Structural and microstructural analysis of Ti-25Ta-10Zr for biomedical applications

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Resumo:
Titanium is widely used as biomaterial because of its good corrosion resistance, good mechanical strength/density ratio, relatively low modulus and good biocompatibility. Currently there is a search by beta-type titanium alloys, that can be obtained through the addition of beta-stabilizers elements, that change the microstructure and mechanical properties. Tantalum is an element beta-stabilizer, with high melting temperature, high mechanical strength, high hardness and corrosion resistant. Zirconium is a neutral element in titanium alloys, their addition in the alloy improves the mechanical resistance and corrosion, besides improving the biocompatibility. This work aims to prepare and characterize a ternary titanium alloy, Ti-25Ta-10Zr, aiming biomedical applications. The alloy was melted using an arc-furnace. Structural analysis of the sample was performed by means of x-ray diffraction technique. The microstructural characterization was performed by scanning electron microscopy measurements. Vickers microhardness measurements were performed, too. In the x-ray diffractogram were observed peaks of martensitic alpha’ and alpha’’ phases, indicating the existence of hexagonal compact and orthorhombic crystalline structures. By scanning electron microscopy, it was verified the presence of small intra-grain needles, characteristics of martensitic alpha’ and alpha’’ phases. The micrographs corroborate the results obtained in x-ray diffraction measurements. The values of hardness were greater than the cp-Ti due to the action of the substitutional elements, which are harder agents, restricting the movement of dislocations in the atomic plans.(Financial support: CNPq e FAPESP).