Titanium, due to its corrosion resistance, good ratio mechanical resistance/density, biocompatibility and elastic modulus relatively low compared to Co-Cr alloys and stainless steel, is very used as biomaterial. In order to obtain the decrease of the elastic modulus, changes in the microstructure and mechanical properties are need and, alloys of the \( ? \)-type, are the most promising. These alloys, from of the addition of a \( ? \)-stabilizer element, present high melting point, high mechanical resistance, high hardness and corrosion resistance, due to its extremely strong interatomic bond. Zirconium is considered a neutral element in titanium alloys. Both elements exhibit similar chemical properties and its addition in the alloy results in improved mechanical and corrosion resistance and besides improve the biocompatibility.

This work has as objective the preparation and characterization of ternary titanium alloy, having tantalum and zirconium as substitutional elements (Ti-25Ta-10Zr). The alloy was melting in an arc-furnace with controlled atmosphere of inert argon, water cooled copper crucible and non-consumable tungsten electrode. The analysis of the material structure was performed using the x-ray technique, quantified by the structural refinement of Rietveld. The diffractometer used was a Rigaku D/Max 2100PC. The microstructural characterization was performed by means of scanning electron microscopy using a Carls Zeiss microscope, model EVO-015. The Vickers microhardness measurements were performed in a microdurometer Shimadzu HMV-2, with a load of 200 g and time of 60s. Through diffractograms, it can be verified peaks characteristics of the martensitic \( ? ' \) and \( ? '' \) phases, with compact and orthorhombic hexagonal phase. The presence of small intra-grain needles was observed by microscopy indicating the presence of the martensitic phases \( ? ' \) and \( ? '' \). The micrographs corroborate the results obtained in x-ray diffraction measurements. Comparing the hardness values of the Ti-25Ta-10Zr alloy with cp-Ti, it was observed that the Ti-25Ta-10Zr sample showed a higher hardness, due to the action of the hardening agents, that is, the substitutional elements, which restrict the dislocations motion. (Support: CNPq and FAPESP).