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研究论文

磁/电场约束下钛合金表面羟基磷灰石/TiO_2复合生物涂层的制备

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摘要:

用恒电位阳极氧化法分别以硫酸和磷酸为电解液, 在钛合金基体上制备出具有不同孔径大小和不同晶型的TiO_2涂层. 外加磁场条件下, 在TiO_2涂层上电沉积形成纳米羟基磷灰石涂层. 当垂直电场方向施加1 T磁场时, 在洛伦兹力影响下生长成羟基磷灰石生长成长度大约为200 nm, 直径大约为50 nm的棒状晶粒; 在磁场平行于电场的条件下, 生成直径为50--70 nm的粒状晶粒. 纳米羟基磷灰石与多孔TiO_2涂层之间几何形貌的匹配程度, 影响复合涂层与钛合金基体的结合强度. 当TiO_2涂层的孔径大约为100 nm时, 棒状羟基磷灰石晶粒与钛合金基体间的锁合更牢固, 结合力更强.

关键词: 材料表面与界面 羟基磷灰石 电沉积 TiO_2多孔涂层 稳恒磁场

Electrochemical preparation of hydroxyapatite/TiO_2 composite coatings on titanium alloy under magnetic field

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Abstract:

Using sulfuric acid and phosphoric acid as electrolyte respectively, TiO_2 coatings of different pore size and physical properties were prepared on titanium alloy matrix by potentiostatic anodic oxidation method. On the TiO_2 coating, nano–hydroxyapatite (nHA) grain coatings was prepared by electro–deposition under the external magnetic field. When the magnetic field was applied perpendicular to the current density, rod–like nHA crystals with a length scale of about 200 nm and an average diameter of about 50 nm were obtained. But when the magnetic field was parallel to the electric field, the hydroxyapatite grain presented as granular grain was about 50–70 nm in diameter. It was found that the matching degree between nano–hydroxyapatite and TiO_2 coatings directly affected the bonding strength between composite coatings and Ti alloy substrate. When the TiO_2 coating with a pore diameter of 100 nm was implaned by rod–like nHA crystals, the combination between the two layers was stronger.

Keywords: surface and interface in the materials hydroxyapatite electrodeposition TiO_2 porous coating static magnetic field

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