

The Use of Electrospinning for Preparation of Biodegradable Polyester Scaffolds for the Tissue Engineering. Introduction of Nanoporosity

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The modification of bioactive surfaces, e.g. sintered Bioglass pellets and scaffolds, by nanostructured features is highly desirable to enhance the attachment of osteoblast cells for tissue engineering applications. In this research the combination of Bioglass substrates and polymer nanofibres has been investigated. Bioactive glass-ceramic scaffolds were fabricated using the recently developed foam replica technique. Fibre meshes were prepared from poly(caprolactone), PCL, poly(3-hydroxybutyrate), PHB, and copolymer poly(3-hydroxybutyrate-co-hydroxyvalerate), PHBV, with the use of electrospinning method. The aim of the research was modification of porosity of fibrous media, to be deposited on the bioactive glass surfaces, with the purpose to promote cell adhesion and proliferation. Two strategies were employed: the change of solvent system used for the electrospinning (influence on the fibre porosity) or addition of water-soluble polymer poly(ethylene oxide), PEOX, that was subsequently dissolved to leave porous free spaces through the fibre. The electrospinning process was optimised to obtain materials of desired properties. Electrospinning was observed by ultra-fast camera. Materials were characterised by means of optical and Scanning Electron Microscopy (SEM). Polymer coated bioactive glass surfaces were further investigated in simulated body fluid to assess their acellular bioactive behaviour.