# EFFECT OF HEAT TREATMENTS ON SOME PROPERTIES OF Ti-10Mo-Mn FOR BIOMEDICAL APPLICATIONS

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## ABSTRACT

Titanium alloys have been extensively studied due to having favorable properties for their use as biomaterials. Recent studies have looked for beta-type alloys that have a low elastic modulus. For this, adding beta-stabilizer elements, such as molybdenum and manganese, to titanium is an interesting point. Heat treatment is the act of heating the material to a specific temperature and cooling it after some time, under conditions established to give the unique material properties. This study aimed to develop new Ti-10Mo-xMn (x=0, 2, 4, 6, and 8 wt%) alloys and study the influence of heat treatments on some properties of the produced alloy. The alloys were melting in an arc-furnace. Homogenization heat treatment was conducted at 1000 °C for 24 hours in a $10^{-6}$ torr vacuum. Hot rolling was performed at 1000 °C with air cooling. The solubilization heat treatment was conducted at 900 °C for one hour in a $10^{-6}$ torr vacuum, followed by water cooling. The aged heat treatment was performed at 300, 600, and 900 °C for 1, 3 and, 6 h in a vacuum of $10^{-6}$ torr, with quick cooling with water. The chemical composition was analyzed by EDS and density measurements, whose results showed that the stoichiometry was well respected. The structure was studied by XRD, with the Rietveld method, where the predominance of the beta phase was observed. OM and SEM analyzed the microstructure, and SEM analyzed the microstructure. The micrographs reinforce the results obtained in the structural characterization. The elastic modulus and Vickers microhardness analyzed the mechanical properties. The initial electrochemical characterization was studied by OCP and PD, which shows that the corrosion potential of

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the alloys was higher than that of commercial alloys. Qualitatively, alloys showed higher corrosion resistance than commercial alloys. No cytotoxic effects were observed in all studied alloys. Favorable properties values were presented, with the alloys having great potential for application as biomaterials.

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