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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte RICHARD D. MCCULLOUGH, JOHN BELOT, REBECCA POTASH, ELIZABETH SEFTON, and CHRISTIANA COX

Appeal 2019-004285
Application 13/777,374
Technology Center 1700

Before DONNA M. PRAISS, N. WHITNEY WILSON and MERRELL C. CASHION, JR., *Administrative Patent Judges*.

CASHION, *Administrative Patent Judge*.

DECISION ON AP00PEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from a Final Office Action, dated May 14, 2018, rejecting claims 1–8, 13–23, 25, 27–30, 32–41, 54, 55, and 73–76. Appeal Br. 1. An oral hearing was held on April 3, 2020.[2] We have jurisdiction under 35 U.S.C. § 6(a). We AFFIRM.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Liquid X Printed Metals, Inc. of Pittsburgh, Pennsylvania. Appeal Br. 1.

[2] A written transcript of the oral hearing, herein after referred to as "Oral Hearing Transcripts" or "Tr.," was made of record on April 21, 2020.

The invention is directed to metal-containing ink compositions. Spec. 8. Claims 1 and 76, reproduced from the Claims Appendix to the Appeal Brief, illustrate the invention (formatting added):

1. A composition, comprising:

at least one metal complex comprising:

at least one metal, wherein the at least one metal is silver,

at least one first ligand which is a sigma donor to the metal and volatilizes upon heating the metal complex, wherein the first ligand is a bidentate amine, and

at least one second ligand, which is different from the first ligand and also volatilizes upon heating the metal complex; and

two or more polar protic solvents,

wherein the metal complex has a solubility at 25°C of at least 100 mg/ml in at least one of the two or more polar protic solvents,

wherein the amount of the at least one first ligand, the at least one second ligand, and the at least one metal in the composition is stoichiometric,

wherein the composition is formulated for deposition on a substrate and conversion of the deposit to a continuous-conductive metal film by adapting a viscosity of the composition to be less than 500 Cps, and

wherein the composition is substantially free of particles, including microparticles and nanoparticles.

76. A composition, comprising:

at least one metal complex comprising:

at least one metal, wherein the at least one metal is silver,

at least one first ligand which is a sigma donor to the metal and volatilizes upon heating the metal complex, wherein the first ligand is a bidentate amine, and

at least one second ligand, which is different from the first ligand and also volatilizes upon heating the metal complex; and

two or more polar protic solvents,

wherein the metal complex has a solubility at 25°C of at least I 00 mg/ml in at least one of the two or more polar protic solvents,

wherein the composition is formulated for deposition on a substrate and conversion of the deposit to a continuous-conductive metal film by adapting a viscosity of the composition to be less than 500 Cps, and

wherein the composition is substantially free of particles, including microparticles and nanoparticles.

Appeal Br. 34, 40 (Claims Appendix).

Independent claims 32 and 55 recite compositions similar to the composition of claim 1 but include additional features.

Appellant requests review of the following rejections[3]:

I. Claims 1–8, 13–23, 25, 27–30, 32–41, 54, 55, and 73–75 rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

II. Claim 76 rejected under 35 U.S.C. § 102(b) as anticipated by, or, alternatively, under 35 U.S.C. § 103(a) as unpatentable over Nojiri (US 4,939,114, issued July 3, 1990).

[3] The Examiner withdrew the nonstatutory obviousness-type double patenting rejection based on co-pending Application No. 12/941,932's claim 1 because the co-pending Application is now abandoned. Ans. 3; *See*

III. Claims 1–5, 7, 8, 13, 15–23, 25, 27–30, 32–35, 37, 39, 40, 54, 55, and 73–75 rejected under 35 U.S.C. § 103(a) as unpatentable over Nojiri and McCullough (US 2011/0111138 A1, published May 12, 2011).

IV. Claims 6 and 41 rejected under 35 U.S.C. § 103(a) as unpatentable over Nojiri, McCullough, and Takano (US 4,398,026, issued August 9, 1983).

V. Claim 36 rejected under 35 U.S.C. § 103(a) as unpatentable over Nojiri, McCullough, and Jan (US 4,266,011, issued May 5, 1981).

VI. Claims 14 and 38 rejected under 35 U.S.C. § 103(a) as unpatentable over Nojiri, McCullough, and Cavitt (US 4,102,820, issued July 25, 1978).

