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A Si-αTCP scaffold for biomedical applications: a morphological, histological and histomorphometric study in an animal model

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We herein, hypothesize that bioceramics with an appropriate architecture made of Si-αtricalcium phosphate (Si-αTCP) meet the biocompatibility and biological safety requirements for bone grafting applications. Polyurethane sponges were used as templates, soaked with ceramic slurry at different ratios and sintered at 1400°C for 3 h at heating and cooling rates of 5°C/min. Four critical size defects of 6 mm Ø were created in 15 NZ tibias. Three working times were established as 15, 30 and 60 days. A highly porous Si-αTCP scaffold with micro and macropores and pore interconnectivity was produced by the polymer replication method. Considerably more bone formation took place in the pores and the periphery of the implant for the Si-αTCP scaffolds than for the control group. The ceramic scaffold (68.32% ± 1.21) generated higher bone-to-implant contact (BIC) percentage values (higher quality, closer contact) than the control group, according to the histomorphometric analysis, and defect closure was significant compared with the control group. The highest percentages of BIC and bone formation were found after 60 days of implantation. We successfully prepared bioactive porous Si-αTCP scaffolds with a highly porous large-pore microstructure by a polymer replication method. The porous Si-αTCP scaffolds possess high porosity, a large pore size, as well as improved mechanical strength compared to other β-TCP scaffolds obtained by the same method. Within the limitations of this *in vivo* rabbit study, it may be stated that the porous Si-αTCP scaffolds are a valid effective alternative to other materials used for bone tissue engineering.

Biography

Piedad N de Aza received her Doctoral Degree in Chemistry-Ceramics in 1995. She did a Post-doctoral stage 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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