Remarks

By the foregoing amendment, claims 1 and 18 have been amended, claim 2 has been canceled, and new claim 19 has been added. Thus, with this amendment, claims 1, 3-12, 18, and 19 are pending and under consideration, claims 13-17 having been withdrawn.

Restriction Requirement

Applicants acknowledge that the Examiner has made the Restriction Requirement final. Applicants allow the withdrawn claims to remain pending, subject to possible rejoinder.

Claim Rejections – 35 U.S.C. § 112, Second Paragraph

The Action rejects claim 18 under 35 U.S.C. § 112, second paragraph, as allegedly indefinite for lack of antecedent basis for "substrate" in line 1 of the claim. Applicants respectfully note that the claim has been amended and the allegedly objectionable term has been removed from the claim.

Applicants request withdrawal of the rejection.

Claim Rejections under 35 U.S.C. §§ 102(b) and 103(a)

The Office Action maintains the rejection of claims 1-12 under 35 U.S.C. § 102(b) as allegedly being anticipated by Bouyer et al., "Suspension Plasma Spraying for Hydroxyapatite Powder Preparation by RF Plasma," IEEE Transactions on Plasma Science, vol. 25, no. 5, pp. 1066-1072. The Action rejects claim 18 under 35 U.S.C. § 103(a) as allegedly obvious over Bouyer et al. in view of U.S. Patent Application Publication No. 2005/0158399, to Yu. Applicants respectfully disagree with the rejections for the reasons that follow.

Initially, Applicants note that all dependent claims depend ultimately from claim 1. For ease of reference, claim 1 is set forth as follows:

"1. A method for producing particles, comprising:

mixing a first substance containing at least either one phosphorus oxide selected from the group consisting of phosphorus suboxide, diphosphorus trioxide, diphosphorus tetroxide, and diphosphorus pentoxide, or triethyl phosphate and a second substance containing calcium in a solvent to react the first substance with the second substance to thereby obtain a slurry in a gelled liquid state;

feeding droplets of the slurry containing an amorphous reaction product obtained from a reaction between the first substance and the second substance in a heated atmosphere to bring the amorphous reaction product into a gaseous state; and

crystallizing the amorphous reaction product in the gaseous state to obtain particles mainly composed of a calcium phosphate-based compound."

Applicants note that claim 1 recites that the first substance contains at least either one phosphorus oxide selected from the group consisting of phosphorus suboxide, diphosphorus trioxide, diphosphorus tetroxide, and diphosphorus pentoxide, or triethyl phosphate. This feature of the invention is advantageous, in that when the first substance contains at least either one phosphorus oxide selected from the group consisting of phosphorus suboxide, diphosphorus trioxide, diphosphorus tetroxide, and diphosphorus pentoxide, or triethyl phosphate, the first substance can easily react with the second substance containing calcium in a solvent thereby to efficiently obtain a slurry containing an amorphous reaction product. This makes it possible to bring the amorphous reaction product into a gaseous state when droplets of the slurry containing the amorphous reaction product are fed in a heated atmosphere. As a result, the particles produced by crystallizing the amorphous reaction product in the gaseous state are relatively fine and have a spherical shape that is very nearly a perfect sphere.

Further, the particles described above can exhibit excellent dispersibility in a dispersion medium. For example, the particles can be uniformly dispersed in a liquid sample containing objects to be captured, such as proteins, nucleic acids, or cells, and therefore can be used as carriers capable of efficiently adsorbing (capturing), objects to be captured. (See, for example, the discussion at paragraph [0078] of the original specification.)

Applicants submit that Bouyer et al. fails to disclose at least these features of the presently claimed invention. For example, Bouyer et al. discloses that an aqueous hydroxyapatite (HA) suspension is synthesized, and then the resulting HA suspension is sprayed (gas atomized) by RF plasma, thereby forming the HA powders. The synthesis reaction of the HA suspension is as follows (and is quoted in the Office Action at page 3, line 15):

$$10Ca(OH)_2+6H_3PO_4=Ca_{10}(PO_4)_6(OH)_2+18H_20 \qquad (1)$$

However, as shown in formula (1), Bouyer et al. discloses only the HA powders formed by the synthesis reaction between phosphoric acid (H_3PO_4) and calcium hydroxide ($Ca(OH)_2$), and does not disclose an amorphous reaction product obtained by the reaction between the first substance of the present invention stated above (that is, a first substance containing at least either one phosphorus oxide selected from the group consisting of phosphorus suboxide, diphosphorus trioxide, diphosphorus tetroxide, and diphosphorus pentoxide, or triethyl phosphate) and the second substance containing calcium. For at least this reason, Applicants submit that Bouyer et al. fails to teach each and every element of Applicants' claimed invention, and thus, does not anticipate at least claim 1.