VII. Claims 1–5, 7, 8, 13, 15–23, 25, 27–30, 32–35, 37, 39, 40, 54, 55, and 73–75 rejected under 35 U.S.C. § 103(a) as unpatentable over Nielsen (US 3,702,259, issued November 7, 1972).

VIII. Claims 6 and 41 rejected under 35 U.S.C. § 103(a) as unpatentable over Nielsen and Takano.

IX. Claim 36 rejected under 35 U.S.C. § 103(a) as unpatentable over Nielsen and Jan.

X. Claims 14 and 38 rejected under 35 U.S.C. § 103(a) as unpatentable over Nielsen and Cavitt.

OPINION

Rejection I (35 U.S.C. § 112, first paragraph-written description)

After review of the respective positions of Appellant and the Examiner, we REVERSE the Examiner's rejection of claims 1–8, 13–23, 25, 27–30, 32–41, 54, 55, and 73–75 under 35 U.S.C. § 112, first paragraph,

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Appeal Br. 32. Accordingly, this rejection is not before us for review on appeal.

essentially for the reasons Appellant presents in the Appeal and Reply Briefs. We add the following for emphasis.

Claim 1 recites "wherein the amount of the at least one first ligand, the at least one second ligand, and the at least one metal in the composition is stoichiometric."

The Examiner finds the Specification, as originally filed, does not disclose the unique benefits or unexpected results of a stoichiometric mixture. Final Act. 5; *see* Ans. 3. In the Answer, the Examiner explains "[t]here is no teaching in the specification which would inform a person of skill in the art that a stoichiometric composition has any advantage over a non-stoichiometric composition" and "the specification does not attribute the beneficial effects of the invention to a stoichiometric combination of metal, first ligand and second ligand." Ans. 15.

The purpose of the written description requirement in 35 U.S.C. § 112, first paragraph, is to "clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed." *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc) (quoting *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1562–63 (Fed. Cir. 1991) (citation omitted)). In addition, the written description requirement of 35 U.S.C. § 112, first paragraph, applies to all claims including original claims that are part of the disclosure as filed. *Ariad*, 598 F.3d at 1349. As stated by the Federal Circuit, "[a]lthough many original claims will satisfy the written description requirement, certain claims may not." *Ariad*, 598 F.3d at 1349; *see also LizardTech, Inc. v. Earth Res. Mapping, Inc.*, 424 F.3d 1336, 1343–46 (Fed. Cir. 2005); *Regents of the*

University of California v. Eli Lilly & Co., 119 F.3d 1559, 1568 (Fed. Cir. 1997).

The Examiner has the initial burden of presenting evidence or reasoning to explain why persons skilled in the art would not recognize in the original disclosure a description of the invention defined by the claims. *See In re Wertheim*, 541 F.2d 257, 263 (CCPA 1976). "[T]he test for sufficiency is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Ariad*, 598 F.3d at 1351 (citations omitted). This test "requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art." *Id.* "Based on that inquiry, the specification must describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed." *Id.*

We agree with the Appellant that there is reversible error in the Examiner's determination that the claims lack adequate written descriptive support.

The focus of the Examiner's rejection for lack of written descriptive support relates to arguments that Appellant presents for patentability of the claims over the prior art (*see*, for example, Appeal Br. 13) (i.e. the advantages of the stoichiometric relationship between the components). The Examiner does not point to any specific language in the claim as lacking adequate written descriptive support (Final Act. 5; *see* Ans. 3, 15). Thus, the Examiner has not established that the original disclosure is insufficient to reasonably convey to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.

Therefore, we reverse the Examiner's rejection under 35 U.S.C. § 112, first paragraph.

Rejection II (Claim 76)(35 U.S.C. §§ 102(b), 103(a) over Nojiri)

After review of the respective positions of Appellant and the Examiner, we AFFIRM the Examiner's rejections of claim 76 under 35 U.S.C. §§ 102(b), and 103(a), essentially for the reasons the Examiner presents in the Final Action and the Answer. We add the following for emphasis.

Claim 76 recites metal-containing ink compositions having metal complexes comprising first and second ligands as well as metal, "wherein the metal complex has a solubility at 25°C of at least 100 mg/ml in at least one of the two or more polar protic solvents."

