PREPARATION AND MICROSTRUCTURAL CHARACTERIZATION OF TI-25Ta-Zr ALLOYS

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1. Introduction

Titanium is a transition metal that has an allotropic transformation around 883° C. Below this temperature, its crystalline structure is hexagonal compact (α phase). Above this temperature it has cubic body-centered cubic crystalline structure (β phase) [1]. Zirconium has an allotropic transformation similar to titanium, around 862° C. Molybdenum has body-centered cubic crystalline structure [2]. Titanium can present metastable phases, preventing the rearrangement of atoms by means of atomic diffusion or mechanical strain. These are the martensitic α' (distorted hexagonal crystalline structure) and α'' (orthorhombic structure), and ω (trigonal or hexagonal structure) phases. The objective of this study was produce Ti-25wt%Ta alloys as base material, being varied the zirconium concentration in 10, 20, 30 and 40wt%, for biomedical applications

2. Experimental

The melting of the alloys was performed using an arc-melting furnace. The samples were characterized by density measurements using Archimedes' principle, x-ray diffraction using the powder method and scanning electronic microscopy. The diffractograms were analysis by Rietveld's method.

3. Results and Discussions

X-ray measurements and Rietveld's analysis revealed the presence of α' + α" + β in the Ti-25Ta-10Zr, α" + β for Ti-25Ta-20Zr and Ti-25Ta-30Zr, and only β for the Ti-25Ta-40Zr. These result were corroborated by microscopy results, with a microstructure composed by grain of β phase and needles of the α' and α" phases in the region intra-grain.

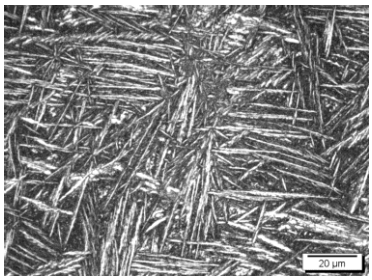

Figure 1: Micrograph of Ti-25Ta-10Zr

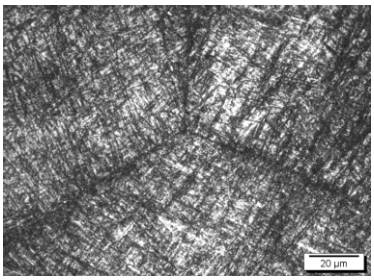

Figure 2: Micrograph of Ti-25Ta-20Zr

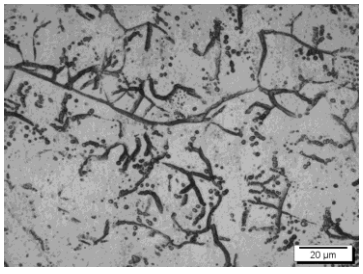

Figure 3: Micrograph of Ti-25Ta-30Zr

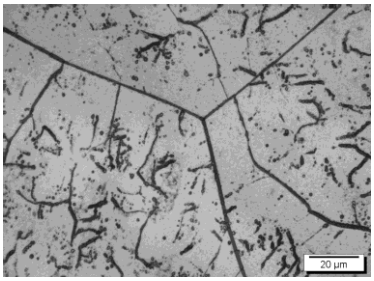

Figure 4: Micrograph of Ti-25Ta-40Zr

4. References

[1]- C. M. Lee, C. P. Ju and J. H. Lin. Journal of Oral Rehabilitation 29 (2002) 314-322.
[2]- Kuroda, P. A. B.; Buzalaf, M. A. R.; Grandini, C. R. Materials Science & Engineering. C 67 (2016) 511-515.

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