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Aerogel-based bioceramic in dentistry

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In the recent years the bone replacement has been an outstanding solution for the treatment of the spontaneously very slowly or not healing bone illnesses. The application of β-tricalcium-phosphates and hydroxyapatites are widespread for the replacement of the bone artificially. The aim of the study was to prepare mesoporous silica containing biomaterials for dental application, using hydroxyapatite and β-tricalcium phosphate, as bioactive agents. Silica-based aerogel scaffold was chosen as raw material and modified by different proportions hydroxyapatite (HA), β-tricalcium phosphate (β-TCP). The composite samples were prepared by drying supercritical conditions and heat-treated. Sample A contained only β-TCP as additive, the B combined HA and β-TCP modifiers, and the C sample used only nano-HA as a new alternative. These bioactive materials were characterized by porosimeter, scanning electron microscopy, X-ray fluorescence elemental analyses and confocal laser scanning microscopy. Biological effect of modified aerogel surfaceswere examined with SAOS-2 osteosarcoma cell line in vitro. As a consequence of the nanoparticles' ability to be uniformly distributed in the matrix, composite C showed the lowest thermal shrinkage and good mechanical strength, in contrast to other micron-sized inorganic fillers, which may form agglomerates in the matrix. We have demonstrated that these materials are biocompatible and non-toxic for this cell type, and it could be applicable in the dental field in the future.

Biography

HEGEDŰS received his general medicine degree from the Medical University of Debrecen (Hungary) in 1982 and his Ph.D. degree in Medical Sciences from the University of Debrecen (UD) in 2000. He is currently a full professor and head of the Biomaterials and Prosthetic Dentistry Department at the Faculty of Dentistry UD, and also the dean of the Faculty of Dentistry UD since 2009. His research interest comprises dental materials, the analysis of interfacial systems in dentistry, the metal ceramic-bioceramic and implant surface modification.

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