The Examiner finds that Nojiri teaches compositions that anticipate or, alternatively, render obvious the compositions of claim 76. Final Act. 16–17.

Appellant argues that Nojiri does not disclose a composition free of particles, including microparticles and nanoparticles. Appeal Br. 13. According to Appellant, Nojiri discloses uniform deposition of metals in the form of fine particles as most desirable, which Appellant contends necessarily eliminates the ability of the deposited metal to form a continuous conductive film. Appeal Br. 14; Nojiri col. 4, ll. 43–52. Appellant directs attention to experimental evidence in a Declaration under 37 C.F.R. § 1.132

by Dr. Chengeto Gwengo[4] (hereinafter we refer to the Declaration as "Declaration" or "Decl." and to Dr. Gwengo as "Declarant") as showing that forming metal complexes using the methods and amounts of amine ligand disclosed in Nojiri necessarily leads to compositions comprising particles and that deposition of such compositions does not lead to continuous conductive films. Appeal Br. 14; Decl. ¶¶ 11, 13, 15, 16, and 21. Appellant further contends that the Examiner's designation of the limitation "formulated for deposition of a substrate and conversion of the deposit to a continuous-conductive metal film" as a statement of intended use that does not further limit the claimed composition is erroneous because the disputed limitation denotes an actual state of configuration that fundamentally ties formation of a continuous-conductive metal film to the physical characteristics of the composition (a composition that is free of particles). Appeal Br. 14–15. Appellant additionally asserts that the Declaration demonstrates that Nojiri's metal complexes and compositions are not capable of forming continuous-conductive metal films. *Id*. at 14. Thus, Appellant argues that the metal complexes and compositions are necessarily not the same as those presented in the independent claims of the present application. *Id*.

Appellant's arguments do not identify reversible error in the Examiner's finding of anticipation.

In order to anticipate, a reference must identify something falling within the claimed subject matter with sufficient specificity to constitute a

[4] Appellant/Applicant submitted the Declaration on December 21, 2017 and the Examiner entered it into the record in the Non-Final Office Action dated February 13, 2018.

description thereof within the purview of § 102. *In re Schaumann*, 572 F.2d 312, 317 (CCPA 1978). It is also well settled that when a claimed product reasonably appears to be substantially the same as a product disclosed by the prior art, the burden is on the applicant to prove that the prior art product does not inherently possess characteristics attributed to the claimed product, and that it is of no moment whether the rejection is based on § 102 or § 103 since the burden on the applicant is the same. *In re Spada*, 911 F.2d 705, 708 (Fed Cir. 1990); *In re Best*, 562 F.2d 1252, 1255 (CCPA 1977).

The premise of the Examiner's rejection is that Nojiri teaches a composition free of particles that includes a complex compound comprising silver carboxylate and a bidentate amine (ethylenediamine), where the carboxylate can be an acetate or an oxalate in a polar protic solvent of water and alcohol. Final Act. 16; Nojiri col. 4, ll. 9–32. The Examiner finds Nojiri's silver complex compound (ethylenediamine silver acetate) is the same as the silver complex compound of claim 76 and, thus, would possess the claimed solubility property. Final Act. 16. The Examiner concludes Nojiri's composition anticipates the subject matter of claim 76. *Id*. at 17.

Given the Examiner's findings, there is reason to believe Nojiri's composition would possess the claimed solubility property. *See Best*, 562 F.2d at 1255. Accordingly, the burden is shifted to Appellant to demonstrate that the claimed composition differs from the composition of the prior art. *Id*.

Appellant does not explain adequately why Nojiri's deposition process would necessarily lead one skilled in the art to understand Nojiri's impregnating solution is not free of particles. While Appellant contends that Nojiri's "[d]eposition of the metal as fine particles necessarily eliminates the

ability of the deposited metal to form a continuous conductive film" (Appeal Br. 14), Nojiri in fact discloses that the solution is treated after the impregnation is carried out by selecting the temperature and time required to deposit silver particles on the carrier. Nojiri col. 4, ll. 41–45. That is, Nojiri's disclosure suggests that deposition of the metal in a specific form depends on the treatment of the solution after impregnation. Like Nojiri, the Specification also discloses that the inventive compositions are subjected to heating or irradiating to form the desired product (conductive films). Spec. 18. Thus, the claim language "formulated for deposition of a substrate and conversion of the deposit to a continuous-conductive metal film" appears to describe a result of a heat treatment of the composition and not necessarily an inherent property of the composition.

