材料研究学报 >>2011 >>25 >>(4)

材料研究学报 2011, 25(4) 439-443 DOI: ISSN: 1005-3093 CN: 21-1328/TG

研究论文

多孔羟基磷灰石微球的药物缓释性能

徐为[1], 姚爱华[1,2], 艾凡荣[1,3], 王德平[1,2], 黄文昆[1,2]

1.同济大学材料科学与工程学院 上海 200092
2.先进土木工程材料教育部重点实验室 上海 200092
3.南昌大学机电工程学院 南昌 330031

摘要: 用锂钙硼(LCB)玻璃在磷酸盐溶液中的原位转化反应制备多孔羟基磷灰石(HA)微球, 表征微球的物相组成、孔结构和形貌, 以溶菌酶为药物模型研究了药物的缓释性能。结果表明, 所制备的HA微球具有较好的孔结构。当溶菌酶溶液的浓度较低时, HA微球将溶菌酶吸附在微球的外表面; 当浓度较高时, 更多的溶菌酶扩散进入HA微球的微孔中, 使缓释效果明显改善。当溶菌酶溶液的初始浓度为1.0 mg/ml时, 载药HA微球的释药周期可达800 h以上。

关键词: 无机非金属材料 羟基磷灰石 多孔微球 溶菌酶 药物缓释载体

Drug Release Behavior of Porous Hydroxyapatite Microspheres

XU Wei[1], YAO Aihua[1,2], AI Fanrong[1,3], WANG Deping[1,2], HUANG Wenhai[1,2]

1.School of Materials Science and Engineering, Tongji University, Shanghai 200092
2.Key Laboratory of Advanced Civil Engineering Materials, Ministry of Education, Tongji University, Shanghai 200092
3.College of Mechanical and Electrical Engineering, Nanchang University, Nanchang 330031

Abstract: Porous hydroxyapatite (HA) microspheres were prepared by a situ Li-Ca-B glass conversion process. The phase composition, pore structure and morphology were characterized by XRD, SEM and BET. The results show that the resultant microspheres possess good internal porous structure. The release behavior of lysozyme as a model drug was investigated in the present work. The results show that lysozyme molecules mainly are absorbed on the external surface of the porous HA when concentration of lysozyme is low. A large amount of lysozyme is loaded in the pores of the microspheres when high concentration of lysozyme is used, which effectively prolonged the drug release. The loading behavior was successfully observed in the 1.0 mg/ml lysozyme solution and the drug can still be released after 800 hours.

Keywords: inorganic non-metallic materials hydroxyapatite porous microsphere lysozyme drug controlled-release carrier

收稿日期 2011-03-30 **修回日期** 2011-05-09 **网络版发布日期** 2011-08-16

DOI:

基金项目:

上海市科委``创新行动计划''基础研究重点08JC1419200和同济大学青年优秀人才培养行动计划资助项目。

通讯作者: 姚爱华

作者简介:

通讯作者E-mail: aihyao@126.com

参考文献：

[1] ZHANG Gang, TAN Yinghui, Research progress of polyeptide, therapeutic grade protein carrier, Journal of Oral and Maxillofacial Surgery, 19(3), 220(2009)

[2] M.Isobe, Y.Yamazaki, M.Mori, K.Ishihara, N.Nakabayashi, T.Amagasa, The role of recombinant human bone morphogenetic protein-2 in PLGA capsules at an extraskeletal site of the rat, Journal of Oral and Maxillofacial Surgery, 57(6), 695 (1999)

[3] J.B.Oldham, L.Lu, X.Zhu, B.D.Porter, T.E.Hefferan, D.R.Larson, Biological activity of rhBMP-2 released from PLGA microspheres, Journal of Biomechanical Engineering, 122 (3), 289(2000)

[4] YANG Weizhong, ZHOU Dali, YIN Guangfu, YIN Shanya, ZHENG Changqiong, Hydraulic characteristic and osteoinduction capacity of calcium phosphate/BMP bioactive bone cement, Journal of Inorganic Materials, 20(5), 1174(2005)

[5] WANG Haiting, CHEN Lei, JIN Xueling, ZHU Haitao, The research and development of hydroxyapatite in the bioceramics, Shangdong Ceramics, 25(2), 3(2002)

[6] M.P.Ferraz, F.J.Monteiro, C.M.Manuel, Hydroxyapatite nanoparticles: a review of preparation methodologies, Journal of Applied Biomaterials & Biomechanics, 2, 74 (2004) crossref

[7] L.L Hench, Biomaterials, Science, 208(23), 826(1980)

[8] W.H ¨ oland, V.Rheinberger, E.Apel, C.Van Thoen, M.H ¨ oland, A.Dommann, M.Obrecht, C.Mauth, U.Graf-Hausner, Clinical applications of glass-ceramics in dentistry, Journal of Materials Science: Materials in Medicine, 17(11), 1037(2006)

[9] B.Palazzo, M.C.Sidoti, N.Roveri, A.Tampieri, M.Sandri, L.Bertolazzi, F.Galbusera, G.Dubini, P.Vena, R.Contro, Controlled drug delivery from porous hydroxyapatite grafts: An experimental and theoretical approach, Materials Science and Engineering C, 25, 207(2005) crossref

[10] A.M.Rauschmanna, A.T.Wichelhausb, V.Stirnal, E.Dingeldein, L.Zichner, R.Schettler, V.Alt, Nanocrystalline hydroxyapatite and calcium sulphate as biodegradable composite carrier material for local delivery of antibiotics in bone infections, Biomaterials, 26(15), 2677(2005)

[11] CUI Daichao, FAN Tianyuan, Applications of microspheres in tissue engineering, Journal of International Pharmaceutical Research, 37(4), 287(2010)

[12] A.H.Yao, F.R.Ai, X.Liu, D.P.Wang, W.H.Huang, W.Xu, Preparation of hollow hydroxyapatite microspheres by the conversion of borate glass at near room temperature, Materials

[13] Research Bulletin, 45, 2010, 25(2010)

[14] ZHAO Ying, XU Wei, YAO Aihua, HUANG Wenhai, Porous hydroxyapatite microspheres formed by a situ conversion process, Journal of Functional Materials, 41(7), 1124 (2010)

本刊中的类似文章

1．高勇 徐兴祥 杨振明 张劲松.TiC/Ti_3SiC_2泡沫陶瓷的制备和性能[J]. 材料研究学报, 2011,25(5): 539-544

2．潘会 王君霞 孟大维 程明 王永钱 刘晓旸.Ce改性$S_2O^{2-}_8$/Al--Zn--O固体酸的制备和催化性能[J]. 材料研究学报, 2011,25(5): 522-526

3．吴春芳 王育华.$LaPO_4$:Eu^{3+}纳米荧光粉的发光强度影响因素[J]. 材料研究学报, 2011,25(5): 534-538

4．邱先念 任国仲 林乐静 陈敏鹏 杨奇斌 .共掺Na+(K+)/Er3+50SiO2--30PbO-20PbF2--0.8ErF3玻璃陶瓷的

上转换光谱性质[J]. 材料研究学报, 2011,25(5): 545-549
5．程三旭 李克智 齐乐华 童永煌 李贺军.反向共沉淀法制备纳米Fe_3O_4及其粒径控制[J]. 材料研究学报, 2011,25(5): 489-494
6．杨一凡 曾惠丹 任晶 陈丹平 陈国荣.SO_4^{2-}对Mn掺杂硫磷酸盐玻璃结构和发光性能的影响[J]. 材料研究学报, 2011,25(5): 517-521
7．孙乃坤 高印博 杨健 柳峰 蔡宗岐 徐送宁.Cr^{3+}离子掺杂对Al_2O_3粉末结构及发光性能影响[J]. 材料研究学报, 2011,25(5): 557-560
8．叶芸 郭太良 蒋亚东 黎威智.热极化和电晕极化铁电PVDF薄膜的成分和结构[J]. 材料研究学报, 2011,25(4): 403-407
9．戴剑锋 陈小婷 慕晓文 高会芳.静电纺丝法制备超长YMnO3单晶纳米纤维[J]. 材料研究学报, 2011,25(4): 399-402
10．张羊换 任慧平 马志鸿 李霞 张国芳 赵栋梁.快淬纳米晶Mg2Ni型合金的气态和电化学贮氢动力学[J]. 材料研究学报, 2011,25(4): 373-380
