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Structural, morphological and high temperature characterization of the biocompatible hydroxyaptite-titania composite

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Hydroxyapatite-based composite was obtained by powder metallurgy technology. HA commercial (Aldrich) was used in ratio HA: TiH_2 = 3 :1 to prepare the HA-TiO_2 composite. In order to obtain a material free of hydride, the powder was sintered by TSS (two steps sintering) for 600 minutes and the HA-TiO_2 ceramic with composition 77.7% HA and 22.3% TiO_2 rutile was obtained. The constitution of the products was further confirmed by the FTIR (Fourier Transform Infrared Analysis) analysis. The DLS (dynamic lighting scattering) measurements correlate well with the morphology observed in the SEM (scanning electron microscopy) images. HA and HA-TiO_2 particles are bidispersive with size values between 59-531 nm and 106-955 nm, respectively. The smaller particles fill the pores between the larger particles. Thermal stability and mechanical properties for pure HA, TiH_2, HA-TiH_2 and HA-TiO_2 ceramic composite were investigated by DSC/TG (differential scanning calorimetry/thermogravimetric analysis) and TMA (thermomechanical analysis). HA-TiO_2 composite is stable up to 900°C, mass loss corresponding dehydroxilation process starting at 912°C. CTE (coefficient of thermal expansion) values of HA ($9.44 \cdot 10^{-6}$/°C) is comparative to that of HA-TiO_2 composite ($11.65 \cdot 10^{-6}$/°C) in the thermal stability range. The MTT (microculture tetrazolium) assay showed that both HA and HA-TiO_2 samples are biocompatible, even at high concentration of the samples (50 mg/ml). The addition of TiH_2 to hydroxyapatite followed by TSS sintering may lead to the formation of a composite with improved thermal properties and without affecting the material biocompatibility.

Biography

Cornelia Marinescu has completed her PhD in 2009 from University of Bucharest. She is junior researcher at the "Ilie Murgulescu" Institute of the Physical Chemistry. She has participated at more than 27 national and international projects.

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