J Material Sci Eng 2014, 3:3
http://dx.doi.org/10.4172/2169-0022.S1.017

OMICS Group Conferences
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3rd International Conference and Exhibition on
Materials Science & Engineering
October 06-08, 2014 Hilton San Antonio Airport, USA

Synthesis and characterization of sol-gel derived SiO^2-Na_2O-CaO-P_2O_5-MgO bioactive glass as biomaterial

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Bioactive glass samples containing SiO_2-- Na_2O- CaO - P_2O5 - MgO were prepared by sol-gel route. These glasses were characterized to determine their use as biomaterials. The nucleation and crystallization regimes were determined by differential thermal analysis (DTA) and the controlled crystallization of glass samples were carried out by heat treatment. The crystalline phase formed after heat treatment was identified using X-ray powder diffraction technique. Bioactivity of these glasses was measured before and after immersion of glass samples in simulated body fluid (SBF) for different time periods. The formation of hydroxyl carbonate apatite (HCA) layer was identified by FTIR spectrometry, scanning electron microscope (SEM) and XRD which showed the presence of HCA as the main phase in all tested bioglass samples. The pH measurement of the SBF solution after immersion of the samples for different time periods also showed the formation of HCA through different stages of chemical reactions on the surface of the bioglass samples. In-vitro studies of glass samples in SBF had shown that the pH of the solution increased with increasing time period after immersion during initial stages of reaction and after attaining maxima it further decreased with increasing time period. This indicated that the bioactivity of the samples had increased with increasing duration of time and on later stages the decrease in pH of the solution with time had shown that the bioactivity of the samples had decreased.

Biography

Himanshu Tripathi has completed his MTech in Ceramic Engineering at the age of 21 from Indian Institute of Technology (Banaras Hindu University), India and pursuing his PhD from same institute. His area of research is bioactive glasses. He is working for his research work as a teaching assistant in the department of Ceramic Engg. of the same institute. He has taught several theories and practical classes at B. Tech and M. Tech levels in Ceramic Engineering. He has published two papers in reputed international journals. He has orally presented several research papers in various national and international seminars, symposia and conferences.

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Cyclic NGR peptide anchored block co-polymeric nanoparticles as dual targeting drug delivery system for solid tumor therapy

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Certain tumor cells overexpress a membrane-spanning molecule aminopeptidase N (CD13) isoform, which is the receptor for peptides containing the NGR motif. NGR-modified docetaxel (DTX)-loaded PEG-b-PLGA polymeric nanoparticles (cNGR-DNB-NPs) were developed and evaluated for their in vitro potential in HT-1080 cell line. The cNGR-DNB-NPs containing particles were about 148 nm in diameter with spherical shape and high encapsulation efficiency. Cellular uptake was confirmed both qualitatively and quantitatively by confocal laser scanning microscopy (CLSM) and flow cytometry. Both quantitatively and qualitatively results confirmed the NGR conjugated nanoparticles revealed the higher uptake of nanoparticles by CD13-overexpressed tumor cells. Free NGR inhibited the cellular uptake of cNGR-DNB-NPs, revealing the mechanism of receptor mediated endocytosis. In vitro cytotoxicity studies demonstrated that cNGR-DNB-NPs, formulation was more cytotoxic than unconjugated one, which were consistent well with the observation of cellular uptake. Hence, the selective delivery of cNGR-DNB-NPs formulation in CD13-overexpressing tumors represents a potential approach for the design of nanocarrier-based dual targeted delivery systems for targeting the tumor cells and vasculature.

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