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THE MARBURY LAW GROUP, PLLC 11800 SUNRISE VALLEY DRIVE 15TH FLOOR RESTON, VA 20191			TADAYYON ESLAMI, TABASSOM	
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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* CHRIS ORIAKHI, ANDRES LEMING, SHAILENDRA  
PARIHAR, RICHARD STEPHENSON, and EMAD EL BATAWI

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Appeal 2019-005060  
Application 15/151,084  
Technology Center 1700

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Before BEVERLY A. FRANKLIN, LINDA M. GAUDETTE, and  
JANE E. INGLESE, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL<sup>1</sup>

The Appellant<sup>2</sup> appeals under 35 U.S.C. § 134(a) from the Examiner’s  
decision finally rejecting claims 1–11.<sup>3</sup>

We AFFIRM.

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<sup>1</sup> This Decision includes citations to the following documents: Specification filed May 10, 2016 (“Spec.”); Final Office Action dated March 20, 2018 (“Final Act.”); Appeal Brief filed January 4, 2019 (“Appeal Br.”); Examiner’s Answer dated April 18, 2019 (“Ans.”); and Reply Brief filed June 17, 2019 (“Reply Br.”).

<sup>2</sup> We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. The Appellant identifies the real party in interest as Bloom Energy Corporation. Appeal Br. 2.

<sup>3</sup> We have jurisdiction under 35 U.S.C. § 6(b).

### CLAIMED SUBJECT MATTER

The invention relates to a method of making a solid oxide fuel cell (SOFC). *See* Spec. ¶ 5. In a typical SOFC fabrication process, electrodes applied to a fuel cell component undergo various process steps before a final, high temperature, firing step. *Id.* ¶ 9. According to the Specification, in processes “in which both electrodes are applied without firing, cross-contamination, or abrasion, may occur between the electrodes, leading to reduced cell performance.” *Id.* The inventive method is said to improve an electrode’s abrasion resistance by altering the ink composition used for printing the electrode. *Id.* ¶ 10. Claim 1, the sole independent claim on appeal, is illustrative of the claimed subject matter:

1. A method of making a solid oxide fuel cell (SOFC), comprising:

forming an anode on a first side of a planar solid oxide electrolyte using an abrasion resistant ink, the abrasion resistant ink comprising around 60–80 wt. % of a composite powder comprising a metal phase and a ceramic phase, and around 1–10 wt. % of an abrasion resistant binder comprising a derivative of methacrylic acid;

drying the anode, such that the binder is cured and forms a matrix that contains dispersed anode precursor powder, thereby providing abrasion resistance;

forming a cathode on a second side of the solid oxide electrolyte prior to firing the anode, by placing the first side of the electrolyte with the dried anode, face down on a conveyor, and then printing the cathode on the second side of the electrolyte, using an ink that does not comprise the abrasion resistant binder;

drying the cathode; and

firing the first and second electrodes during a single firing step, such that the abrasion resistant ink prevents or reduces scuffing of the anode, and prevents or reduces release

of loose anode powder into the cathode during cathode forming and drying.

Appeal Br. 12 (Claims App.).

#### REFERENCES

The Examiner relies on the following prior art as evidence of unpatentability:

Name	Reference	Date
Lee	US 2007/0077476 A1	Apr. 5, 2007
Hata	US 2009/0023027 A1	Jan. 22, 2009
Hwang	US 2010/0098996 A1	Apr. 22, 2010
Batawi	US 2012/0043010 A1	Feb. 23, 2012
Ahn	US 2013/0011768 A1	Jan. 10, 2013

#### REJECTIONS

1. Claims 1–11 are rejected under 35 U.S.C. § 112(a) or 35 U.S.C. § 112 (pre–AIA), first paragraph, as failing to comply with the written description requirement.
2. Claims 1–5, 8, 10, and 11 are rejected under 35 U.S.C. § 103(a) as unpatentable over Batawi in view of Hata and Hwang.
3. Claims 6 and 7 are rejected under 35 U.S.C. § 103(a) as unpatentable over Batawi in view of Hata, Hwang, and Lee.
4. Claim 9 is rejected under 35 U.S.C. § 103(a) as unpatentable over Batawi in view of Hata, Hwang, and Ahn.

OPINION

*Written Description Rejection*

The Examiner determined that there is no support in the Specification for the negative claim 1 limitation “printing the cathode on the second side of the electrolyte, using *an ink that does not comprise the abrasion resistant binder*” (emphasis added). Final Act. 2. The Appellant cites Specification paragraphs 23 and 42 as providing support for the negative claim limitation. Appeal Br. 5. For the reasons discussed below, we determine that the Examiner reversibly erred in rejecting the claims as failing to comply with the written description requirement.

