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The *in vitro* response of osteoclast-like and osteoblast cells to electrospun calcium phosphate biphasic candidate scaffolds for bone tissue engineering

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Successful long term bone replacement and repair still remains a challenge today. Nanotechnology has made it possible to alter the properties of biomaterials and therefore offer major improvements in the biological performance of biomaterials. In this study, biphasic (hydroxyapatite/β-tricalcium phosphate (HA/β-TCP)) nanobioceramic scaffolds were prepared by the electrospinning technique in order to mimic the extracellular matrix (ECM). Scaffolds were characterised by scanning electron microscopy (SEM) and Attentuated Total Reflectance Fourier Transform Infrared (ATR-FTIR). Osteoblasts, as well as monocytes that were differentiated into osteoclast-like cells, were cultured separately on the biphasic bioceramic scaffolds for up to 6 days. Proliferation, adhesion and cellular response were determined using lactate dehydrogenase (LDH) cytotoxicity assay, nucleus and cytoskeleton dynamics, analysis of the cell cycle progression, measurement of the mitochondrial membrane potential and the detection of phosphatidylserine expression. For the osteoblast cells further studies included Alizarin Red-S staining to visualise mineralisation of the cells, intra-cellular calcium concentration and nitric oxide detection as well as confocal studies on the enzymes inducible nitric oxide synthase (iNOS) and endothelial nitric oxide synthase (eNOS) expression. SEM analysis of the biphasic bioceramic scaffolds revealed nano fibers spun in a mesh-like scaffold. Results indicate that the biphasic bioceramic electrospun scaffolds are cytocompatible and have no significant negative effects on either osteoblasts or osteoclast-like cells *in vitro*.From this data, it can be concluded that the electrospun biphasic scaffolds can possibly be used in bone tissue engineering candidates for adherence and growth of osteoclast-like and osteoblast cells.

Biography

Ilse Wepener holds a Masters degree in Biochemistry from Stellenbosch University. She is submitting her doctoral thesis in the Department of Physiology at the University of Pretoria. She was awarded merit bursaries for all her studies and awarded the “Best Student Poster Gold” at the ICFPAM in 2011. She was nominated in 2013 by the South African Department of Science and Technology to attend the Lindau Nobel Laureatte Meeting in Germany. She is a permanent researcher and project manager at the CSIR in the Smart Polymers group and reviews manuscripts for journals and proposals for funding on a regular basis.

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Ultrasonic characterization of co-additives effects on elastic moduli and acoustic properties of $Li_{1-x}Co_x Fe_2O_4$

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Acoustic microscopes can be used to measure Rayleigh and longitudinal wave speeds in a specimen at microscopic resolution. The wave speeds are obtained from the interference pattern as a function of the defocus distance or V (z) curve. The received signal voltage amplitude V is generated by two beams the normally reflected central beam and a nonspecularly reflected beam that strikes the fluid-solid interface at critical angle. In this context, we derive novel analytical expressions for co-additives effects on E, G, Poisson ratio, ν, longitudinal velocity, (V_L) and transverse velocity, (V_S). Such effects are also put into evidence for both reflectance functions, R(θ) and acoustic signatures, V(z). The elastic properties of lithium cobalt mixed ferrites of different compositions from the experimentally and simulation observed that the values of longitudinal (V_L) wave velocities vary form 5072 m/s to 6833 m/s whereas transverse velocities (V_S) from 3084 m/s to 4105 m/s. Moreover, Young's (E) and Bulk (n) moduli evaluated from the sound velocities as a function of cobalt dopping and this moduli are increasing with increasing cobalt content. The Poisson's ratio for all the samples was centered around a value of 0.2. The variation of the elastic moduli with composition was interpreted in terms of the binding forces between the atoms.

Keywords: Mechanical properties $Li_xCo_x Fe_2O_4$, Acoustic signature, SAW velocities

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