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&

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XII WRTCS

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Nanostructured surface modification and characterization of titanium based materials for medical application

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Nanostructured surface of Ti-13Nb-13Zr alloy (coarse-grained (CG), and ultrafine-grained (UFG), obtained by high pressure torsion - HPT) was formed using electrochemical anodization in the 1M H_3PO_4 + NaF electrolyte, during 30, 60, 90 and 120 minutes. The scanning electron microscopy (SEM) was used to characterise the morphology of the surface, while chemical characterization of the obtained nanostructured surface was performed using energy dispersive spectroscopy (EDS). The surface modulus of elasticity and hardness before and after the surface nanostructure modification, was examined using the nanoindentation test, while the analysis of deformation and damage of the nanostructured surface after nanoindentation was performed using SEM. Cytotoxicity of the tested alloys and cell culture viability were assessed using the tetrazolium salt colorimetric test (MTT test) using mouse fibroblasts (L-929) and human lung fibroblasts (MRC-5) in liquid medium. Morphology and adhesion of cells on the surface were analysed using SEM. The obtained results indicate the strong influence of time, as a parameter of anodization, on the surface morphology. Influence of the HPT processing on the homogeneity of the nanostructured surface obtained by electrochemical anodization has also been shown. The alloys before and after the surface nanostructure modification are adequate in their biocompatibility for use in the implantology. Characterization of the titanium-based materials surface using nanoindentation showed a decrease in the values of modulus of elasticity and hardness for materials with nanostructured surface, which are close to the values of bone tissue in the human body.