“Negative claim limitations are adequately supported when the specification describes a reason to exclude the relevant limitation.” *Santarus, Inc. v. Par Pharm, Inc.*, 694 F.3d 1344, 1351 (Fed. Cir. 2012). In considering whether the claims comply with the written description requirement of 35 U.S.C. § 112, we must first determine the scope of the claims. *Ariad Pharms., Inc. v. Eli Lilly and Co.*, 598 F.3d 1336, 1347 (Fed. Cir. 2010). During examination, claim terms are given their broadest reasonable construction consistent with the Specification. *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007). “[I]t is a rule of law well established that the definite article ‘the’ particularizes the subject which it precedes. It is a word of limitation as opposed to the indefinite or generalizing force of ‘a’ or ‘an.’” *Warner–Lambert Co. v. Apotex Corp.*, 316 F.3d 1348, 1356 (Fed. Cir. 2003) (citation omitted).

Applying the above claim construction principles, we understand “the abrasion resistant binder” in the claim 1 negative limitation as referring to the preceding recitation of “an abrasion resistant binder comprising a

derivative of methacrylic acid.” The term “comprising” means that a derivative of methacrylic acid is an essential component of the binder, but other components may also be included in the binder. *See In re Crish*, 393 F.3d 1253, 1257 (Fed. Cir. 2004). The following written description disclosure supports an interpretation of the claimed abrasion resistant binder as including other binders in combination with a methacrylic acid derivative:

Binders suitable for use in the various embodiments *may include one or more* abrasion resistant polymers or polymer precursors (e.g., monomers) which are polymerized during the electrode processing. Any suitable polymers (e.g., polymer resins) may be used, such as acrylic polymers, siloxanes, ethyl cellulose, polyvinyl alcohol, polyvinyl butyral, and other suitable polymer binders and their mixtures. . . . [T]he acrylic polymer may be formed using acrylate monomers, for example, methacrylates (e.g., methyl methacrylate . . .).

Spec. ¶ 28 (emphasis added); *see TiVo, Inc. v. EchoStar Commc'ns Corp.*, 516 F.3d 1290, 1303 (Fed. Cir. 2008) (“As a general rule, the words ‘a’ or ‘an’ in a patent claim carry the meaning of ‘one or more.’”). Thus, we interpret the negative claim 1 limitation—“an ink that does not comprise the abrasion resistant binder”—as meaning that the cathode is formed using an ink that does not include any of the abrasion resistant binder components (e.g., a methacrylic acid derivative) of the ink used in forming the anode.

We turn next to the written description to determine whether it describes a reason to exclude the abrasion resistant binder components used in forming the anode from the ink used to print the cathode. The written description focuses primarily on forming an anode using an abrasion resistant ink and states that the variously described binders “may comprise around 1–10 wt.% of the anode ink” (Spec. ¶ 31). *See generally id.* ¶¶ 24–38. However, the Specification discloses that “in an[] alternative

embodiment, the order of electrode formation may be reversed (i.e., cathode followed by anode), and the abrasion resistant ink properties may be incorporate[d] into the cathode formation using similar materials and processes.” *Id.* ¶ 42. In our view, this disclosure, coupled with the numerous alternative materials identified as suitable for the binder, supports a method of making a SOFC that includes forming the cathode using an ink that contains a different binder material(s) than the ink used to form the anode. *See Inphi Corp. v. Netlist, Inc.*, 805 F.3d 1350, 1357 (Fed. Cir. 2015) (“We hold that . . . properly described, alternative features are sufficient to satisfy the written description standard of § 112, paragraph 1 for negative claim limitations.”). Accordingly, we do not sustain the rejection of claims 1–11 under 35 U.S.C. § 112(a) or 35 U.S.C. § 112 (pre–AIA), first paragraph, as failing to comply with the written description requirement.

#### *Obviousness Rejections*

The Appellant’s arguments in support of patentability of all appealed claims are based on limitations in claim 1. Appeal Br. 4. The Examiner rejected claim 1 under 35 U.S.C. § 103(a) as unpatentable over Batawi in view of Hata and Hwang. The Appellant does not dispute the Examiner’s findings that Batawi discloses the claim 1 method except for the specific binders and the weight percentages of the abrasion resistant ink components used in forming the anode. *See* Final Act. 3–4; Appeal Br. 5–10. The Appellant also does not dispute the Examiner’s finding that Hata would have suggested to the ordinary artisan that the ink used in Batawi’s method comprises “around 60–80% of a composite powder” and “around 1–10% of an abrasion resistant binder” as recited in claim 1. *See* Final Act. 4; Appeal Br. 5–10. Rather, the Appellant argues that the Examiner reversibly erred in

finding that, based on Hata's and Hwang's respective teachings, the ordinary artisan would have used poly methyl methacrylate as the binder in the ink used to form Batawi's anode and PVA as the binder in the ink used to form Batawi's cathode. *See* Final Act. 3–4; Appeal Br. 5–10. The Appellant's arguments are not persuasive for the reasons discussed below.

