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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MITSUHIRO OKUDA,
KAZUAKI NISHIO, and ICHIRO YAMASHITA

Appeal 2009-015032
Application 11/508,261
Technology Center 1600

Decided: May 27, 2010

Before ERIC GRIMES, DEMETRA J. MILLS, and LORA M. GREEN, *Administrative Patent Judges*.

GRIMES, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 involving claims to a method of making a zinc oxide-ferritin complex, which the Examiner has rejected as obvious. We have jurisdiction under 35 U.S.C. § 6(b). We reverse.

STATEMENT OF THE CASE

Claims 1-9 are on appeal. Claim 1 is the only independent claim and reads as follows:

> 1. A process for producing a zinc-oxide protein complex comprising:
> the step a) of preparing a buffer containing a protein having a cavity inside thereof, zinc ion, and ammonia, wherein the protein having a cavity inside thereof is ferritin; and
> a step b) of adding hydrogen peroxide to the buffer so that the concentration of said hydrogen peroxide is 60 mM or greater and 150 mM or less.

Issue

The Examiner has rejected claims 1-9 under 35 U.S.C. § 103(a) as unpatentable over Yamashita '386[1] (Ans. 3) or the combination of Yamashita '047[2] and Yamashita '386 (*id* at 6).

The Examiner finds that Yamashita '386 teaches "that zinc and oxides thereof can be introduced into apoferritin. Further, it is taught (column 6, lines 9-10) that H_2O_2 (hydrogen peroxide) is added to the solution to introduce metal oxide complexes into apoferritin." (Ans. 4.) The Examiner acknowledges that Yamashita '386 does not teach the H_2O_2 concentration range recited in the claims, but concludes that "it would have been obvious to one skilled in the art at the time of invention to determine all optimum and operable conditions, because such conditions are art-recognized result-effective variables" (*id.* at 5).

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[1] Yamashita, U.S. Patent 6,838,386 B2, Jan. 4, 2005.
[2] Yamashita, US 2004/0158047 A1, Aug. 12, 2004. The Examiner actually relies on Yamashita '047 or Yamashita (EP 1433743 A1, June 30, 2004) in the alternative. Since the disclosures of these references appear to be identical, we will discuss only Yamashita '047.

The Examiner finds that Yamashita '047 discloses a method of making cobalt-ferritin complexes using metal ions, apoferritin, HEPES buffer, and an H_2O_2 concentration in the range of 1 mM to 5 M (Ans. 6). The Examiner finds that Yamashita '386 discloses that "not only zinc but zinc oxide can be incorporated into apoferritin via the addition of hydrogen peroxide. Thus one would be motivated to substitute[ ] zinc oxide for zinc [sic, cobalt?]." (*Id.*). With regard to the H_2O_2 concentration range recited in the claims, the Examiner again concludes that "it would have been obvious to one skilled in the art at the time of invention to determine all optimum and operable conditions, because such conditions are art-recognized result-effective variables" (*id.* at 7).

Appellants contend that Yamashita '047 would have led those skilled in the art to expect that apoferritin would be denatured by a H_2O_2 concentration in the range recited in the claims, and that the evidence of record showing efficient production of a zinc oxide-ferritin complex at the recited H_2O_2 concentrations is an unexpectedly superior result that rebuts the evidence relied on by the Examiner (Appeal Br. 4-5). Appellants also contend that the range of 1 mM to 5 M in Yamashita '047 is a mistake and should read "1 mM to 5 mM" (*id.* at 6). Appellants have submitted declaratory evidence to show that Yamashita '047 was translated incorrectly, resulting in the mM-to-M error (Appendixes III to VI attached to the Appeal Brief).

The issue with respect to both rejections is: Have Appellants shown that the H_2O_2 concentration range recited in claim 1 provides results that are superior to what would have been expected based on the prior art?

Findings of Fact

1. Yamashita '386 discloses a method of introducing iron into apoferritin by mixing HEPES buffer, apoferritin, and iron ammonium sulfate (Yamashita '386, col. 5, ll. 13-17).

2. Yamashita '386 discloses that "the concentration of iron ammonium sulfate . . . is preferably in the range of 5 to 10 mmol/L" (*id.* at col. 5, ll. 21-23).

3. Yamashita '386 discloses that "the technology of introducing chromium, manganese, cobalt, nickel, aluminum, tungsten, zinc, and oxides thereof into apoferritin has already been reported" (*id.* at col. 6, ll. 2-5).

4. Yamashita '386 discloses that "in the case of cobalt, inorganic atoms can be introduced into apoferritin by merely adding apoferritin to an ammonium solution of cobalt sulfate, adjusting the pH value to around 8.0, and then adding a small amount of H_2O_2 solution" (*id.* at col. 6, ll. 6-10).

5. Yamashita '047 discloses a "method for producing a cobalt-protein complex" (Yamashita '047 at 2, ¶ 17); the protein may be apoferritin (*id.* at 2, ¶ 21).

6. Yamashita '047 discloses that "a reaction solution is prepared by mixing a HEPES buffer solution, an apoferritin solution and Co^{2+} ion solution" (*id.* at 3, ¶ 42). "Next, . . . an oxidizing agent (e.g., H_2O_2) is added to the reaction solution" (*id.* at 3, ¶ 43).

7. Yamashita '047 discloses that the "concentration of apoferritin in the reaction solution is adjusted to be in a range from 0.1 to 1 mg/ml (about 0.2-2 μM). More specifically, it is preferably about 0.5 mg/ml (1 μM)." (*Id.* at 3, ¶ 48).

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