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Increased Osteoblast Adhesion Densities on High SurfaceRoughness and on High Density of Pores in NiTi Surfaces

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NiTi alloy is widely used innumerous biomedical applications (orthodontics, cardiovascular, orthopaedics, etc.) for its distinctive thermomechanical and mechanical properties such asshape memory effect, super elasticity, low elastic modulus and high dampingcapacity. However, NiTi alloy is still a controversial biomaterial because ofits high Ni content which can trigger the risk of allergy and adverse reactionswhen Ni ion releases into the human body. In order to improve the corrosionresistance of the TiNi alloy and suppress the release of Ni ions, many surfacemodification techniques have been employed in previous literature such asthermal oxidation, laser surface treatment, sol-gel method, anodic oxidationand electrochemical methods. In this paper, the NiTi was electrochemicallyetched in various electrolytes to modify surface. The microstructure, elementdistribution, phase composition and roughness of the surface were investigatedby scanning electron microscopy (SEM), energy-dispersive X-ray spectrometry(EDS), X-ray diffractometry (XRD) and atomic force microscopy (AFM). Systematiccontrolling of nano and submicron surface features was achieved by altereddensity of hydro fluidic acid in etchant solution. Nanoscale surfacetopography, such as, pore density, pore width, pore height, surface roughnessand surface tension were extensively analyzed as systematical variables.Importantly, bone forming cell, osteoblast adhesion was increased in highdensity of hydro fluidic treated surface structures, i.e., in greater nanoscalesurface roughness and in high surface areas through increasing pore densities.All results delineate the importance of surface topography parameter (pores) inNiTi to increase the biocompatibility of NiTi in identical chemistry which iscrucial factor for determining biomaterials.

Keywords: NiTialloy, Osteoblast, roughness, AFM, cell adhesion

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Fabrication and characterization of PCL/TCP-coated PHBVcomposite multilayer as a bone plate

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In this work, Poly(ε-Caprolactone)(PCL) andpoly(3-hydroxybutyrate-co-3-hydroxyvalerate)(PHBV) mats were fabricated usingelectrospinning process. The electrospinning process is a simple and efficientmethod to fabricate the nanofibrous mats. PCL and PHBV is a kind ofbiodegradable polymer but their mechanical properties aren't good. For improving mechanical properties, PHBV mats were coatedby TCP. Using PCL mats and TCP-coated PHBV composite mats, a bio-resorbablebone plate were made by pressing. Detailed micro-structural characterizationwas done by SEM techniques. Tensile strength and bending strength were alsoevaluated for mechanical properties. The cytotoxicity evaluation ofPCL/TCP-coated PHBV composite multilayer was done by MTT assay. The evidenceobtained in this work implies the potential for use as a biodegradable boneplate.

Keywords: PCL, PHBV, TCP, electrospinning, bone plate