Appellant directs us to the Declaration in support of the assertion that Nojiri's impregnating solution is not free of particles. Appeal Br. 14–15. In the Declaration, Declarant states that comparative data demonstrate that compositions produced using methods which include only a small excess of the first ligand, as taught by Nojiri (such as 5 to 30% excess of the amine; Nojiri at col. 3, ll. 39-41), contain particles such as microparticles and nanoparticles while the claimed compositions made using a large excess (stoichiometric amounts) of the first ligand followed by removal of the residual amines, as disclosed on pages 16 and 26 (Example 2) of the Specification, do not. Decl. ¶¶ 11, 13, 15, 16, 21; *see* Appeal Br. 13.[5]

[5] We note that claim 76 is a composition claim that does not include any process steps. That is, claim 76 is not drafted in a product-by-process format. We additionally note that claim 76 does not recite the amounts of the ligands and metal as being stoichiometric nor the addition of excess amine ligand to make the claimed metal complexes.

Declarant further states that the Declaration presents experimental evidence demonstrating that forming metal complexes using only a small excess of the amine "likely failed to promote complete conversion of all reactants to products, which is observed by limited solubility." Decl. ¶ 16; *see* Appeal Br. 13.

We have considered Appellant's arguments and Declarant's statement and find them unpersuasive for the reasons the Examiner presents. Ans. 16.

Appellant asserts the Declaration shows a comparison of Nojiri's compositions against the claimed invention. However, the portions of the Declaration relied upon for this purported showing do not compare Nojiri's compositions as alleged but, instead, compare compositions from a secondary reference to Cavitt against the claimed invention. *See* Decl. ¶¶ 11, 12a. From this comparison, Declarant expressly concludes "[t]hese results show clear differences between the prior art compositions (Cavitt) and the presently claimed compositions." *Id*. ¶ 22. We note Declarant's conclusion is limited to a comparison between Cavitt's compositions and the claimed compositions.

The Appeal Brief, Reply Brief, and Declaration provide no explanation why Nojiri's compositions were not directly compared against the claimed compositions. The Appeal Brief, Reply Brief, and Declaration also fail to explain how or why Cavitt's compositions are representative of Nojiri's compositions. Further, the Declaration only compares inventive compounds made via processes using preferred amounts of excess amines.[6]

[6] The Specification recites the stoichiometric ratio between the amine compound and the silver carboxylate of at least 13:1, or at least 15:1, or at least 20:1 as preferred embodiments. Spec. 16. Thus, the declaration does

At oral hearing, Appellant argued that the compositions of Cavitt and Nojiri are equivalent to the extent that both form metal complexes using a small excess of the amine (30 weight percent). *See generally* Tr. 9–10. This argument does not explain adequately how Cavitt's compositions, as a whole, relate to Nojiri's compositions to the extent of being representative of Nojiri's compositions. Therefore, Appellant does not provide an adequate explanation why the fact that both references use 30% of an amine ligand to make the metal complexes is sufficient for one skilled in the art to understand that Cavitt's compositions are representative of Nojiri's compositions. Thus, we agree with the Examiner that the showing is insufficient because the comparative results presented in the Declaration do not fairly represent Nojiri's compositions. Ans. 16. Appellant has not shown adequately that Nojiri's compositions do not possess the properties (solubility and no particles) of the claimed compositions.

Accordingly, we affirm the Examiner's rejection of claim 76 under 35 U.S.C. § 102(b) as anticipated by Nojiri.

We also uphold the alternative obviousness rejection for the reasons the Examiner presents and those we provide because anticipation is the epitome of obviousness. *See, e.g.*, *In re Fracalossi*, 681 F.2d 792, 794 (CCPA 1982).