The Appellant argues that “the cited references do not teach using an abrasion resistant binder in *only* the anode electrode ink but not in the cathode electrode ink, as recited in claim 1 of the present application.” Appeal Br. 6. This argument is not persuasive because we interpret the claim 1 negative limitation as precluding only the use of the *same* abrasion resistant binders in the anode and cathode. *See supra* p. 5.

The Appellant argues that both Hata and Hwang fail to disclose or suggest forming the anode and cathode using two different inks, each of which contains different binders. Appeal Br. 7; *see also* Reply Br. 6–7. This argument is not persuasive because it fails to address what the collective teachings of the references would have suggested. Batawi expressly teaches a “cell construction with anode and cathode electrodes formed with two different ink formulations.” Batawi ¶ 52, *cited in* Final Act. 3. Batawi does not disclose specific binders for use in the ink formulations. *See* Ans. 3. Batawi discloses that “[t]he anode electrode of one embodiment . . . is a cermet comprising a nickel containing phase (i.e., a metal phase which includes nickel) and a ceramic phase.” Batawi ¶ 23. Hata discloses a method of making a SOFC using an ink paste comprising a powder mix of ceria oxide, nickel oxide, and zirconia, and a binder that is preferably a “(meth)acrylate type copolymer . . . obtained by polymerization or copolymerization of at least one kind of monomer . . . such as methyl



methacrylate.” Hata ¶¶ 15, 36, 38. The Appellant has not shown error in the Examiner’s finding that the ordinary artisan would have understood from Hata that poly methyl methacrylate would be a suitable binder for use in making Batawi’s anode that likewise comprises nickel and a ceramic. *See* Final Act. 4. Batawi discloses that the cathode may comprise “lanthanum strontium cobalt ferrite” (LSCF). Batawi ¶ 25. Hwang discloses a method of making a SOFC wherein the cathode comprises a mixture of LSCF and a PVA binder. Hwang ¶ 114. The Appellant has not shown error in the Examiner’s finding that the ordinary artisan would have understood from Hwang that PVA would be a suitable binder for use in making Batawi’s cathode that likewise comprises LSCF. *See* Final Act. 4.

The Appellant argues that “Hwang *adds nothing to the disclosure of Hata*, since both references disclose that PVA may be used as a binder for forming LSCF cathode electrodes,” and, therefore, “it must be presumed that that Examiner has improperly relied upon hindsight and Appellants’ own disclosure in order to arrive at such a combination.” Appeal Br. 9–10; *see also* Reply Br. 6–7. Hata provides direction to select poly methyl methacrylate for use as the binder in Batawi’s ink used in forming the anode. *See* Hata ¶¶ 37–38. As conceded by the Appellant, Hata discloses a list of binders, including PVA, for use in forming a cathode comprising LSCF. *See* Hata ¶¶ 37, 50. Hwang provides explicit direction to select PVA as the binder for a LSCF cathode. Hwang ¶ 114; *see* Final Act. 9. The Appellant argues that “the functionality of the claimed binder and Hwang’s binder are different.” Appeal Br. 10. This argument fails to show error in the Examiner’s finding that the ordinary artisan would have combined the teachings of Batawi, Hata, and Hwang. One of ordinary skill in the art need

not see an applicant’s identical problem addressed in a prior art reference to be motivated to apply its teachings. *Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1323 (Fed. Cir. 2005); *see also In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007) (explaining that a reference’s teachings and its obvious variants are relevant prior art, even if the reference addresses a problem which differs from that addressed by a patent applicant). In sum, the Appellant has not persuasively argued that the Examiner relied upon improper hindsight reasoning in combining the teachings of Batawi, Hata, and Hwang.

#### CONCLUSION

For the reasons discussed above, we reverse the Examiner’s rejection of claims 1–11 under 35 U.S.C. § 112(a) or 35 U.S.C. § 112 (pre–AIA), first paragraph, as failing to comply with the written description requirement, but sustain the Examiner’s rejections under 35 U.S.C. § 103(a).

#### DECISION SUMMARY

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1–11	112	Written description		1–11
1–5, 8, 10, 11	103(a)	Batawi, Hata, Hwang	1–5, 8, 10, 11	
6, 7	103(a)	Batawi, Hata, Hwang, Lee	6, 7	
9	103(1)	Batawi, Hata, Hwang, Lee	9	
<b>Overall Outcome:</b>			1–11	

Appeal 2019-005060  
Application 15/151,084

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED