Comparison of Chitosan and Albumin influence on Calcium Phosphate formation on TiO2 nanomaterials

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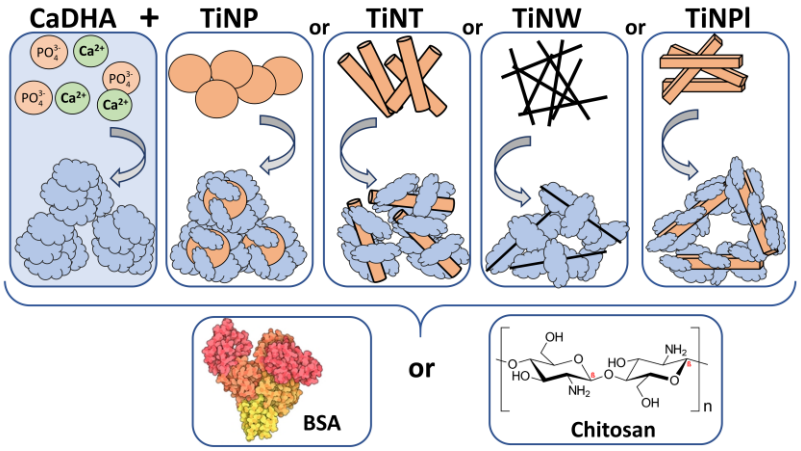
The constantly growing need for advanced bone regeneration materials motivates the development of calcium phosphates (CaPs) composites with a different metal or metal-oxide nanomaterials, among which the TiO2 nanomaterials (TiNMs) stands out [1]. The most important properties of bioimplant materials are mechanical properties and biocompatibility, which could be improved by incorporation of different organic additives. Albumin is one of the first proteins that adsorbs on the implant surface after implantation and affects their behaviour in *vivo*, i.e. their biocompatibility [2]. On the other hand, mechanical properties can be improved by preparing nanocomposites with chitosan, a polysaccharide with antimicrobial properties [3]. With the aim to develop the biomimetic route for preparation of multifunctional bone regeneration materials, the influence of bovine serum albumin (BSA) and chitosan on precipitation of CaP in the presence of TiNMs of different morphology (nanoparticles (TiNP), nanotubes (TiNT), nanowires (TiNW) and plates (TiNPl)) was investigated. The advancement of the precipitation was followed by monitoring pH changes in time. The obtained materials were characterized by powder X-ray diffraction, Fourier transforms infrared spectroscopy, scanning electron microscopy, and dynamic and electrophoretic light scattering. The results showed that BSA and chitosan inhibit the CaPs formation in precipitation systems, added alone or in combination with TiNM. The only exception is BSA in the presence of TiNTs. Neither BSA or chitosan influence the structure and composition of precipitated CaPs' phase. In all systems, calcium deficient hydroxyapatite (CaDHA) was formed within one hour [4]. On the other hand, BSA and chitosan influenced the morphology of the precipitated phase which seems to be more crystalline in the presence of these two additives.
Obtained results show that BSA and chitosan can be used as additives in CaP/TiNM nanocomposites preparations, and point to the fast and simple biomimetic route for multifunctional nanocomposite preparation.

Keywords: calcium phosphates, TiO2 nanomaterials, chitosan, bovine serum albumin



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