In upholding the alternative obviousness rejection, we have considered the Declaration to the extent that it purports to show unexpected results or benefits from using stoichiometric amounts of the ligands and the

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not provide information beyond the preferred amounts disclosed and, therefore, does not support the full scope of the claim.

metal in forming the metal complex. Decl. ¶¶ 6, 9, 13, 15, 16. We do not find this evidence persuasive because it is not clear that the showing distinguishes the claimed invention from the closest prior art (Nojiri) for reasons we give above. *See In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972). Further, the showing is based on a limited number of examples and Appellant has not explained adequately why these examples are reasonably commensurate with the broad scope of compositions claimed so as to provide an adequate basis to support a conclusion that other embodiments falling within the claim will behave in the same manner. *In re Grasselli*, 713 F.2d 731, 743 (Fed. Cir. 1983); *In re Clemens*, 622 F.2d 1029, 1035 (CCPA 1980).

Rejection III (Claims 1, 32, and 55) (35 U.S.C. § 103(a) over Nojiri and McCullough)

After review of the respective positions of Appellant and the Examiner, we AFFIRM the Examiner's rejections of claims 1–5, 7, 8, 13, 15–23, 25, 27–30, 32–35, 37, 39, 40, 54, 55, and 73–75 under 35 U.S.C. § 103(a), essentially for the reasons the Examiner presents in the Final Action and the Answer. We add the following for emphasis.

Appellant identifies independent claims 1, 32, and 55 as representative of the claimed subject matter for this ground of rejection. Appeal Br. 15. Accordingly, we limit our discussion to independent claim 1. Claims 2–5, 7, 8, 13, 15–23, 25, 27–30, 32–35, 37, 39, 40, 54, 55, and 73–75 stand or fall with claim 1.

Claim 1 recites metal-containing ink compositions having metal complexes comprising first and second ligands as well as at least one metal,

"wherein the amount of the at least one first ligand, the at least one second ligand, and the at least one metal in the composition is stoichiometric."

We refer to the Examiner's Final Office Action for a complete statement of the rejection of claim 1. Final Act. 6–8.

Appellant argues that Nojiri teaches the use of a small excess (an amount of 5 to 30%) of the amine (first ligand) and, thus, teaches away from using a large excess of the amines as taught in the present application to produce the metal complex. Appeal Br. 16–17; Nojiri col. 4, ll. 39–41; *see* Spec. 16. Appellant further argues that the Declaration presents comparative data demonstrating that compositions produced using methods which include only a small excess of the first ligand, as taught by Nojiri, also contain particles such as microparticles and nanoparticles. Appeal. Br. 17 (citing Dec. ¶¶ 11, 13, 15, 16, and 21), 19–20. Thus, Appellant asserts that Nojiri's compositions necessarily comprise non-stoichiometric amounts of the first and second ligands and the metal because Nojiri does not teach a 13-fold excess of the amine as disclosed in the Specification nor the removal of the excess of unreacted amine in a purification step after formation of a complex. Appeal Br. 17–20; Spec. 16.

Appellant's arguments do not identify reversible error in the Examiner's determination of obviousness.

Appellant's arguments and evidence are not persuasive of a teaching away from the invention. "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re*

Gurley, 27 F.3d 551, 553 (Fed. Cir. 1994). Further, references in a combination may be said to teach away where their combined teachings would produce a "seemingly inoperative device". *See In re Sponnoble*, 405 F.2d 578, 587 (CCPA 1969). Teaching an alternative or equivalent method, however, does not teach away from the use of a claimed method. *See In re Dunn*, 349 F.2d 433, 438 (CCPA 1965).

In this case, as Appellant notes, Nojiri discloses adding excess amine ligand "[u]sually" in "an amount 5 to 30% in excess of the equivalent amount." Appeal Br. 16–17; Nojiri col. 4, ll. 39–41. Thus, this portion of Nojiri discloses adding excess amine ligand and that a typical amount of excess amine ligand is added to facilitate the formation of metal complexes. At best, this disclosure relates to a preferred embodiment. Appellant has not explained adequately why Nojiri's disclosure would lead a person of ordinary skill in a direction divergent from the path that was taken by the applicant when it clearly teaches the use of excess amount of amine ligand. Appellant directs us to no portion of Nojiri or provides any other technical explanation of why one skilled in the art would understand Nojiri's disclosure as being limited to adding only 5 to 30% excess amine ligand in forming the metal complexes. Thus, Appellant fails to direct our attention to any teaching in the prior art that supports the teaching away argument. Generally, the disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or non-preferred embodiments. *In re Susi*, 440 F.2d 442, 446 n.3 (CCPA 1971).

