United States Court of Appeals for the Federal Circuit

AIA ENGINEERING LIMITED,
Plaintiff/Counterclaim Defendant-Appellee,

AND

VEGA INDUSTRIES, LTD., INC.,
Third Party Defendant-Appellee,

v.

MAGOTTEAUX INTERNATIONAL S/A AND MAGOTTEAUX, INC.,
Defendants/Counterclaim Plaintiffs-Appellants.

2011-1058

Appeal from the United States District Court for the Middle District of Tennessee in Case No. 09-CV-0255, Judge William J. Haynes, Jr.

Decided: August 31, 2011

DAVID LIEBERWORTH, Garvey Schubert Barer, of Seattle, Washington, argued for plaintiff/counterclaim defendant-appellee. With him on the brief was JARED VAN KIRK.

ROBERT S. RIGG, Vedder Price P.C., of Chicago, Illinois, argued for defendants/counterclaim plaintiffs-appellants. With him on the brief were JOHN J. GRESENS and WILLIAM J. VOLLER III.

Before RADER, *Chief Judge*, and LOURIE and BRYSON, *Circuit Judges*.

LOURIE, *Circuit Judge*.

Magotteaux International S/A and Magotteaux, Inc., (together, "Magotteaux") appeal from the holding of the United States District Court for the Middle District of Tennessee on summary judgment that the asserted claims of U.S. Patent RE39,998 (the "RE'998 patent") are invalid under 35 U.S.C. § 251 for impermissibly recapturing subject matter surrendered during reissue examination. *AIA Eng'g Ltd. v. Magotteaux Int'l S/A*, 745 F. Supp. 2d 852 (M.D. Tenn. 2010) ("*SJ Op.*"). Because the district court erred in construing the claim term "solid solution," and thus erred in determining that the reissued claims impermissibly recaptured surrendered subject matter, we reverse and remand.

BACKGROUND

I

The patented technology in this case involves composite wear products used for crushing and grinding abrasive materials in industrial settings. Magotteaux manufactures composite wear products for grinding rock and other abrasive materials and sells those products to power stations and customers in the cement, mining, and recycling industries. *SJ Op.* at 855. Magotteaux also owns the RE'998 patent, a reissue of Magotteaux's earlier U.S. Patent 6,399,176 (the "'176 patent"). Entitled "Composite

Wear Component," the RE'998 patent is directed to a wear component that contains ceramic materials with a mixture of aluminum oxide (alumina or Al_2O_3) and zirconium oxide (zirconia or ZrO_2). *Id.* at 856.

The district court's opinion describes at length the prosecution histories of the RE'998 and '176 patents. *See id.* at 856-62. We summarize them here only as relevant to the dispute on appeal. The '176 patent issued from an application filed in the United States Patent and Trademark Office ("PTO") on June 1, 1999, which itself was a national stage of a PCT application, 35 U.S.C. § 371, that claimed priority from two European applications. J.A. 1365. In the original application received in the PTO, independent claim 1 claimed a "[c]omposite wear component" containing "inserts" that consist of a "ceramic pad," wherein the ceramic pad consists of "a homogeneous solid solution of 20 to 80 % of Al_2O_3 and 80 to 20 % of ZrO_2." J.A. 345.[1] The claim further required that the ceramic pad "be[] impregnated with a liquid metal" during the production process. *Id.* The examiner initially rejected the pending claims as either anticipated under 35 U.S.C. § 102(b) by U.S. Patent 5,551,963 ("Larmie") or obvious under 35 U.S.C. § 103(a) over Larmie in view of other

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[1] As filed, claim 1 read as follows:

> 1. Composite wear component produced by classical or centrifugal casting and consisting of a metal matrix whose working face or faces include inserts which have a very high wear resistance, characterized in that the inserts consist of a ceramic pad, *this ceramic pad consisting of a homogeneous solid solution of 20 to 80 % of Al_2O_3 and 80 to 20 % of ZrO_2*, the percentages being expressed by weights of the constituents, and the pad then being impregnated with a liquid metal during the casting.

J.A. 345 (emphasis added).

prior art references. J.A. 323-30. In response, the applicant submitted an amendment with remarks. J.A. 335-65. The applicant amended independent claim 1 to specify, *inter alia*, that the ceramic pad was "porous," but the applicant did not alter the portion of the claim requiring a "homogeneous solid solution."[2] In addition, the applicant disputed the examiner's rejection over Larmie, arguing that instead of using "*liquid metal*" during the production process, Larmie merely taught the use of a "*solution* of . . . *salts* of a metal." J.A. 339. With respect to the "solid solution" limitation of the pending claims, the applicant stated that "the invention is based on the observation that the ceramic pad must be a homogenous solid solution of Al_2O_3/ZrO_2." J.A. 340.

