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Lanthanides doped glass-reinforced hydroxyapatite (GR-HA) composites with antibacterial properties as bone substitutes

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Abstract

Bone is a connective tissue associated to a high number of health problems. Thus, the need to search new methods/treatments to bone repair or regeneration arises as an issue of great interest. Autografts, which present the best clinical outcome, have some limitations including patient pain and limited supply. Allografts and xenografts also present complications, such as imunocompatibility and/or possibility of disease transmission. Lanthanides such as cerium and samarium doped hydroxyapatite composites are in the focus of interest for bone related biomaterial applications since they can replace calcium in bones and cause local activation of osteoblasts. Due to this ability to modulate the bone regeneration process, the inclusion of lanthanides on synthetic bone grafts has been evaluated. These composites have the ability to release, in a controlled way, bioactive species, promoting a better bone regeneration. Besides the bioactivity, the success of a bone graft depends also on the capacity to avoid infections, since bacterial infections after implantation are responsible for negatively affect the patients' recovery process. Thus, the main goal of this work was to develop a Glass-Reinforced Hydroxyapatite composite doped with lanthanides, in order to simultaneously promote the biomaterial bioactivity and antibacterial ability. Therefore, bacterial adhesion on the two doped composites was studied using the three main bacteria involved in orthopaedic implant-associated infections, *Staphylococcus aureus, Staphylococcus epidermidis* and *Pseudomonas aeruginosa.* The accomplished results demonstrated that the cerium and samarium doped composites have potential to decrease bacterial adhesion without compromising osteoblast-like cells viability, gathering important features as a successful bone substitute**.**

Biography

Sooraj has completed his Ph.D. in the year 2002 from Sri Venkatestwara University, Tirupati, India and postdoctoral studies in 2008 from INEB- Institute de Engenharia Biomédica, University of Porto, Portugal. Now he is a Senior Researcher at INESC Porto/Department of Physics, University of Porto. Also, he is a senior collaborative Researcher in the Company – Biosckin, S. A, Portugal. He has published more than 55 papers in reputed journals, 7 book chapters and editor of 3 books. Also, he had been nominated and representative for two EU cost actions from Portugal. Further, he is acting as a working group leader in the cost action on materials (soft, bio and nano) and technologies for optofluidic devices.