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Biphasic Si-Ca-P ceramic for regenerative medicine: Scaffold processing and biocompatibility

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The present study refers to the preparation and biocompatibility characterization of a biphasic Si-Ca-P scaffolds to be used as matrices for bone regeneration or as-specific release vehicles. Ceramics are widely used for bone tissue engineering purposes and in this study, a Si-Ca-P biphasic porous scaffold, with nominal composition 28.39 wt% $7CaOP_2O_52SiO_2$-71.61wt% $5CaOP_2O_5SiO_2$ was produced using the polymer replication method of homogeneous mixtures of fine synthetic $7CaOP_2O_52SiO$ and $5CaOP_2O_5SiO_2$ powders. Polyurethane sponges were used as templates and impregnated with ceramic slurry at different ratios, and sintered at 1450ºC during 2 hours with 5ºC/min as heating and cooling rates. The characteristics of the Si-Ca-P porous scaffolds and respective powder used as starting material were investigated by using SEM, particle size distribution, XRD and Hg porosimetry techniques. It was possible to produce highly porous biphasic Si-Ca-P scaffolds presenting micro and macropores and pore interconnectivity. In addition, bioactivity was evaluated by examining *in vitro* apatite formation in simulated body fluid (SBF) for several periods of time. The experimental results demonstrated that, during soaking in SBF the porous surface of the ceramic became coated by HA-like layer after 6 hours. Also, *in vivo* biocompatibility was tested by implantation in NZ rabbits´ tibia. All animals survived the 6 months study period without evidence of inflammation or infection at the implantation site and strong adhesion between bone and the scaffolds was observed. The first results of *in vivo* tests on NZ rabbits showed good biocompatibility and osteointegration of the porous scaffolds implants, with higher osteoconductive properties and earlier bioresorption.

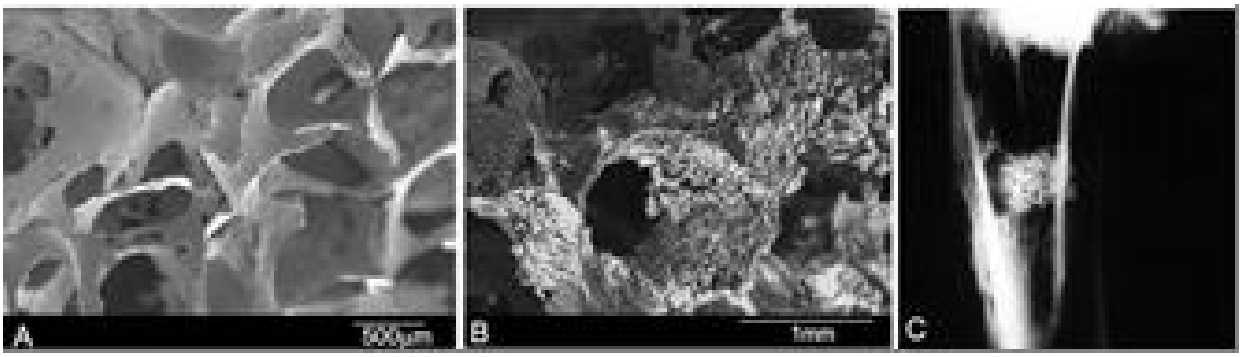

Figure 1: (A) SEM view of the biphasic Si-Ca-P scaffolds (B) scaffold after 5 days SBF soaking and (C) antero-posterior X-ray of the bone section contained the implant after 3 month implantation.

Biography

De Aza P N received her Doctoral degree in Chemistry-Ceramin in 1995. She did a Post-doctoral degree at the IRC in Biomaterials at the Queen Mary College, University of London (UK) working on *in vitro* and *in vivo* behavior of bioceramics. At this moment, she is the Chair of the Materials Science, Optic and Electronic Technology department, Professor of Materials Science and Metallurgical Engineering and Researcher at the Bioengineering Institute at the Miguel Hernandez de Elche University.

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