STUDY OF THE HEAT TREATMENTS IN A Ti-15Zr-xMo ALLOY

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1. Introduction

Titanium and its alloys are widely used as biomaterials with applications in both dental and orthopedic implants. For titanium alloys with a defined composition, heat treatments allow microstructure modification, hence alteration in the mechanical properties of the material, which might open new potential applications of the alloy in biomedical applications [1].

This study provides a detailed study of heat treatment conditions of alloys belonging to the Ti-15Zr-xMo system. The aim is to optimize its mechanical properties for use in orthopedic implants systems.

2. Experimental

The alloys were melted in an arc voltaic furnace, with four different alloys compositions: Ti-15Zr, Ti-15Zr-5Mo, Ti-15Zr-10Mo and Ti-15Zr-15Mo, allowing samples with α, α+β and β phase microstructures to be obtained. The heat treatments were performed with 600ºC/6h, 12h and 24h, 900ºC/8h and 1000ºC/8h. For the heat treatment conditions, it was performed XRD, Rietveld analysis, microstructural analysis and microhardness measurements.

3. Results and Discussions

For the as cast conditions, EDS analysis were realized where a study on the chemical composition of the samples was performed. It was determined that the alloys were cast with good quality and without the presence of agglomerates, porosity or segregates.

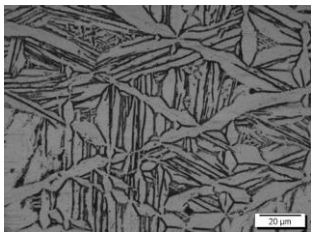

Fig. 1. *Optical microscopy of Ti-15Zr alloy.*

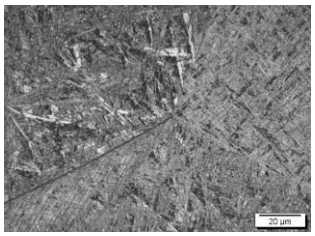

Fig. 2. *Optical microscopy of Ti-15Zr-5Mo alloy.*

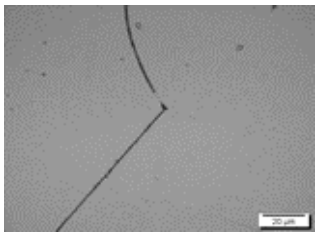

Fig. 1. *Optical microscopy of Ti-15Zr-10Mo alloy.*

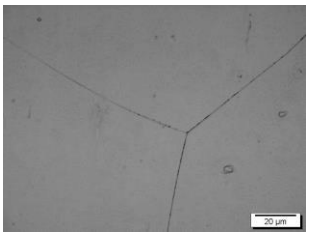

Fig. 1. *Optical microscopy of Ti-15Zr-15Mo alloy.*

For Ti-15Zr alloy, it was only possible to observe the presence of a lamellar structure composed of α phase. On the other hand, the Ti-15Zr-5Mo alloy has a microstructure of a β phase matrix with fine needle of α phases at the grain boundaries. The Ti-15Zr-10Mo and Ti-15Zr-15Mo alloys showed only beta type grain boundary. The results concerning the effects on the microstructure and microhardness for the heat treatment conditions will be discussed.

4. References (bold face Times New Roman 11 pt)

Li, C., et al. *Journal of Alloys and Compounds* 627 (2015): 222-230.

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