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Thermal and spectral behaviour of some biocompatible powder particles for bone reconstruction

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It is well-known that the hydroxyapatite (HAP) is widely used for bone grafts manufacturing [1]. For the same purpose, our research uses biocomposite mixtures made of micronic (av. 100 μm) respectively submicronic (< 200 nm) HAP particles (> 60 % mass) and titanium powders (20-30 % mass) [2]. Beyond these components, the mixtures content citric acid (1-3 % mass) and foaming agents as $CaCO_3$ and NH_4HCO_3, each of (1-2) % in order to obtain the required density related to the grafted cortical respectively trabecular bone tissue.

In order to depict the thermal effects during the heating in argon, the thermal analysis was developed. The TA thermoanalytical curves from Fig. 1 a show the thermal behaviour of the biocomposite mixture. Its organic bonds are underlined by FTIR analysis in Fig.2.

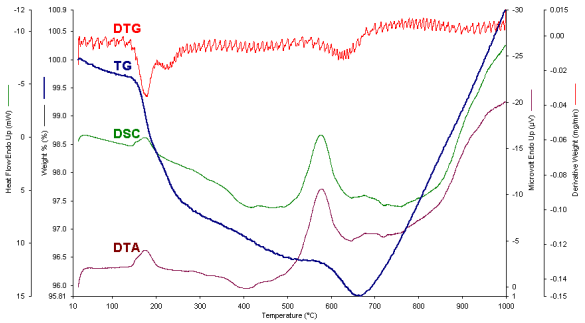

Fig. 1

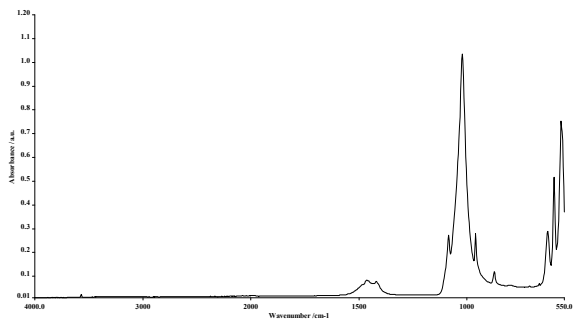

Fig. 2

Decomposition of the sample takes place in three stages to a temperature of 650 °C. In the first stage (weak endothermic), loss of mass is 2.5 %. The second step (very weak exothermic) shall be carried with mass loss of 1 %. In the third stage (strongly endothermic), loss of mass is 0.8 %. From 650 °C, the porous sample absorbs argon from the gas stream, increasing its mass by 5.1 %. This phenomenon frequently occurs in the case of porous materials located in argon.

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[2] I.C. Pascu, O. Gingu, P. Rotaru, I. Vida-Simiti, A. Harabor, N. Lupu, J. Therm. Anal. Calorim, 113 (2013) 849