With respect to Appellant's argument concerning the removal of unreacted amine in a purification step after formation of a complex in Nojiri, this argument is unpersuasive because it does not address the rejection the

Examiner presents. It is well established that the obviousness inquiry does not ask "whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole." *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc); *see also In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (stating "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference"). "[T]he test [for obviousness] is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *Keller*, 642 F.2d at 425–26.

The Examiner's rejection is based on the combined teachings of Nojiri and McCullough.[7] Final Act. 7–8. The Examiner relies on McCullough's teachings to establish that it is known to remove excess unreacted amine

[7] If prosecution is further continued, the Examiner may wish to consider whether McCullough's teachings, as a whole, are relevant to the claimed invention. McCullough is Appellant's own prior art given that three of the named inventors for this Application (Richard D. McCullough, John Belot, and Rebecca Potash) are also named as inventors in the McCullough reference. In addition to the teachings highlighted by the Examiner, McCullough discloses metal complexes adapted to form conductive metal films and lines upon deposition and treatment. McCullough Abstr. McCullough discloses a composition comprising at least one metal complex comprising at least one metal (silver) and at least two ligands, wherein at least one first ligand is a bidentate amine and at least one second ligand different from the first (carboxylate), wherein the metal complex is soluble in a solvent at 25° C. *Id*. ¶¶ 4, 6, 12, 19. McCullough also describes the composition as substantially or totally free of nanoparticles. *Id*. ¶¶ 23–24. In addition, McCullough discloses making the composition using a large excess amount of amine and removing the unreacted amount of amine. *Id*. ¶¶ 264, 267. Therefore, McCullough's teachings may be significant in evaluating the patentability of the claimed invention.

after formation of a silver complex compound by evaporation under vacuum. Ans. 19; McCullough ¶ 267. Moreover, like McCullough, Nojiri teaches the use of excess amines in forming metal complexes. Nojiri col. 4, ll. 39–41. One skilled in the art would have reasonably expected that some of Nojiri's excess amines would remain unreacted after forming the desired complexes. Thus, Appellant does not explain adequately why one skilled in the art, using no more than ordinary creativity, would not have been able to modify Nojiri's teachings to incorporate McCullough's technique for removing unreacted amines as taught by McCullough. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) ("A person of ordinary skill is also a person of ordinary creativity, not an automaton."); *see also In re Sovish*, 769 F.2d 738, 743 (Fed. Cir. 1985) (presuming skill on the part of one of ordinary skill in the art).

Appellant's argument that using only a small excess of amine would yield a non-stoichiometric complex or a composition that does not comprise stoichiometric amounts of the first and second ligands and the metal (Appeal Br. 18–19) is unpersuasive for the reasons we give above in our previous discussion of the Declaration evidence related to the anticipation/ obviousness rejections of claim 76.

We have also considered Appellant's arguments and evidence alleging that Nojiri's compositions are not free of particles in the context of this rejection. We again find the evidence insufficient to overcome a prima facie case of obviousness for the reasons we give in our previous discussion of the Declaration related to the anticipation/ obviousness rejections of claim 76.

Appellant argues that Nojiri does not teach forming a metal complex in solution prior to deposition on a substrate is an important feature of the composition. Appeal Br. 18. According to Appellant, Nojiri discloses the amine ligand can be added at any stage in formation of the silver catalyst (i.e., metal complex) and, thus, Nojiri provides no motivation to one of ordinary skill in the art to purify the excess amine from the metal complex prior to deposition on a substrate. *Id*.

Appellant's arguments lack persuasive merit. It is well settled that a reference may be relied upon for all that it discloses and not merely the preferred embodiments as suggested by Appellant. *See Merck & Co. v. Biocraft Labs., Inc.*, 874 F.2d 804, 807 (Fed. Cir. 1989) ("'[A]ll disclosures of the prior art, including unpreferred embodiments, must be considered.'" (quoting *In re Lamberti*, 545 F.2d 747, 750 (CCPA 1976))); *In re Fracalossi*, 681 F.2d 792, 794 n.1 (CCPA 1982) (explaining that a prior art reference's disclosure is not limited to its examples).

