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In vitro cytocompatibility of the new bioalloy with superior performances in simulated extra-cellular fluids

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A new Ti-25Ta-5Zr alloy based only on non-toxic and non-allergic elements was elaborated in as-cast and thermo-mechanical processed states in order to be used as candidate material for implant applications. The new alloy has a microstructure with dendritic crystallites, till 200 μm in as-cast state and a more homogeneous microstructure with equiaxed β grains, till 50-70 μm, containing fine submicron acicular α phase in thermo-mechanical state. The interface between alloy and simulated extra-cellular fluids was characterized by a nobler, passive electrochemical behavior of the processed alloy than of the as-cast one, due to its finer microstructure obtained after thermo-mechanical treatment. Corrosion and ion release rates exhibited the lowest values for the recrystallized alloy as result of its more favorable microstructure. Impedance spectra denoted a more protective passive film. The processed alloy showed more electropositive values of its open circuit potentials, representing a better stability than the as-cast alloy. These potentials tended to more electropositive values in time, suggesting the strengthening of the processed alloy passive state. Scanning electron microscopy confirmed some depositions from solutions that contain calcium, phosphorous and oxygen ions (detected by energy dispersive X-ray analysis), namely calcium phosphate. *In vitro* tests performed on pre-osteoblastic MC3T3-E1 cells revealed that Ti-25Ta-5Zr alloy both in as-cast and recrystallized states exhibits good cytocompatibility and that thermo-mechanical treatment endows the alloy with superior biological performances in terms of cell adhesion and proliferation.

Biography

P Drob has completed his PhD at the age of 30 years from "Politehnica" University of Bucharest and postdoctoral studies from Institute of Physical Chemistry "Ilie Murgulescu" of Romanian Academy. She is Senior Researcher at Institute of Physical Chemistry "Ilie Murgulescu", Bucharest, Romania. She has published more than 110 papers in reputed journals concerning the alloying elements effect on corrosion resistance of metallic biomaterials, passive film formation and their stability, corrosion and passivation mechanisms.

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Non visible science and their visible applications in biology

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Cancer is caused by damage of genes which control the growth and division of cells. Cancer nanobiotechnology is an interdisciplinary area of research in science, engineering, and medicine with broad applications for molecular imaging, molecular diagnosis and targeted therapy. A wide range of materials may be used to construct nanoparticles that can solubilize chemotherapeutics to increase the capability of delivery or to provide unique optical, magnetic, electrical and structural properties for imaging and therapy. Nano Particles (NPs) being of a few of Nano meters size and the cells being of the size of few microns, NPs can enter inside the cells and can access the DNA molecules/genes and therefore, there is a possibility that the defect in the genes can be detected. In the nanotechnology methods, certain NPs can be designed to absorb preferentially certain wave length of radiation and if they enter in the cancerous cells, they will burn them. These multiplexed nanoparticles may be able to identify malignant cells by means of molecular detection, visualization of their location in the body by providing enhanced contrast in medical imaging techniques, killing tumors cells with minimal side effects through selective drug targeting, and monitoring treatment in real time. The review's basic approach is the defining features of cancer nanotechnology are embedded in their breakthrough potential for design and development of nanomaterial based drugs.

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