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Plasma-assisted deposition of bone apatite-like thin films from natural apatite

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Abstract

In orthopedics and dentistry, novel approaches for fabricating biomimetic and mechanically robust bioactive coatings are highly desirable in order to truly improve the clinical results of coated implants compared to uncoated ones. In this paper, a biological-like apatite coating is deposited for the first time by plasma-assisted deposition of a natural apatite source. Specifically, we deposited bone apatite-like (BAL) thin films from bone apatite targets by pulsed electron deposition (PED). Morphology, composition, structure and mechanical properties of as-deposited and annealed BAL and stoichiometric hydroxyapatite (HA) films were investigated. While as-deposited BAL and HA films were poorly crystalline at room temperature, they crystallized to an extent very close to that of natural apatite when annealed at 400 °C. In addition, FTIR analysis pointed out that BAL films closely resembled the composition of the starting natural apatite target. Finally, nanoindentation tests indicated that BAL films with high mechanical properties could be deposited by PED.

Keywords

Bone implant; hydroxyapatite; biogenic source; FTIR; indentation and hardness

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