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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ALBERT EPSHTEYN and ANDREW P. PURDY

Appeal 2019-004808
Application 14/881,241
Technology Center 1700

Before ROMULO H. DELMENDO, GEORGE C. BEST, and
ELIZABETH M. ROESEL, *Administrative Patent Judges*.

ROESEL, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 13 and 16. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ We use the word Appellant to refer to "applicant" as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as the Government of the United States of America, as represented by the Secretary of the Navy. Appeal Br. 2.

CLAIMED SUBJECT MATTER

Appealed claims 13 and 16 depend from withdrawn claims 1 and 12 and are directed to nanoparticles comprising a decomposition product of metal hydride compounds, where the nanoparticle is made by the reaction of a transition metal salt with an aluminum hydride compound and a borohydride compound. Appeal Br. 2, 6. Appellant represents that the nanoparticles may be useful in munitions. *Id.* at 3.

Claims 1, 12, 13, and 16 are reproduced below.

1. (withdrawn) A process comprising:

reacting a transition metal salt with a metal hydride compound to produce one or more nanoparticles comprising a decomposition product of the metal hydride compound;

wherein the metal hydride compound is an aluminum hydride compound, a borohydride compound, or a gallium hydride compound; and

wherein the reaction occurs in solution while being sonicated at a temperature at which the metal hydride compound decomposes.

12. (withdrawn) The process of claim 1, wherein the transition metal salt is reacted with the aluminum hydride compound and the borohydride compound.

13. A nanoparticle made by the method of claim 12.

16. The nanoparticle of claim 13, wherein the transition metal salt is a titanium salt.

Appeal Br. 6 (Claims Appendix).

REFERENCE

The prior art relied upon by the Examiner is:

Name	Reference	Date
Murphy	US 2007 /0254225 A1	Nov. 1, 2007

REJECTION

The Examiner maintains the rejection of claims 13 and 16 under 35 U.S.C. § 103(a) as unpatentable over Murphy.

OPINION

The Examiner finds that Murphy teaches: a catalyst is made by reacting a metal hydride with a transition metal salt; wherein the metal hydride can be a mixture of sodium borohydride and lithium aluminum hydride; and the transition metal salt can be titanium. Final Act. 2–3 (citing Murphy ¶¶ 81, 82, 86). The Examiner acknowledges that “Murphy does not teach nanoparticles.” Final Act. 3. The Examiner finds, however, that it would have been expected that at least some of the catalyst is present as a nanoparticle. *Id.* As support for this finding, the Examiner relies on Murphy’s teachings that the catalyst is made and used “in solution” and that a solid is formed from the solution. *Id.* (citing Murphy ¶¶ 81, 87). The Examiner reasons that “a molecule in solution” falls within the broadest reasonable definition of a nanoparticle and that nanoparticles would be present “at some point” when going from a solution to a solid. *Id.*

Appellant focuses its patentability arguments on three aspects of the claimed subject matter: decomposition product, nanoparticles, and sonication. Appeal Br. 3–4. We address each of these aspects in turn.

First, Appellant argues, “[t]here is no disclosure in Murphy that the reaction forms a decomposition product of a metal hydride,” and “the Office Action does not even allege that such a decomposition product is disclosed in Murphy, either explicitly or inherently.” Appeal Br. 3.

Appellant’s argument does not persuade us to reverse the rejection. As evidence of what the claim means by “decomposition,” the Examiner directs us to paragraph 14 of Appellant’s Specification, which discloses in pertinent part: “The metal hydride compounds can contain hydrogen-bridging bonds, which may break during decomposition. This results in the loss of some, but not necessarily all of the hydrogen in the nanoparticles in the form of hydrogen gas.” Spec. ¶ 14. The Examiner also directs us to Murphy’s disclosure that “[i]n embodiments in which a metal hydride—transition metal salt catalyst system is employed, *the metal hydride may be added slowly, to prevent H₂ build-up within the reaction system.*” Murphy ¶ 87 (emphasis added). We agree with the Examiner that the Specification shows that decomposition is associated with the breaking of hydrogen bridging-bonds and the generation of hydrogen gas. Ans. 4; Spec. ¶ 14. We further agree with the Examiner that Murphy’s disclosure of “H₂ build-up within the reaction system” evidences the breaking of metal-hydrogen bonds and the decomposition of the metal hydride, consistent with the Specification’s description of decomposition. Ans. 4; Murphy ¶ 87; Spec. ¶ 14.

In our view, the Examiner has provided a sound basis for believing that the catalyst disclosed in Murphy comprises a decomposition product of a metal hydride, as claimed. Murphy’s disclosure of hydrogen gas build-up is strong evidence that decomposition is occurring. *Howmedica Osteonics*

Corp. v. Zimmer, Inc., 640 F. App'x 951, 958 (Fed. Cir. 2016) (unpublished) (“A sound basis for believing in identity does not turn on absolute certainty; rather, a sound basis for finding identity requires the Board to make sufficient factual findings, such that it can reasonably infer that the prior art product and that of the patent at issue are the same.”); *In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990) (“[W]hen the PTO shows sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not.”). Although Murphy seeks to prevent the build-up of hydrogen gas, it is reasonable to infer that decomposition is not entirely suppressed. Appellant does not argue or provide evidence to the contrary.

