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研究论文

$CaO-P_2O_5-SiO_2$系统溶胶-凝胶生物活性多孔材料在SBF中的性能研究

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摘要 利用溶胶-凝胶生物活性材料粉末二次烧结工艺, 制备了$CaO-P_2O_5-SiO_2$系统溶胶-凝胶生物活性多孔材料, 并利用体外实验(*in vitro*)方法和XRD, SEM及FTIR技术研究了此烧结材料的显微形貌、晶相、生物活性和可降解性能. 结果表明, 经800 ℃烧结5 min后, 有少量硅磷酸钙[$Ca_5(PO_4)_2SiO_4$, 5CPS]析出, 在模拟体液(SBF)中浸泡, 随着时间的增长, 材料表面最初形成的无定形钙磷化合物矿化成碳酸羟基磷灰石(HCA)纳米团簇, 并逐渐相互融合形成HCA覆盖层; HCA只在烧结体的玻璃相(SG相)表面生成, 在5CPS微晶相表面未发现HCA, 该材料在37 ℃恒温的SBF溶液中具有较高的生物活性和可降解性能.

关键词 溶胶-凝胶技术 生物活性 模拟体液(SBF) 碳酸羟基磷灰石(HCA)
分类号

Performance Investigation of the Sol-gel Porous Biomaterial of the System $CaO-P_2O_5-SiO_2$ in SBF Solution

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Abstract The porous bioactive material was prepared through secondary sintering of the sol-gel derived glass powder in the system $CaO-P_2O_5-SiO_2$. The micro-morphologies, crystalline phases and bioactivity were investigated using *in vitro* test, XRD, SEM and FTIR techniques. It was indicated that a few $Ca_5(PO_4)_2SiO_4$ crystals (5CPS) were already formed in the porous material during sintering at 800 ℃ for 5 min. In the simulated body fluid (SBF), as the reaction progressed, the originally formed amorphous-phosphorus compound on the surface of glass were mineralized into hydroxy-carbonate-apatite (HCA) nanometer cluster, and interfused mutually until the HCA covering were formed. HCA crystallites were only formed on the glass phase, however not on the surface of 5CPS. This kind of material has the better bioactivity and biodegradability in SBF solution at the constant temperature 37 ℃.

Key words sol-gel technology bioactivity simulated body fluid (SBF) hydroxyl-carbonate-apatite (HCA)

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