under FRE 703. *See Joy Techs., Inc. v. Manbeck*, 751 F.Supp. 225, 233 n.2 (D.D.C 1990), *aff’d*, 959 F.2d 226 (Fed. Cir. 1992) (“A prior art document submitted as a ‘printed publication’ . . . is offered simply as evidence of what it describes, not for proving the truth of the matters addressed in the document. Therefore, it is not hearsay under Fed. R. Evid. 801(c).”). To the extent the challenged exhibits are hearsay, we would limit their purpose to showing the basis for testimony.

Accordingly, we deny Patent Owner’s Motion to Exclude Exhibits 1031, 1054, 1081, 1082, 1107, 1116, 1128, 1130, 1132, and 1135 for lack of authentication or hearsay. We also do not rely on any of Exhibits 1031, 1054, 1081, 1082, 1107, 1116, 1128, 1130, 1132, and 1135 to reach our determination.

C. Materials from Other Proceedings (Exs. 1091, 1092, 1136)

Exhibits 1091 and 1092 are the declaration and deposition transcript of Patent Owner’s declarant David L. Carroll, Ph.D. from IPR2024-01038, which also challenged the ’315 patent. Exhibit 1136 is the deposition transcript of Patent Owner’s declarant Douglas S. Ruby, Ph.D. from IPR2024-01199 and IPR2024-01203, in which Petitioner challenges another two of Patent Owner’s patents, US 8,878,053 and US 8,222, 516, respectively. Patent Owner argues that “the exhibits are hearsay, and no hearsay exception applies.” Mot. 11–13. Petitioner responds that it

“introduced Exhibits 1091, 1092, and 1136 as evidence of what they describe, not for the truth of their content.” Mot. Opp. 14 (citing Fed. R. Evid. 801(c), 1972 Adv. Comm. Note). In particular, Petitioner avers that “Exhibit 1091 is cited in Petitioner’s Reply to show what Maxeon disputes about gettering, not for the substance of Dr. Carroll’s testimony about gettering” and “Ex. 1092 is cited to show the inconsistency between a past position of Maxeon’s expert and Maxeon’s current position, not for the substance of Dr. Carroll’s testimony about silicon wafer quality.” *Id.*

Because we do not rely on Exhibits 1091, 1092, and 1136 to reach our determination, we deny Patent Owner’s Motion to Exclude Exhibits 1091, 1092, and 1136 as moot.

IV. CONCLUSION

After reviewing the parties’ arguments and weighing the evidence offered by both parties, we determine that Petitioner does not show, by a preponderance of the evidence, that claims 10–20 of the ’315 patent are unpatentable.

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
10–17, 19, 20	103	Choi, Granek, Marvin, Istratov		10–17, 19, 20
18	103	Choi, Granek, Marvin, Istratov, Smith		18
10–15	103	Cousins, Granek, Marvin, Istratov		10–15
Overall Outcome				10–20

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has not established by a preponderance of the evidence that claims 10–20 of the '325 patent are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Exclude (Paper 46) is *denied*; and

FUTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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FOR PETITIONER:

David Cavanaugh

John Hobgood

Jorge Kina

Robert Stiller

Nora Xu

Alexander J. Nemtzow

Gilbert Smolenski

Abigail Lubow

Jorge Kina

WILMER CUTLER PICKERING HALE AND DORR LLP

David.Cavanaugh@wilmerhale.com

John.Hobgood@wilmerhale.com

Jorge.Kina@wilmerhale.com

Robert.Stiller@wilmerhale.com

Nora.Xu@wilmerhale.com

Alex.Nemtzw@wilmerhale.com

Gilbert.Smolenski@wilmerhale.com

Abigail.lubow@wilmerhale.com

Jorge.kina@wilmerhale.com

FOR PATENT OWNER:

Eric Klein

Jeffrey Swigart

Crobin Cessna

VINSON & ELKINS LLP

eklein@velaw.com

jswigart@velaw.com

ccessna@velaw.com

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Jacob A. Snodgrass
Bradford A. Cangro
Jeremy D. Peterson
Jing Zhao
PV LAW LLP
jacob.snodgrass@pvuslaw.com
bradford.cangro@pvuslaw.com
jeremy.peterson@pvuslaw.com
jing.zhao@pvuslaw.com