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磷灰石-硅灰石/β-磷酸三钙复合多孔支架材料的制备和表征

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摘要 以磷灰石-硅灰石玻璃陶瓷(AW)粉和β-磷酸三钙(β-TCP)粉为原料. 以硬脂酸为致孔剂. 经模压成型、1170℃烧结制备磷灰石-硅灰石/β-磷酸三钙复合多孔支架材料(AW/βTCP). 采用X射线衍射(XRD)、扫描电镜(SEM)、能谱(EDS)、诱导耦合等离子体原子发射光谱(ICP-AES)等方法分析支架的晶相组成、显微结构、物理性能、生物活性和降解性. 将大鼠骨髓间充质干细胞(rMSCs)与支架体外复合培养评价支架的生物相容性. 结果表明: 所制备的AW/β-TCP支架材料的抗压强度达14.3MPa. 孔隙率达66.9%. 孔径为100～700μm. 具有良好的生物相容性、生物活性和降解性. 可作为骨组织工程支架的候选材料.

关键词 磷灰石-硅灰石 β-磷酸三钙 支架材料 骨组织工程

分类号 R318, TB332

Preparation and Characterization of Porous Apatite-Wollastonite/β-Tricalcium Phosphate Composite Scaffolds

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Abstract Porous apatite-wollastonite/β-tricalcium phosphate composite scaffolds (AW/β-TCP) were prepared from apatite-wollastonite (AW) glass-ceramic powders and β-tricalcium phosphate (β-TCP) bioceramic powders, using stearic acid as porogen. The mixture powders were allowing compression molding and firing at 1170℃ to obtain porous composite scaffolds. Characteristics of the scaffolds were determined by X-ray diffraction (XRD), scan electron microscope (SEM), energy dispersive spectrum (EDS), inductively couple plasma atomic emission spectroscopy (ICP-AES) and so on. Rat mesenchymal stem cells (rMSCs) were co-cultured with AW/β-TCP in vitro to evaluate the biocompatibility of the composite. Results show that: AW/β-TCP composite scaffolds with 30wt% of stearic acid reach the compressive strength of 14.3MPa, with the porosity as high as 66.9% and pore diameter ranging from 100 to 700\mum. In vitro experiments reveal that AW/β-TCP scaffolds are biocompatible, bioactive and biodegradable. The porous AW/β-TCP composite is expected to be a andidate scaffold for bone tissue engineering.

Key words apatite-wollastonite β-tricalcium phosphate scaffolds bone tissue engineering

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