Second, Appellant challenges the Examiner's finding that at least some of the catalyst would be expected to be present as nanoparticles. Final Act. 4; Appeal Br. 4. Appellant argues that, in Murphy, “the reaction product is formed in solution” and “is not formed as a solid that is later dissolved while passing through a transitory nanoparticle state.” Appeal Br. 4. Appellant contends it is not reasonable to interpret “nanoparticle” so broadly as to encompass “a molecule in solution.” *Id.* (quoting Final Act. 3). Responding to the Examiner's assertion that nanoparticles would be present “at some point,” Appellant argues “there is no evidence that such alleged nanoparticles would have any more than a transitory existence.” *Id.* (quoting Final Act. 3).

We agree with Appellant that it is not reasonable to interpret “nanoparticle” so broadly as to encompass “a molecule in solution.” We are nevertheless not persuaded to reverse the rejection. Murphy discloses that a catalyst is “prepared from the reaction of a metal hydride and a transition

metal salt, which may produce a black, granular material.” Murphy ¶ 81. Murphy further discloses that the metal hydride is dissolved in a solvent before it is added to the transition metal salt. *Id.* ¶ 87. From these teachings, the Examiner reasonably infers that, “when making the black granular product material even if the black granular material is itself not comprised of nanoparticles, as the molecules or reaction product begin to agglomerate to form this granular material it would necessarily pass through a transitory state where it was comprised of nanoparticles in suspension.” Ans. 4–5. Appellant agrees that nanoparticles would have “a transitory existence” in Murphy’s process. Appeal Br. 4. A transitory nanoparticle is still a nanoparticle and is sufficient to teach the claim limitation. *See Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 843 F.3d 1315, 1337 (Fed. Cir. 2016) (that prior art meets claim limitation only during startup mode—not normal operation—is irrelevant to the analysis of anticipation, where the claim is not limited to normal operation); *see also Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1002 (Fed. Cir. 2016) (“[C]ombinations of prior art that sometimes meet the claim elements are sufficient to show obviousness.”).

Furthermore, in our view, the Examiner has provided a sound basis for believing that the process disclosed in Murphy produces one or more nanoparticles. *See Howmedica*, 640 F. App’x at 958; *In re Spada*, 911 F.2d at 708. Murphy does not disclose the particle size of the “black, granular material believed to be an active catalyst.” Murphy ¶ 81. Nevertheless, in view of the similarities between Murphy’s disclosed process and the process described in Appellant’s Specification, there is a sound basis for believing that Murphy’s black, granular catalyst material includes at least one

nanoparticle, and there is no contrary evidence from Appellant. *Compare* Murphy ¶¶ 81, 82, 87 (disclosing preparation of black, granular material by the reaction of a metal hydride, e.g., LiAlH_4 , and a transition metal salt by dissolving the metal hydride in a solvent and adding it slowly to the transition metal salt), *with* Spec. ¶ 26 (describing preparation of black powder by the reaction of a metal hydride (LiAlH_4) and a transition metal salt (ZrCl_4) by adding a solution of the metal hydride dropwise to the transition metal salt under sonication). We note that Appellant’s experiments produced a range of particle sizes, only some of which were nanoparticles. Spec. ¶ 32 (“TEM images of sample 3 suggest that it is a material made up of a mixture of particles that are heterogeneous in size, with the bulk of it made up of larger particles with diameter on the order of hundred(s) nanometers”); ¶ 33 (“there is TEM evidence of much smaller nanoparticles that range from 1.8 nm to 7.4 nm in diameter”).

Third, Appellant argues that “sonication is used to create the presently claimed nanoparticles having the decomposition product” and that “[n]o such sonication is disclosed in Murphy.” After considering Appellant’s argument, we agree with the Examiner that sonication is a product-by-process limitation, and Appellant has not shown that the use of sonication will result in a product that is materially different from the product taught by Murphy. Ans. 4. *See Biogen MA Inc. v. EMD Serono, Inc.*, No. 2019-1133, 2020 WL 5755468, at *5 (Fed. Cir. Sept. 28, 2020) (discussing “the longstanding rule that ‘an old product is not patentable even if it is made by a new process’” (citing *Amgen Inc. v. Hoffman-La Roche Ltd.*, 580 F.3d 1340, 1366 (Fed. Cir. 2009)); *In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985) (“If the product in a product-by-process claim is the same as or

obvious from a product of the prior art, the claim is unpatentable even though the prior art product was made by a different process.”). Appellant’s Specification is equivocal about the causal relationship between sonication and the formation of nanoparticles. Spec. ¶ 14 (“The use of sonication in solution may cause nucleation of the decomposition products so that nanoparticles are formed.”). There is no evidence, in the Specification or elsewhere in the record, that sonication is necessary for the formation of nanoparticles or that sonication contributes to the decomposition of the metal hydride.

Accordingly, we sustain the Examiner’s rejection of claims 13 and 16.

CONCLUSION

The Examiner’s rejection is affirmed.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference/Basis	Affirmed	Reversed
13, 16	103(a)	Murphy	13, 16	

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). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED