Sr- substituted phosphates tube-like particles are potential biomaterials

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Tube-like particles have been employed in several fields due to their special properties. In particular, the high surface area; high mechanical, thermal and chemical resistance; excellent flexibility, and low density make these kind of particles potential candidates for biomedical research and application.[1] Despite these exciting features, the use of these materials *in vivo* is limited by the lack of knowledge about their toxicity, biocompatibility, and bioactivity, so additional efforts to improve their specific biological responses are required. Combining the tubular geometries with biological response of biominerals consists in a promising strategy to develop new biocompatible and bioactive materials. Besides, Sr has become increasingly popular in osteoporosis treatments due to its ability to enhance bone volume and prevent bone loss.[2] In this sense, we present the formation and characterization of a series of hybrid tube-like particles based on Ca and Sr phosphates aiming the association of the biocompatibility of biominerals to the mechanical properties of the tube-like nanoparticles that mimic the nanofiber arrangement of the bone tissue.[3] To this end, polycarbonate membranes with 200 and 400 nm pore size were used as templates via immersion into the PAA/$CaCl_2$ or PAA/$SrCl_2$ solutions, followed by exposition to CO_2(g)-saturated atmosphere. The Sr^{2+}/Ca^{2+} molar ratios were 1, 0.5 and 0.1. The bioactivity of the particles was evaluated by immersion in a simulated body fluid (SBF) for 5 days. Scanning electron microscopy (SEM) images (FIG 1) showed that the particles exhibit well-defined tube-like morphology with diameter of 200 and 400 nm. Infrared spectroscopy revealed that the particles are composed by phosphate. SEM images, infrared spectroscopy and x-ray diffraction data showed the formation of apatite after the exposure of the particles to SBF, attesting their bioactivity. The overall results indicated the potential application of the particles as bioactive material in biomimetic matrixes to stimulate the bone formation.

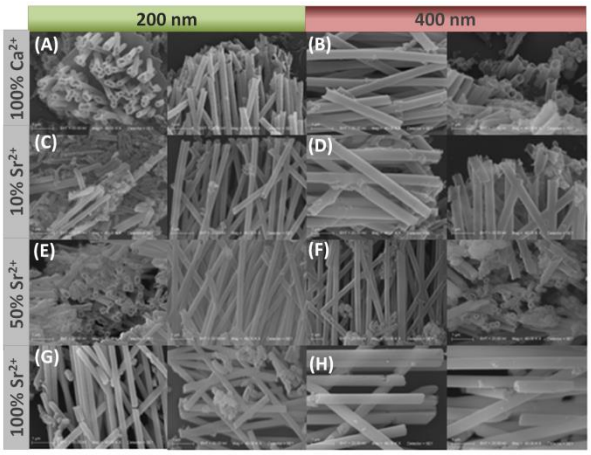

Fig. 1: SEM images of tube-like structures containing 100% Ca, 10%, 50% and 100% Sr^{2+} with 200 nm (A, C, E, G) and 400 nm (B, D, F, H) .

[1] Sharma, Priyanka, et al. *Curr Drug Deliv*, **2015**, 12.

[2] Li, Z. Y., et al. *Biomaterials*, ***2007***, *28*, 1452-1460.

[3]A. Rajyalakshmi, B. Ercan, K. Balasubramanian, T. & Webster, *Int. J. Nanomed*, **2011**, 6, 1765-1771.

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