Appellant does not direct us to any portion of Nojiri that teaches addition of an amine ligand at any stage in the formation of the silver catalyst, nor do we find any. Moreover, assuming arguendo that Nojiri discloses such an addition, this would only mean that Nojiri contemplates a number of different embodiments, including Appellant's technique for adding the amine ligand. Appellant does not explain adequately why such a broader teaching would lead one skilled in the art away from any specifically disclosed technique for the addition of an amine ligand.

Appellant argues that Nojiri and McCullough teach away from the use of polar protic solvents. Appeal Br. 21; Nojiri col. 5, ll. 1–6; McCullough ¶¶

185–190. Appellant further argues that McCullough's teachings provides no expectation that a purified metal complex may be successfully dissolved in a solvent other than a hydrocarbon solvent. Appeal Br. 21.

Appellant's arguments do not identify reversible error in the Examiner's determination of obviousness.

The cited portions of Nojiri (col. 5, ll. 1–6 (disclosing that the use of alcohol as a solvent as not desirable from a safety standpoint)) and of McCullough (¶ 186 (disclosing that an "oxygenated solvent can be substantially or totally excluded")) differentiate between preferred embodiments and less preferred embodiments for the practice of their respective inventions. As such, these disclosures do not exclude the use of polar protic solvents but, instead, indicate that their use is not as desirable. *See Merck,* 874 F.2d at 807; *Fracalossi*, 681 F.2d at794 n.1. As we note above, the disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or non-preferred embodiments. *Susi*, 440 F.2d at 446 n.3.

With respect to the argument specific to McCullough, Appellant does not direct us to any portion of the reference that limits the removal of unreacted amine to instances where the metal complex is used in a non-polar solvent. Appellant also fails to provide an adequate technical reasoning or other objective evidence in support of the stated argument. Appellant's attorney arguments cannot take the place of evidence. *See In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984); *In re Payne*, 606 F.2d 303, 315 (CCPA 1979).

Accordingly, we affirm the Examiner's rejection of claims 1–5, 7, 8, 13, 15–23, 25, 27–30, 32–35, 37, 39, 40, 54, 55, and 73–75 under 35 U.S.C. § 103(a) as unpatentable over Nojiri and McCullough.

Rejection IV (Claims 6 and 41)(35 U.S.C. § 103(a) over Nojiri, McCullough, and Takano)

Claims 6 and 41 recite the use of isopropyl alcohol as one of the polar protic solvents in the claimed composition.

Both the Examiner and Appellant agree that Nojiri teaches the use of polar protic solvents such as alcohols, but does not teach specifically the use of isopropyl alcohol. Final Act. 8; Appeal Br. 27. Specifically, Nojiri discloses the use of an aqueous alcohol solution, which suggests a polar protic solvent. Nojiri col. 4, ll. 29–30. The Examiner relies upon Takano for its teaching that isopropyl alcohol is a protic solvent. Final Act. 9; Takano col. 1, ll. 60–62.

We have considered Appellant's arguments with respect to Takano (Appeal Br. 27) and are unpersuaded of reversible error in the Examiner's determination of obviousness.

While Takano may involve a different process, Takano does teach isopropyl alcohol as a known protic solvent. Given that Nojiri teaches the use of alcohols in its compositions, Appellant does not explain adequately why one skilled in the art, using no more than ordinary creativity, would not have been capable of using a known protic solvent, such as isopropyl alcohol, as a solvent for Nojiri's compositions. *See KSR,* 550 U.S. at 421; *Sovish*, 769 F.2d at 743.

Accordingly, we affirm the Examiner's prior art rejection of claims 6 and 41.

Rejection V (Claim 36) (35 U.S.C. § 103(a) over Nojiri, McCullough, and Jan)

Dependent claim 36 recites the R2 substituent in the metal complex formula (I) of claim 32 is substituted with at least one heteroatom.

The Examiner relies on Jan as teaching a silver complex compound in which the complexing agent is urea. Final Act. 9; Jan col. 9, l. 35. The Examiner finds that urea is known to contain two amine groups and a hetero atom (oxygen). Final Act. 9.

We have considered Appellant's arguments regarding this rejection (Appeal Br. 28), but find them unpersuasive for the reasons the Examiner presents (Final Act. 9–10). Moreover, Appellant's arguments do not refute the Examiner's finding that urea is a known complexing agent for the formation of metal complexes.

