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NANOCRYSTALLINE CALCIUM PHOSPHATES FABRICATED UNDER SOLVO- AND IONOTHERMAL CONDITIONS

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Synthesis of novel bioceramic materials based on Ca₃(PO₄)₂ (TCP) and polyphosphates (usually done via high-temperature and solid-state routes) by non-aqueous techniques is of great importance. Microcrystalline and uniform with respect to particle size powders are essential components of photopolymerisable slurries designed for production of osteoconductive bioceramics by 3D-printing. In some studies [e.g.,1], syntheses of microcrystalline (0.2-1 μm) TCP powders in water-methanol and water-ethylene glycol media are reported.

Within this work, synthesis of calcium phosphates in non-aqueous solvents was done in a wide temperature range, up to 350°C. Constitutive role of solvent viscosity was suggested coming from synthesis yields. Syntheses of the phosphates in solvents with high boiling points as well as in imidazole-type ionic liquids (IL) were carried out for the first time. It was shown that nanoparticles of amorphous calcium phosphate could be precipitated in this way. Acid-base reactions (of compounds with Ca/P>1.5 – CaO, CaCO₃, Ca₃P₂O₇ with that one of Ca/P<1.5 – Ca(H₂PO₄)₂, CaHPO₄, Ca₃(HPO₄)₂(PO₄)₂·5H₂O) in high-boiling non-viscous aprotic solvents (glycols) were treated as prospective solvothermal synthesis pathway. Beneficial potential of specially elaborated ionothermal synthesis in nitrite-nitrate alkaline melts was also mentioned.

References

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