The applicant also submitted a declaration under 37 C.F.R. § 1.132 by the application's sole named inventor, Hubert Jacques Francois. J.A. 358-61. In characterizing his claimed invention, Francois used the term "solid solution" several times, stating, for instance, that a "*homogeneous solid solution* of both ceramics meets the advantages of both Al_2O_3 and ZrO_2"; that "[a]n unexpected synergy is the result of this *solid solution* which exhibits better results than each single component contribution";

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[2] As amended, claim 1 read as follows:

> 1. Composite wear component produced by classical or centrifugal casting and consisting of
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> a metal matrix having a working face or faces including inserts which have wear resistance, the inserts consist of a porous ceramic pad, *the porous ceramic pad consisting of a homogenous solid solution of 20 to 80 % of Al_2O_3 and 80 to 20 % of ZrO_2*, the percentages being expressed by weights of the constituents, and the porous ceramic pad being integrated into the metal matrix by impregnation of a liquid metal in the porous ceramic pad during the casting.

J.A. 336 (emphasis added).

and that "[o]nly *solid solutions* of Al_2O_3 / ZrO_2 in proportions of 80/20 to 20/80 presents [sic] no 'microspalling' effects." J.A. 359 (emphases added).

Following the applicant's response to the office action, the examiner issued a notice of allowance for claims 1-11. J.A. 370. The '176 patent issued on June 4, 2002, with issued claim 1 reading as follows:

> 1. Composite wear component produced by classical or centrifugal casting and *consisting of*
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> a metal matrix having a working face or faces including inserts which have wear resistance, the inserts consist of a porous ceramic pad, the porous ceramic pad *consisting of* a *homogeneous solid solution* of 20 to 80% of Al_2O_3 and 80 to 20% of ZrO_2, the percentages being expressed by weights of the constituents, and the porous ceramic pad being integrated into the metal matrix by impregnation of a liquid metal in the porous ceramic pad during the casting.

'176 patent claim 1 (emphases added).

On May 30, 2003, the applicant, with the consent of assignee Magotteaux, applied for reissue of the '176 patent. J.A. 392-415. Through reissue the applicant sought to amend claim 1 and to add new claims 12-21. *SJ Op.* at 858. Both amended claim 1 and new independent claim 12 were directed to a composite wear component. *Id.* at 859. Claims 1 and 12 both replaced the term "solid solution" in issued claim 1 with "ceramic composite." J.A. 520-21. Moreover, new claim 12 used the terms "comprising" and "comprises" instead of "consisting of" in specifying the makeup of the wear component and the ceramic pad. The examiner never objected to these new claim

limitations. *See* J.A. 447-51, 460-62, 470-80, 516, 533-42, 1326-34.

During prosecution of the RE'998 patent, an anonymous party filed a protest under 37 C.F.R. § 291, contending that claims 1 and 12 of the reissue application should be rejected under 35 U.S.C. § 251. *SJ Op.* at 860; J.A. 1277-89. Specifically, the protestor asserted that the substitutions in the reissue claims of (1) "comprises" for "consisting of" and (2) "ceramic composite" for "solid solution" impermissibly recaptured subject matter that was surrendered during prosecution of the original '176 patent. The examiner disagreed with the protestor and found that the reissue claims did not violate § 251. *SJ Op.* at 860; J.A. 1330-31. Regarding the first substitution, the examiner concluded that the applicant's submissions during prosecution of the '176 patent did not limit the ceramic pads to only Al_2O_3 and ZrO_2 and that "the specification clearly teaches that other additives in addition to the claimed compounds may be included in the composite." J.A. 1331. As for the second substitution, the examiner acknowledged that the applicant referred to the invention as a solid solution during prosecution, but stated that, upon review of the specification and its disclosed method of forming the composite, "it is unclear how Applicant's reference to this composite as a 'solid solution' would somehow limit the scope of the claims from any other combination of the claimed materials." J.A. 1330-31.

The RE'998 patent issued on January 8, 2008, and a certificate of correction issued shortly thereafter to correct

certain claim language.[3] J.A. 1365, 1373. Claims 1 and 12 of the RE'998 patent, as corrected, read as follows:

> 1. Composite wear component produced by classical or centrifugal casting and consisting of a metal matrix having a working face or faces including inserts which have wear resistance, wherein the inserts consist of a porous ceramic pad, the porous ceramic pad *consisting of* a *homogeneous ceramic composite* of 20 to 80% of Al_2O_3 and 80 to 20% of ZrO_2, the percentages being expressed by weights of the constituents, and the porous ceramic pad being integrated into the metal matrix by impregnation of a liquid metal in the porous ceramic pad during the casting.
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> 12. Composite wear component produced by classical or centrifugal casting, said composite wear component *comprising* a metal matrix having a working face or faces including inserts which have wear resistance, the inserts include a porous ceramic pad, wherein the porous ceramic pad *comprises* a *homogeneous ceramic composite* [of] 20 to 80% of Al_2O_3 and 80 to 20% of ZrO_2, the percentages being expressed by weights of the constituents, and the porous ceramic pad being integrated into the metal matrix by impregnation of a liquid metal in the porous ceramic pad during the casting.

RE'998 patent claims 1, 12 (emphases added); *SJ Op.* at 862.

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[3] For purposes of this appeal, the written description portions of the '176 and RE'998 patents contain no material differences.