Accordingly, we affirm the Examiner's prior art rejection of claim 36.

Rejection VI (Claims 14 and 38) (35 U.S.C. § 103(a) over Nojiri, McCullough, and Cavitt)

Claim 14 recites "wherein the first ligand comprises at least one amine group which is substituted with a polar group or a linear alkane." Claim 38 recites similar subject matter.

The Examiner relies on Cavitt as teaching the recited claim features. Final Act. 10.

Appellant argues that Cavitt suggests the metal complex may require the excess amine to be solubilized, or remain soluble. Appeal Br. 29. Thus, Appellant contends one of ordinary skill in the art would not have had a reasonable expectation of success that the complex would be soluble when purified away from the excess amine, and re-dissolved. *Id.* (citing to Cavitt col. 2, ll. 15–24, 30–35, col. 4, ll. 11–28, 38–47).

Appellant's arguments do not point to reversible error in the Examiner's determination of obviousness.

We have reviewed the cited portions of Cavitt and find no suggestion therein that the metal complex may require the excess amine to be solubilized, or remain soluble. Moreover, Appellant's arguments do not persuasively contest that Cavitt teaches a ligand comprising at least one amine group which is substituted with a polar group or a linear alkane.

Accordingly, we affirm the Examiner's prior art rejection of claims 14 and 38.

Rejections VII–X (All under 35 U.S.C. § 103 (a) based on Nielsen)

The Examiner presents a number of rejections under 35 U.S.C. § 103(a) relying on Nielsen as the primary reference. *See* Final Act. 11–17. Nielsen's teachings are substantially similar to Nojiri's teachings, as applied by the Examiner. *Compare* Nielsen based rejections (Final Act. 11–16) *with* Nojiri based rejections (Final Act. 6–11, 16–17). In addressing the rejections based on Nielsen, Appellant relies on a line of argument substantially similar to the one presented for the rejections based on Nojiri. For example, Appellant relies on the Declaration to show that Nielsen's compositions are not free of particles for the same reasons argued

for Nojiri's compositions. *Compare* arguments pertaining to Nielsen (Appeal Br. 23–24) *with* arguments pertaining to Nojiri (Appeal Br. 17–18).

We have considered Appellant's arguments for each of the rejections based on Nielsen as a primary reference. We find these arguments do not identify error in the Examiner's determination of obviousness for essentially the same reasons we give above for the rejections based on Nojiri as a primary reference.

Arguments not specifically addressed are deemed not persuasive for the reasons the Examiner presents.

Accordingly, we affirm the Examiner's prior art rejections of claims 1–8, 13–23, 25, 27–30, 32–41, 54, 55, and 73–75 over Nielsen.

CONCLUSION

Because the affirmed rejections reach all the claims presented for review on appeal, our decision is an affirmance.

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–8, 13–23, 25, 27–30, 32–41, 54, 55, 73–75	112, first paragraph	Written Description		1–8, 13–23, 25, 27–30, 32–41, 54, 55, 73–75
76	102(b)/103(a)	Nojiri,	76	
1–5, 7, 8, 13, 15–23, 25, 27–30, 32–35, 37, 39, 40, 54, 55, 73–75	103(a)	Nojiri, McCullough	1–5, 7, 8, 13, 15–23, 25, 27–30, 32–35, 37, 39, 40, 54, 55, 73–75	
6, 41	103(a)	Nojiri, McCullough, Takano	6, 41	
36	103(a)	Nojiri, McCullough, Jan	36	
14, 38	103(a)	Nojiri, McCullough, Cavitt	14, 38	
1–5, 7, 8, 13, 15–23, 25, 27–30, 32–35, 37, 39, 40, 54, 55, 73–75	103(a)	Nielsen	1–5, 7, 8, 13, 15–23, 25, 27–30, 32–35, 37, 39, 40, 54, 55, 73–75	
6, 41	103(a)	Nielsen, Takano	6, 41	
36	103(a)	Nielsen, Jan	36	
14, 38	103(a)	Nielsen, Cavitt	14, 38	
Overall Outcome			**1–8, 13–23, 25, 27–30, 32–41, 54, 55, 73–76**	

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED