Fabrication and Electrochemical Properties of Hierarchical Titanium Dioxide Nanoflower-Calcium Phosphate Composites

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The biological properties of implants can be improved by modifying calcium phosphate (CaP)/TiO₂ thin films on dental implants by controlling the structure, morphology, and thickness of the TiO₂ layer. Hierarchical TiO₂ nanoflowers (TNFs) were successfully fabricated on titanium substrate via hydrothermal reaction of titanium tetraisopropoxide and hydrochloric acid aqueous solution at 180°C for 3 h. The TNF films were soaked in modified simulated body fluid (m-SBF) for 1 to 7 days to form CaP crystals. The crystalline structure, shape and size of the prepared composites were characterized by X-ray diffractometry and scanning electron microscopy (SEM). The nucleation and growth of calcium phosphate coating on TNF in m-SBF solution were investigated using SEM, XPS, and FT-IR surface analytical techniques. The density of CaP increased with increase of soaking time in m-SBF. The CaP crystallites coated on TNF were obtained as spherical agglomerates with nano-sized calcium phosphate particles exhibiting low β -TCP crystallinity. The CaP/TNF coatings showed significant improvement in corrosion resistance compared with TNF coating.

Keywords: TiO₂ nanoflower: Hydrothermal method: Modified-simulated body fluid: Calcium phosphate, Corrosion resistance

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