II

On March 16, 2009, AIA Engineering sued Magotteaux in the United States District Court for the Middle District of Tennessee for a declaratory judgment of noninfringement, invalidity, and unenforceability of the RE'998 patent. As alleged in its complaint, AIA Engineering designs, develops, manufactures, installs, and services wear-, corrosion-, and abrasion-resistant products for the cement, mining, and thermal power generation industries. Compl. at 4; *see also SJ Op.* at 854-55. Magotteaux then filed a third-party complaint against Vega Industries, a subsidiary of AIA Engineering, alleging infringement of the RE'998 patent. The court held a claim construction hearing on the disputed claim terms in November 2009. AIA Engineering and Vega Industries (together, "AIA") then moved for summary judgment of invalidity, arguing that the claims of Magotteaux's RE'998 patent improperly recaptured subject matter surrendered during the prosecution of its earlier '176 patent.

In a memorandum opinion dated September 3, 2010, the district court granted summary judgment in favor of AIA. *SJ Op.* at 875-86. The court detailed the prosecution histories of the '176 and RE'998 patents, summarized above, and described the patented technology. *Id.* at 856-62. The court found that the process for preparing Magotteaux's composite wear component begins by "combin[ing] or mix[ing] Al_2O_3 and ZrO_2 into composite ceramic grains," which are manufactured by a process that "allow[s] the two constituent chemicals to fuse." *Id.* at 859. The court clarified, however, that "[o]nce combined, the Al_2O_3 and ZrO_2 retain their crystal structure." *Id.* As the court found, the porous ceramic pad is then "formed by pouring the composite ceramic grains and an adhesive into a mold to hold the ceramic grains together," where-

upon "liquid metal is impregnated in the pad during casting to form the final composite wear component." *Id.*

To determine whether Magotteaux broadened claim scope during reissue, the district court reviewed the parties' claim construction arguments. The court concluded that, in the '176 patent, "'homogeneous solid solution' in claim 1 and the related specification means that its composition is limited to '20 to 80% of Al_2O_3 and 80 to 20% of ZrO_2, the percentages being expressed by weights of the constituents,' with no other solute present in the solid solution." *Id.* at 870. The court then turned to the parties' arguments concerning the term "homogeneous ceramic composite" in the RE'998 patent, but, as we discuss below, the court did not explicitly construe this term. *Id.* at 870-73. Nevertheless, the court held that the substitution of "ceramic composite" in claims 1 and 12 of the RE'998 patent for "solid solution" in claim 1 of the '176 patent broadened the scope of the reissue claims. *Id.* at 873. Finally, citing *Vehicular Technologies Corp. v. Titan Wheel International, Inc.*, 212 F.3d 1377, 1382-83 (Fed. Cir. 2000), the court noted that the term "consisting of" (as in claim 1 of the '176 patent) signifies restriction and exclusion, whereas "comprising" (as in claim 12 of the RE'998 patent) indicates an open-ended construction, and the court thus found broadening in this aspect as well. *SJ Op.* at 870, 873.

Having found the reissued claims broadened, the district court turned to the issue of recapture. With respect to claims 1 and 12 of the RE'998 patent, the court held that Magotteaux relied on the "solid solution" limitation to overcome prior art during prosecution of the '176 patent and thus surrendered broader scope to a "ceramic

composite." *Id.* at 875.[4] The court thus held that the two independent claims in the RE'998 patent are invalid for violating the rule against recapture under 35 U.S.C. § 251. *Id.* at 875-86.

Magotteaux timely appealed from the district court's final judgment. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

DISCUSSION

We review a district court's grant of summary judgment *de novo*, applying the same standard as the district court and drawing all reasonable inferences in favor of the nonmovant. *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255 (1986). Summary judgment is appropriate "if the movant shows that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law." Fed. R. Civ. P. 56. Determining whether the claims of a reissue patent violate 35 U.S.C. § 251 is a question of law, which we review *de novo*. *Pannu v. Storz Instruments, Inc.*, 258 F.3d 1366, 1370 (Fed. Cir. 2001). Whether a claim amendment during reissue examination enlarged the scope of the claim is a matter of claim construction. *Medtronic, Inc. v. Guidant Corp.*, 465 F.3d 1360, 1374 (Fed. Cir. 2006). Claim construction is a question of law that we review without deference. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456 (Fed. Cir. 1998) (en banc). Likewise, comparing the scope of the claims of an original patent and a reissue patent is a legal question subject to *de novo* review. *Westvaco Corp. v. Int'l Paper Co.*, 991 F.2d 735, 741 (Fed. Cir. 1993).

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[4] Although the district court discussed the amendment of "consisting of" to "comprises" in the recapture portion of its opinion, it is unclear whether the court found this amendment to recapture surrendered subject matter. *See SJ Op.* at 875.

As we explain below, we hold that the RE'998 patent does not violate the rule against recapture under § 251 and that the district court erred by granting summary judgment of invalidity on this basis. In particular, we conclude that the district court legally erred in its construction of "homogeneous solid solution," and that, correctly construed, this term is synonymous with "homogeneous ceramic composite" in the patents at issue. Accordingly, there was no recapture with respect to this amendment. Further, the parties do not dispute that the amendment of "consisting of" to "comprising," although broadening, does not recapture surrendered subject matter here. The district court thus erred by invalidating the RE'998 patent under § 251.

I

A party accused of infringing a reissued patent may assert as an affirmative defense the failure of the patentee to comply with 35 U.S.C. § 251. *See* 35 U.S.C. § 282 (2006). Under § 251, a patentee may obtain reissue of a patent if that patent is, "through error without any deceptive intention, deemed wholly or partly inoperative or invalid, . . . by reason of the patentee claiming more or less than he had a right to claim in the patent . . . ." *Id.* § 251. If proposed within two years from the grant of the patent, the reissue may broaden the scope of the claims. *In re Graff*, 111 F.3d 874, 877 (Fed. Cir. 1997). Notwithstanding the limited ability to enlarge claim scope through reissue, the recapture rule prevents a patentee from regaining subject matter deliberately surrendered during the prosecution of the original patent. *Pannu*, 258 F.3d at 1370-71.

To invalidate a patent claim for recapture, "[t]he challenger of the reissued patent . . . must establish surrender of recaptured subject matter by clear and convincing

evidence." *Kim v. ConAgra Foods, Inc.*, 465 F.3d 1312, 1322 (Fed. Cir. 2006); *see also Microsoft Corp. v. i4i Ltd.*, 131 S. Ct. 2238, 2242 (2011). A three-step test guides the analysis:

> (1) first, we determine whether, and in what respect, the reissue claims are broader in scope than the original patent claims; (2) next, we determine whether the broader aspects of the reissue claims relate to subject matter surrendered in the original prosecution; and (3) finally, we determine whether the reissue claims were materially narrowed in other respects, so that the claims may not have been enlarged, and hence avoid the recapture rule.

Medtronic, 465 F.3d at 1373.

The first step of the recapture test requires the application of claim construction principles to determine whether and in what aspect the reissue claims are broader than the original claims. *Id.* at 1374. To ascertain the scope and meaning of a claim, we consider the claim language, the specification, the prosecution history, and the relevant extrinsic evidence. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314-17 (Fed. Cir. 2005) (en banc). Apart from the claim language itself, "the specification is the single best guide to the meaning of a claim term." *Curtiss-Wright Flow Control Corp. v. Velan, Inc.*, 438 F.3d 1374, 1378 (Fed. Cir. 2006). The prosecution history, in contrast, "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Nevertheless, the prosecution history may "demonstrat[e] how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution." *Id.*

Extrinsic evidence, which includes expert and inventor testimony, dictionaries, and learned treatises, may "'aid the court in coming to a correct conclusion' as to the 'true meaning of the language employed' in the patent." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980 (Fed. Cir. 1995) (en banc) (quoting *Seymour v. Osborne*, 78 U.S. 516, 546 (1870)). We generally view extrinsic evidence as "less reliable than the patent and its prosecution history in determining how to read claim terms." *Phillips*, 415 F.3d at 1318. Nevertheless, extrinsic evidence in the form of expert testimony can be useful "for a variety of purposes, such as to provide background on the technology at issue, to explain how an invention works, [or] to ensure that the court's understanding of the technical aspects of the patent is consistent with that of a person of skill in the art." *Id.*

The district court concluded that replacing "homogeneous solid solution" in original claim 1 with "homogeneous ceramic composite" in reissue claims 1 and 12 broadened the scope of the reissue claims. For the following reasons, we disagree.

We first consider the term "homogeneous ceramic composite" in claims 1 and 12 of the RE'998 patent. The district court's handling of this term is a source of some confusion among the parties on appeal. The court's opinion first noted the parties' differing proposed constructions and then proceeded to discuss, almost exclusively, Magotteaux's proposed constructions for "homogeneous," "composite," "ceramic composite," and "homogeneous ceramic composite." *SJ Op.* at 870-73 (noting that Magotteaux offered a total of five constructions for these terms, including two different constructions for "ceramic composite"). Despite the various constructions proposed by the parties, however, the court

never explicitly adopted a single construction for this term. *Id.*

On appeal, Magotteaux argues that the district court's recapture analysis was fundamentally flawed because the court failed to construe "homogeneous ceramic composite." Magotteaux proposes the following construction for this claim term: "an aggregation of relatively consistent grains of at least Al_2O_3 and ZrO_2 wherein each of the Al_2O_3 and ZrO_2 retains a distinct composition and/or crystal structure." Magotteaux Opening Br. 24. That construction, Magotteaux argues, is supported by the claim language, the written description, and the prosecution history of the RE'998 patent.

In response, AIA does not propose a construction for "homogeneous ceramic composite." Rather, AIA contends that the district court correctly (albeit implicitly) adopted Magotteaux's proposed construction below. Yet AIA fails to identify which of Magotteaux's several constructions the court in fact adopted. AIA Br. 45 (contending only that the district court "adopt[ed] through its analysis Magotteaux's proposed *definition(s)* for the phrase 'homogeneous ceramic composite' in the claims" (emphasis added)). Nevertheless, AIA appears to allege that the construction proposed by Magotteaux on appeal is inconsistent with Magotteaux's earlier proposed constructions.

Reviewing *de novo* the district court's claim construction analysis and the parties' arguments, we agree with the construction proposed by Magotteaux on appeal, and we hold that "homogeneous ceramic composite" means "an aggregation of relatively consistent grains of at least Al_2O_3 and ZrO_2, wherein each of the Al_2O_3 and ZrO_2 retains a distinct composition and/or crystal structure." As an initial matter, we note that the construction proposed by Magotteaux on appeal is consistent with the

constructions it proposed to the district court. For example, at the district court, Magotteaux asserted that "homogeneous ceramic composite" means "[a]n aggregation of relatively consistent grains of at least 20 to 80% of Al_2O_3 and 80 to 20% of ZrO_2" and that "ceramic composite" means "the mixture of at least Al_2O_3 and ZrO_2, wherein each of the Al_2O_3 and ZrO_2 retains a distinct composition and/or crystal structure." *SJ Op.* at 871-72. To the extent that AIA disagrees with Magotteaux's construction, we note that AIA declined on appeal to offer any construction for this term.

Magotteaux's construction is supported by the claims, written description, and prosecution history of the RE'998 patent. Claims 1 and 12 of the RE'998 patent require "a *homogeneous ceramic composite* of 20 to 80% of *Al_2O_3* and 80 to 20% of *ZrO_2*," indicating that the composite must contain Al_2O_3 and ZrO_2—both of which are ceramics. The specification describes the ceramic material that makes up the claimed ceramic pad as both "homogeneous" and "composite." RE'998 patent col.2 ll.61-65 (describing the claimed inserts as "being made of a ceramic material, itself *composite*, consisting of a solid solution or *homogeneous* phase of 20 to 80% of Al_2O_3 and 80 to 20% [of] ZrO_2" (emphases added)). The RE'998 patent also discloses that "[t]his composite ceramic material is produced from an *aggregate of ceramic grains*" that are formed by "allowing the two constituents [*i.e.*, alumina and zirconia] *to fuse*." *Id.* col.3 ll.23-30 (emphases added). In describing "the zirconium *particles* present in the alumina" within the ceramic pads, the specification is clear that, although they are fused together, the Al_2O_3 and ZrO_2 particles remain distinct in the ceramic composite. *Id.* col.3 ll.57-58 (emphasis added).

The prosecution history does not alter the meaning of "homogeneous ceramic composite" provided by the claims

and specification. The scope or meaning of this term was not addressed during prosecution, and the parties do not argue otherwise on appeal.

Finally, the parties' scientific experts confirm that the teachings of the specification support Magotteaux's proposed claim construction. Dr. Andreas Glaeser, AIA's expert, cited an introductory materials science and engineering textbook as evidence that a person skilled in the art at the time of the invention would have understood "composite" to mean "a material that is a mixture or combination of two or more materials, *each of which has and retains a distinct composition and/or crystal structure*." Report of Andreas M. Glaeser at 1, *AIA Eng'g Ltd. v. Magotteaux Int'l S/A*, No. 09-cv-255 (ECF No. 52-5) (Sept. 11, 2009) (emphasis added) (citing William D. Callister, *Materials Science and Engineering: An Introduction* 514 (3d ed. 1994)). On appeal, AIA references the same textbook, conceding that "there is at least some external evidence that a 'composite' could be generally viewed as a '*multiphase* material'" and that "[t]his extrinsic definition is consistent with Magotteaux's contention that a 'homogeneous ceramic composite' is a *mixture in which the constituent materials retain their own distinct crystalline structure*." AIA Br. 46 n.8 (second emphasis added).

Magotteaux's expert, Dr. Katherine Faber, declared that "[a] composite is comprised of two or more substances that are physically and chemically differentiable" and noted that this definition is "substantially identical" to the construction offered by Dr. Glaeser. J.A. 2463-64. Dr. Faber further explained that the statement in the specification regarding "'the zirconium [oxide] particles present in the alumina'" indicates that "zirconium oxide is not mixed at the atomic level in the solid, . . . but at the particle level (at least hundreds of atoms) consistent with

Dr. Glaeser's and my understanding of composite." J.A. 2464.

In light of the claims, written description, and prosecution history of the RE'998 patent, as well as the relevant expert testimony, we construe "homogeneous ceramic composite" as "an aggregation of relatively consistent grains of at least Al_2O_3 and ZrO_2, wherein each of the Al_2O_3 and ZrO_2 retains a distinct composition and/or crystal structure."

We next consider the meaning of "homogeneous solid solution" in claim 1 of the '176 patent. As noted above, the district court construed this term as a "composition . . . limited to '20 to 80% of Al_2O_3 and 80 to 20% of ZrO_2, the percentages being expressed by weights of the constituents,' with no other solute present in the solid solution."[5] *SJ Op.* at 870.

Magotteaux argues that the district court erred by ignoring the intrinsic evidence and adopting an extrinsic definition from a trade treatise proffered by AIA. Magotteaux asserts that the district court disregarded the fact that it is impossible to make an alumina-zirconia solid solution, as defined by the district court, in the claimed range of compositions. Magotteaux further asserts that the district court's construction of this term directly contradicts its determination that, once combined, Al_2O_3 and ZrO_2 retain their crystal structure. Magotteaux maintains that, properly construed, "homogeneous solid solution" is synonymous with "homogeneous ceramic

[5] That construction was similar, but not identical, to the construction proposed by AIA to the district court: "a mixture of two or more types of molecules or atoms in the solid state wherein the minor component, the solute, is incorporated into the major component, the solvent, and the crystal structure of the solvent is maintained as the concentration of the solute is increased." J.A. 1405.

composite." This meaning, according to Magotteaux, is supported by the claim language, the specification, and the prosecution histories of the '176 and RE'998 patents.

In response, AIA contends that the district court correctly recognized that a "homogeneous solid solution" is characterized by a solute in solution, arguing that the correct construction of this term is "a mixture of a solute or solutes into a solvent in which the materials maintain the single, uniform crystalline structure of the solvent." AIA Br. 31-32. According to AIA, the claims, specification, and prosecution history support this construction. AIA also contends that extrinsic evidence, in the form of numerous technical treatises, demonstrates that a skilled person would have understood the ordinary meaning of "solid solution" to require a single, uniform crystalline structure. AIA further contends that, contrary to Magotteaux's assertions, solid solutions of alumina and zirconia can be formed.

We agree with Magotteaux that these two terms, as used in the '176 and RE'998 patents, are synonymous. Initially, we note that Magotteaux and AIA agree that the ordinary meaning of "solid solution" requires a single, uniform structure containing both a "solvent" component and a "solute" component, in which the solvent component dictates the overall structure of the solid. *See SJ Op.* at 864; *see also* AIA Br. 42; Magotteaux Opening Br. 26-28. Further, according to the technical treatise cited by AIA and quoted by the district court, there are generally two types of solid solutions, but it is not necessarily possible to form either type of solid solution from two given chemical substances.[6] *SJ Op.* at 864.

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[6] As the treatise explains, an "interstitial" solid solution, in which the solute is positioned in the interstitial sites formed by the solvent, "is possible only when the

While the parties agree on the ordinary meaning of "solid solution," they dispute the physical form of the alumina-zirconia material required by the "solid solution" of claim 1 of the '176 patent. AIA, in accordance with the district court's construction, seeks to apply the ordinary meaning of "solid solution" involving a solute in a solvent with a single, uniform structure. Magotteaux, on the other hand, urges that the patentee acted as his own lexicographer and employed a special definition for "solid solution"—*i.e.*, used it as a synonym for "homogeneous ceramic composite."

We have recognized that "the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess." *Phillips*, 415 F.3d at 1316. In such cases, "the inventor's lexicography governs." *Id.* Moreover, "[t]he specification need not reveal such a definition explicitly," but may do so "by implication." *Astrazeneca LP v. Apotex, Inc.*, 633 F.3d 1042, 1051-52 (Fed. Cir. 2010) (internal quotation marks omitted).

In this case, the intrinsic evidence reveals that the patentee acted as his own lexicographer and used "homogeneous solid solution" as a synonym for "homogeneous ceramic composite." With respect to the claim language, claim 1 of the '176 patent requires a "homogeneous solid solution of 20 to 80% of Al_2O_3 and 80 to 20% of ZrO_2," which, like the "homogeneous ceramic composite" of claims 1 and 12 of the RE'998 patent, requires both Al_2O_3 and ZrO_2 in the same claimed proportions. As for the written description portion of the specification, the only

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solvent . . . is much larger compared to the solute." *SJ Op.* at 864. A "substitutional" solid solution, in which the solute replaces the solvent at specific sites in the solid, "is only possible[] if both the [solute and solvent] are similar in size and also in nature." *Id.*

instance of "solid solution" states that the "inserts" in the "composite wear component" are "made of a ceramic material, itself *composite*, consisting of a *solid solution* or homogeneous phase of 20 to 80% of Al_2O_3 and 80 to 20% of ZrO_2." '176 patent col.2 ll.53-62 (emphases added).

A composite, as noted above, is a mixture in which the constituent materials retain their own distinct crystalline structures. Yet the ordinary meaning of "solid solution," the parties agree, requires a single, uniform crystalline structure. *SJ Op.* at 864; *see also* J.A. 1491, 1714. Thus, rigidly confining "solid solution" to its ordinary meaning gives rise to a contradiction in terms, such that a "ceramic material, itself composite, consisting of a solid solution," '176 patent col.2 ll.58-59, would at once require two distinct crystalline structures and a single, uniform crystalline structure. We strive, where possible, to avoid nonsensical results in construing claim language. *Bd. of Regents of the Univ. of Tex. Sys. v. BENQ Am. Corp.*, 533 F.3d 1362, 1370 (Fed. Cir. 2008) ("We decline to adopt a construction that would effect this nonsensical result."). Construing "solid solution" as having the same meaning as "ceramic composite" avoids this absurdity and confirms that the specification teaches fused grains of Al_2O_3 and ZrO_2, each of which retains its crystal structure.

In addition to avoiding a nonsensical result, this construction is also supported by the district court's description of the nature of the claimed invention. As noted above, the court determined that, "[o]nce combined, the Al_2O_3 and ZrO_2 retain their crystal structure." *SJ Op.* at 859. This description of the invention, which would require two distinct crystalline structures in the combined material, is inconsistent with the ordinary meaning of "solid solution."

Furthermore, the parties do not seriously dispute that the only method disclosed in the '176 and RE'998 patents for preparing the claimed ceramic pad involves forming a ceramic composite, not a solid solution as that term is conventionally defined. While we recognize that "there is sometimes a fine line between reading a claim in light of the specification, and reading a limitation into the claim from the specification," *Decisioning.com, Inc. v. Federated Department Stores, Inc.*, 527 F.3d 1300, 1307-08 (Fed. Cir. 2008) (internal quotation marks omitted), the fact that the specification here does not teach any method of preparing an alumina-zirconia solid solution with a single, uniform crystal structure lends further credence to Magotteaux's position that one of ordinary skill would recognize that the inventor acted as his own lexicographer.

We disagree with the district court's and AIA's view of the prosecution history as evincing a narrow definition for "solid solution." Consistent with the district court's reasoning, *SJ Op.* at 869-70, AIA emphasizes the number of times during prosecution that Magotteaux recited the term "solid solution." AIA does not, however, identify any instances in which Magotteaux expressly or implicitly defined this term or qualified it to distinguish any of the prior art references. For example, AIA notes that the inventor stated in a declaration that a "*homogeneous solid solution* of both ceramics meets the advantages of both Al_2O_3 and ZrO_2"; that "[a]n unexpected synergy is the result of this *solid solution* which exhibits better results than each single component contribution"; and that "[o]nly *solid solutions* of Al_2O_3 / ZrO_2 in proportions of 80/20 to 20/80 presents [sic] no 'microspalling' effects." J.A. 359 (emphases added). None of these statements clarifies the meaning of "solid solution"; they are merely examples of the applicant referring to his claimed invention using the same language as in the existing claims.

Indeed, as the PTO examiner observed in the RE'998 patent's notice of allowance, "it is unclear how Applicant's reference to this composite as a 'solid solution' would somehow limit the scope of the claims from any other combination of the claimed materials." J.A. 1330-31. We conclude, contrary to the district court, that the applicant did not disclaim any interpretations of "solid solution" during prosecution and that, in this case, the prosecution history is not particularly helpful in construing this term. *See Rhodia Chimie v. PPG Indus. Inc.*, 402 F.3d 1371, 1384 (Fed. Cir. 2005) ("The purpose of consulting the prosecution history in construing a claim is to exclude any interpretation that was disclaimed during prosecution." (internal quotation marks omitted)); *Athletic Alternatives, Inc. v. Prince Mfg., Inc.*, 73 F.3d 1573, 1580 (Fed. Cir. 1996) ("The prosecution in this case is thus unhelpful as an interpretive resource . . . ."); *see also Phillips*, 415 F.3d at 1317.

We may look to extrinsic evidence "to ensure that the court's understanding of the technical aspects of the patent is consistent with that of a person of skill in the art." *Phillips*, 415 F.3d at 1318. In this case, in determining the meaning of "solid solution" as used in claim 1 of the '176 patent, the extrinsic evidence of record is particularly illuminating. Significantly, the parties' experts agree that, under AIA's proposed construction, an alumina-zirconia solid solution as claimed in the '176 patent is not physically possible. As noted, AIA asserts that one of ordinary skill would understand that the ordinary meaning of "solid solution" requires a single, uniform crystalline structure containing both Al_2O_3 and ZrO_2. But Dr. Glaeser, AIA's expert, explained that it was known as of the '176 patent's priority date that, "[a]t equilibrium, solid Al_2O_3 and solid ZrO_2 do not share a common crystal structure at any temperature." J.A. 1558;

see also J.A. 1588 ("The equilibrium phase diagram, a stability map that defines which phase(s) should be present at a given temperature and system composition, shows no solid solutions of Al_2O_3 and ZrO_2 in the range of composition that the Francois patent specifies." (emphasis omitted)). A crystalline material containing a mixture of alumina and zirconia, Dr. Glaeser explained, "contains two distinct phases. It is then not a solid solution. It is also not a homogeneous solid solution." J.A. 1558. Moreover, the impossibility of forming the claimed "solid solution" would have been apparent to one of ordinary skill: "The patent literature points out the difficulty of achieving 'homogeneous' composites in the Al_2O_3-ZrO_2 system when materials are formed by conventional solidification processes or by mixing of Al_2O_3 and ZrO_2 powders." *Id.* Dr. Faber, Magotteaux's expert, agreed with this assessment: "[I]t is accepted by persons with ordinary skill in the art that from a thermodynamic standpoint, Al_2O_3 and ZrO_2 do not form a complete solid solution." J.A. 2463.

AIA's proposed claim construction, therefore, requires a material that its own expert admits is physically impossible to produce. AIA nonetheless contends that its construction would not render the invention inoperable, because nonequilibrium "amorphous" solid solutions in the claimed proportions of Al_2O_3 and ZrO_2 can be prepared. For support, it cites Dr. Glaeser's report, which stated that "[s]olid solutions (amorphous solids) within the composition range defined by [the '176 patent] have been formed in the Al_2O_3-ZrO_2 system." J.A. 1558. Yet those solids are amorphous, not crystalline as AIA's claim construction requires. *See, e.g.*, J.A. 1589 (distinguishing "amorphous" materials from "crystalline" materials). Furthermore, even assuming AIA's proposed construction encompassed an amorphous solid solution, the viability of

such a solid solution remains dubious. As Dr. Glaeser conceded, "it would be extremely difficult if not impossible to produce amorphous 'homogeneous solid solution' particles of the size specified in the ['176] patent." J.A. 1589.

