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Biography

Sergei Kulkov has completed his Graduation and Post-graduation in Physics department from Tomsk State University in the year 1975 and 1979 respectively. He has published around 150 articles, has 24 Russian patents and is the author and co-author of 6 books. He is a member of American Ceramic Society. He is a Professor of Material Sciences department and Head of the Department of Theory of Strength and Mechanics of Solids at Tomsk State University and also Head of Ceramics department at the Institute of Strength Physics and Materials Science of the Russian Academy of Sciences.

kulkov@ispms.tsc.ru

Abstract

Porous composite materials ZrO2(Mg)-MgO for biomedical applications

Sergey Kulkov1, Ales Buyakov2, Larisa Litvinova3, Valeria Shupletsova4 and Denis Kulbakin5
1Institute of Strength Physics and Materials Science SB RAS, Russia
2National Research Tomsk State University, Russia
3National Research Tomsk Polytechnic University, Russia
4Immanuel Kant Baltic Federal University, Russia

Applications of ceramics for biomedical usages had a special interest now. The most actively developed studies in this area are investigations of zirconia ceramic included in ISO register as a material for bone replacement. Ceramics based on zirconia stabilized with magnesium oxide is involved in protein synthesis and DNA processes, stabilization of DNA molecules, RNA and ribosomes. In this paper were studied pore structure and phase composition of ceramic composite material ZrO2(Mg)-MgO at different sintering temperatures. It has been shown that during sintering of porous ceramic were formed bimodal porosity structure with mean size 26-30 and 94-110 μm. It has been shown that main mechanical characteristics of the material were determined and it was shown, that they are close to the characteristics of natural bone tissues. Ceramic strength directly depends on microstresses and at high microstresses ceramic has a low strength. In vitro studies were shown that the tested materials are not cytotoxic, cultured MMS cells on the surface of the samples have high viability and osteogenic differentiation ability, and the presence of cell clusters in the pores of the samples may indicate their proliferation.