# THERMOMECHANICAL TREATMENTS OF Ti-10Mo-30Zr BETA ALLOY FOR BIOMEDICAL APLICATIONS

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## ABSTRACT

Titanium is one of the most utilized metals as a manufacturing element for orthopedic implants. This element has very interesting aspects, such as excellent mechanical and biological properties, because of its interest in biomedical applications. Titanium, as a pure element, has dimorphism, that is, has a compact hexagonal structure, alpha phase, stable until 862°C and for temperatures above it, reveals a body-centered cubic structure, beta phase. Heat treatments aim to reduce the residual stress of melting or deformations in some materials, increasing their ductility, hardness, and corrosion resistance. Molybdenum makes part of an element set called β stabilizers. These elements, when mixed with titanium, reduce the transition temperature of α to β phase. Zirconium increases the corrosion resistance and biocompatibility of the alloy. The alloys with the predominance of beta phase are the most desirable for biomedical application due to their higher mechanical compatibility with the bone tissue. The present work presents the preparation and characterization of the Ti-10Mo-30Zr (wt%) alloy by measurements of density, energy dispersive spectrometry (EDS), X-ray diffraction (XRD), optical (OM), scanning electron microscope (SEM), Vickers hardness, Elastic modulus, and biocompatibility. The density values of the alloy were higher than that of pure titanium due to the addition of the zirconium and molybdenum. The EDS measurements reveal a

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suitable stoichiometry of the elements and no impurities contamination. In the XRD measurements, it was observed only peaks characteristics of beta phase. In the OM and SEM micrographs, the grains that are characteristic of the β phase were observed. The Vickers hardness and the elastic modulus measurements showed a high hardness and low elasticity modulus, an advantage over implant tissue mechanical compatibility, decreasing the stress shielding effect. No cytotoxic effects were observed in the measurements.

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