While inoperability in itself does not doom AIA's construction, "a construction that renders the claimed invention inoperable should be viewed with extreme skepticism." *Talbert Fuel Sys. Patents Co. v. Unocal Corp.*, 275 F.3d 1371, 1376 (Fed. Cir. 2002), *vacated and remanded on other grounds*, 537 U.S. 802 (2002); *see also Astrazeneca*, 633 F.3d at 1053 n.1. Of course, "courts may not redraft claims, whether to make them operable or to sustain their validity." *Chef Am., Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1374 (Fed. Cir. 2004). But where, as here, the specification reveals a special meaning for a term that differs from the meaning it might otherwise possess, that special meaning governs, particularly when it also serves to avoid an inoperable claim construction. *Astrazeneca*, 633 F.3d at 1051 ("'[T]he specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor's lexicography governs.'" (quoting *Phillips*, 415 F.3d at 1316)); *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Grp., Inc.*, 262 F.3d 1258, 1268 (Fed. Cir. 2001) ("[A] claim term may be clearly redefined without an explicit statement of redefinition.").

Here, AIA relies on extrinsic evidence to prove that one of ordinary skill would have known that "solid solution" has an ordinary and customary meaning in the art. But that same extrinsic evidence also proves, as both parties' experts agree, that one of ordinary skill would also have known that it is physically impossible to make a "solid solution," under that term's ordinary meaning, as claimed in the '176 patent. Taken as a whole, therefore,

the extrinsic evidence demonstrates that although "solid solution" has an ordinary meaning in the art, the patentee here chose instead to apply a special meaning to the term.

Finally, AIA urges us in construing "solid solution" to consider evidence from corresponding foreign applications, including claim amendments in the European and PCT priority applications and patentability statements in the international preliminary examination report for the corresponding PCT application. We have previously noted that "the theories and laws of patentability vary from country to country, as do examination practices." *Heidelberger Druckmaschinen AG v. Hantscho Commercial Prods., Inc.*, 21 F.3d 1068, 1072 n.2 (Fed. Cir. 1994); *see also Lindemann Maschinenfabrik GMBH v. Am. Hoist & Derrick Co.*, 730 F.2d 1452, 1458 n.2 (Fed. Cir. 1984) ("[T]he language and laws of other countries differ substantially from those in the United States."). For this reason, we have noted "that 'the varying legal and procedural requirements for obtaining patent protection in foreign countries might render consideration of certain types of representations inappropriate' for consideration in a claim construction analysis of a United States counterpart." *TI Grp. Auto. Sys. (N. Am.), Inc. v. VDO N. Am., L.L.C.*, 375 F.3d 1126, 1136 (Fed. Cir. 2004) (quoting *Caterpillar Tractor Co. v. Berco, S.p.A.*, 714 F.2d 1110, 1116 (Fed. Cir. 1983). Accordingly, despite AIA's urgings, our precedent cautions against indiscriminate reliance on the prosecution of corresponding foreign applications in the claim construction analysis. Here, even assuming that the foreign claim amendments and patentability statements were relevant to our claim construction analysis, we find that evidence unpersuasive. We also note that evidence proffered by AIA regarding statements in the specification of one of the European priority applica-

tions is, at best, equivocal as to the meaning of "solid solution"; it does not alter the clear import of the claim language, specification, and relevant extrinsic evidence in this case. *See Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, 1290 (Fed. Cir. 2009).

We therefore hold that the district court's claim construction was erroneous. In light of the intrinsic and extrinsic evidence of record, we conclude that the patentee acted as his own lexicographer and that the claim terms "homogeneous solid solution" and "homogeneous ceramic composite" are synonymous in the context of the '176 and RE'998 patents. Accordingly, the reissue prosecution did not broaden the claims in this aspect.

II

Applying the remainder of the recapture test in this case is straightforward. Only if a reissued claim contains "broader aspects" than the originally issued claim do we consider the matter of surrender. *Clement*, 131 F.3d at 1468-69. Here, as noted, the reissue claims were not broadened with respect to the substitution of "ceramic composite" for "solid solution." Because there was no broadening in this aspect of the claims, there can be no pertinent surrender.

Furthermore, while the parties agree with the district court's holding that the substitution of "comprises" and "comprising" for "consisting of" in new reissued claim 12 (as compared to original claim 1) did broaden the claims in this aspect, *SJ Op.* at 875, the parties also agree that no subject matter was surrendered by this substitution.

Accordingly, we conclude that the test for impermissible recapture under 35 U.S.C. § 251 is not met, and that the district court erred by granting AIA's motion for

summary judgment and invalidating the reissued claims of the RE'998 patent on this basis.

CONCLUSION

For the foregoing reasons, we reverse the district court's summary judgment of invalidity of the RE'998 patent under 35 U.S.C. § 251. We remand the case to the district court for further proceedings.

REVERSED AND REMANDED

COSTS

Costs to Magotteaux.