Applicants further note that the method of using phosphoric acid (H_3PO_4) disclosed in Bouyer et al. is considered to be the same as the Comparative Examples of the present specification, in which phosphoric acid is used in the slurry. In this regard, Applicants note that the method of the present invention includes "feeding droplets of the slurry containing an amorphous reaction product obtained by the reaction between the first substance and the second substance in a heated atmosphere to bring the amorphous reaction product into a gaseous state." That is, the slurry containing the amorphous reaction product is heated to bring the amorphous reaction product into a gaseous state, thereby obtaining fine particles of calcium phosphate-based compound. Through experiments by the inventors, it was confirmed that in the case in which phosphoric acid (H_3PO_4) is used in the slurry, as in the Comparative Examples shown in Table 1, particles obtained through the gaseous state necessarily have larger diameters and poor spherical shapes (roundness coefficients) as compared to the present invention, in which the slurry contains at least either one phosphorus oxide selected from the group consisting of phosphorus suboxide, diphosphorus trioxide, diphosphorus tetroxide, and diphosphorus pentoxide, or triethyl phosphate. Applicants submit, without wishing to be bound by any particular theory of

operation, that this difference appears to result from the difference between the materials used in the slurries, that is, between the slurry containing phosphoric acid (H_3PO_4) and the slurry containing at least either one phosphorus oxide selected from the group consisting of phosphorus suboxide, diphosphorus trioxide, diphosphorus tetroxide, and diphosphorus pentoxide, or triethyl phosphate. (Applicants also note that claim 9 requires that the particles be substantially spherical in shape.)

In view of the above experimental result, it would not be possible to obtain fine particles such as obtained in the present invention using the phosphoric acid according to the method of Bouyer et al. In fact, see, for example, page 1070 of Bouyer et al., which states that "[t]he measured average diameter of the collected powder in the SPS reactor is 20 μm," while as shown in Table 1, an average particle diameter of the particles of the present invention (see in Example 1-3 and 5-10) is 100 nm or less). (Applicants also note that claim 10 requires the average particle diameter of the spherical particles to be in the range of 5 to 300 nm.)

Applicants also wish to point out that in the present invention, the slurry is in a gelled liquid state – that is, the slurry has relatively high viscosity. On the other hand, Bouyer et al. teaches that a viscosity of an aqueous HA suspension to be sprayed via the RF plasma is too high to be fed into the RF plasma. Further, Bouyer et al. also teaches that some dispersing agent is added to the aqueous HA suspension for decreasing the viscosity. (See page 1067, *"A. HA Suspension Preparation,"* of Bouyer et al.) Bouyer et al. note that it is essential that the aqueous HA suspension has to have a relatively low viscosity. On the other hand, the present claims recite that the slurry is in a gelled liquid state. For this reason as well, Applicants submit that Bouyer et al. does not anticipate the presently claimed invention.

Still further, Applicants respectfully note that there is nothing in Bouyer et al. that would lead to changes to arrive at the presently claimed invention. That is, there is nothing that would lead to the specific choices of the recited phosphorus oxides, or that would allow for the production of substantially spherical particles, or particles having the presently claimed sizes. And Applicants note that the use of a slurry in a gelled liquid state is particularly nonobvious over Bouyer et al., as such feature would be completely counter to Bouyer et al.'s teachings. Thus, Applicants respectfully submit that at least these features of the present invention would not be obvious in view of Bouyer et al.

The Action rejects claim 18 under 35 U.S.C. § 103(a) as allegedly obvious over Bouyer et al. in view of U.S. Patent Application Publication No. 2005/0158399, to Yu et al. In response, Applicants submit that Bouyer et al. in view of Yu et al. fails to render obvious the presently claimed invention.

Applicants respectfully note that the polymeric sol of Yu et al. is used for coating a metal implant (which is different from the final product of Bouyer et al.), and thus the slurry used in Yu et al.'s method should have a relatively high viscosity in view of its intended use. For this reason, Applicants respectfully submit that a person skilled in the art would not combine the teaching of Yu et al. with that of Bouyer et al., as the high viscosity slurry would be incompatible with the teachings of Bouyer et al., and would render Bouyer et al. unsatisfactory for its intended use.

The law clearly states that if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Applicants also note that the law states that if the proposed modification of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). Thus, Applicants submit that the Office's rejection is legally improper, on at least two legal bases, and respectfully request its withdrawal for at least these reasons.

For at least the foregoing reasons, Applicants respectfully submit that a *prima facie* case of obviousness has not been established, and respectfully request withdrawal of the rejections of record.

Double Patenting Rejection

The Office provisionally rejects claims 1, 6, 11, and 12 as being in conflict with claims 1, 2, 12, and 13 of copending U.S. Application No. 11/541,526.

In response, Applicants respectfully submit that the presently recited features of claim 1 (and those claims dependent therefrom) would not be obvious over any claim of copending

Application No. 11/541,526. Applicants respectfully request that the Office reconsider the rejection in view of the present amendments and remarks.

CONCLUSION

In view of the foregoing amendments and remarks, Applicants submit that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. Favorable consideration with early allowance of all of the pending claims is most earnestly requested.

If there should be any questions, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,
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