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Heat treatment effect on structure and in vitro bioactivity of titanosilicate microspheres

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*Heat treatment effect on structure and in vitro bioactivity of titanosilicate microspheres*M. Todea^{a,b}, M. Muresan-Pop^a, A. Vulpoi^a, S. Simon^{a*}, D. Eniu^b^a *Institute of Interdisciplinary Research on Bio-Nano-Sciences, Babes Bolyai University, 400084, Cluj-Napoca, Romania*^b *Department of Molecular Sciences, Faculty of Medicine, Iuliu Hațieganu University of Medicine and Pharmacy, 400349, Cluj-Napoca, Romania***Abstract**

Titania–silica based systems are among the materials investigated for biomedical applications. TiO₂-SiO₂ microspheres studied in this work were prepared by spray-drying method. The amorphous as-prepared samples were heat treated at different temperatures up to 1000 °C. The study was carried out with the aim of assessing the effect of treatment temperature first on the microspheres structure, concerning both the crystallization process and the changes in the atomic environment of the component elements, as well as on the microspheres bioactivity tested in vitro, using XRD, FTIR and XPS analyses. XRD results show that the only crystalline phase developed up to 1000 °C inclusively is anatase. In contrast to TiO₂ rutile form, the anatase would promote in the body fluid the self-assembling of hydroxyapatite type phases and thereby contribute to bioactivity enhancement. The structural changes are less evidenced by FTIR analysis, but they are well indicated by XPS results with respect both to heat treatment temperature and bioactivity tested in simulated body fluid.

Keywords: titano-silicate; XPS; FTIR; XRD; SBF; anatase; bioactivity

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