HIGH ASPECT RATIO HYDROXYAPATITE FOR LOW DENSITY AEROGELS

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Abstract

Aerogels are materials with huge potential for a number of applications such as thermal insulation, catalyst carriers, electrodes or flame retardant materials, etc [1]. HA is a well-known biocompatible material [2]. Making this material in the shape of aerated low-density structures brings advantages regarding, among others, the bone cells growth inside this ceramic matrix, with high potential to improve the biocompatibility aspects [3, 4]. The aspect ratio of the original crystals is one of the factors that plays an important role in obtaining tridimensional structures. The purpose of the present study was to obtain tridimensional low density structures based both on a high aspect ratio and pseudo-spherical HA particles.

Two HA samples were prepared, one by simple precipitation, and the other by precipitation followed by hydrothermal crystallization at 200°C. The synthesized materials were used in order to obtain low density tridimensional structures by applying the freeze-drying method.

Both samples were further used as aqueous suspension, frozen at -25°C for 18h, then freeze-dried for 18h and sintered at 750°C, heating rate 5 deg/min, and naturally cooled to room temperature. The powders were characterized by SEM, XRD and FT-IR, and the freeze-dried structures were studied by SEM.

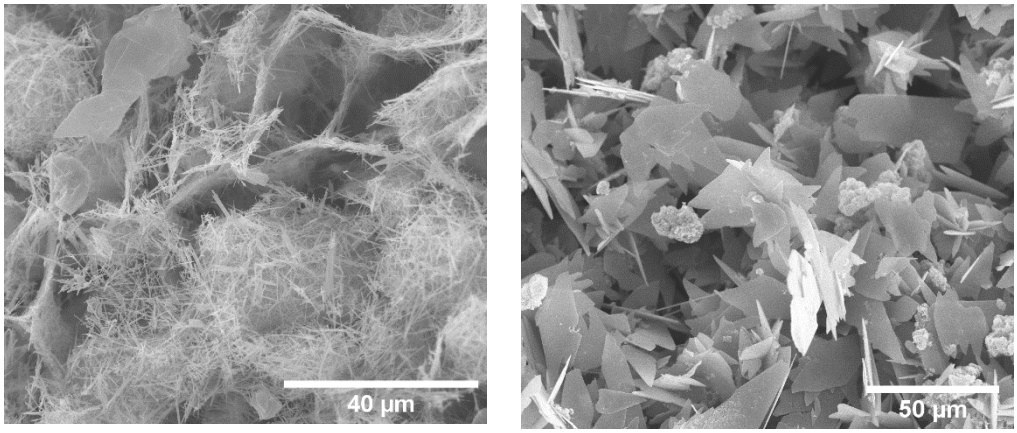

Fig. 1 SEM images of tridimensional freeze-dried structures: left – from hydrothermally synthesized HA; right – from precipitated HA

The results proved the formation of pure phase HA powders. The hydrothermal treatment leads to the improvement of the crystallinity and aspect ratio of the particles. As a result of the hydrothermal treatment, long crystals with lengths of 5-10 µm and widths of 0.1-1 µm are formed, superstructured in highly porous microspheres. Using particles with a large shape coefficient (nanowires) obtained hydrothermally, aerogels of the same porosity but with higher mechanical strength can be obtained than by using precipitated particles

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