DEVELOPMENT OF NEW Ti-15Zr-2.5Mo FOR USE AS BIOMATERIAL

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1. Introduction

Titanium and its alloys are used in the biomedical area due to favorable characteristics that the metal has, as a good mechanical strength/density ratio, high corrosion resistance and excellent biocompatibility [1]. Titanium is an allotropic element which change of structure crystalline near of 883 ºC, changing of hexagonal structure (phase α) for a body-centered cubic structure (phase β), that exhibit low Young's modulus. Molybdenum is a strong β-stabilizer, the addition of molybdenum decreases the phase change temperature of titanium (β-transus), being considered a strong β-stabilizer, with the β phase retention starting around 10% in weight. Zirconium has an allotropic transformation similar to titanium, around 862° C. It is considered a neutral element to form titanium alloys [2]. In this paper, the development of new titanium alloys containing titanium, zirconium and molybdenum has been studied.

2. Experimental

The alloy was produced by arc-melting, with tungsten electrode and water-cooled copper crucible, in inert argon atmosphere. A homogenization heat treatment was made at 1000 °C by 6 hours, in vacuum of 10^{-6} Torr. Hot-rolling was performed at 1000 °C with air-cooling. Chemical analysis was obtained by EDS, with elements mapping. The structural and microstructural characterization was obtained by XRD, with Rietveld's analysis, OM and SEM. The selected mechanical properties were analyzed by Vickers microhardness and Young's modulus measurements.

3. Results and Discussions

In the chemical analysis, the values of the alloying elements remain close to nominal values, without the presence of metallic impurities. The alloy was sensitive to thermo-mechanical treatments. It's possible to observe the presence of α and β phases in addition to the martensite α'' (Fig. 1). The alloy showed better mechanical compatibility to commercially used biomedical alloys, with good potential for biomedical application (Fig. 2).

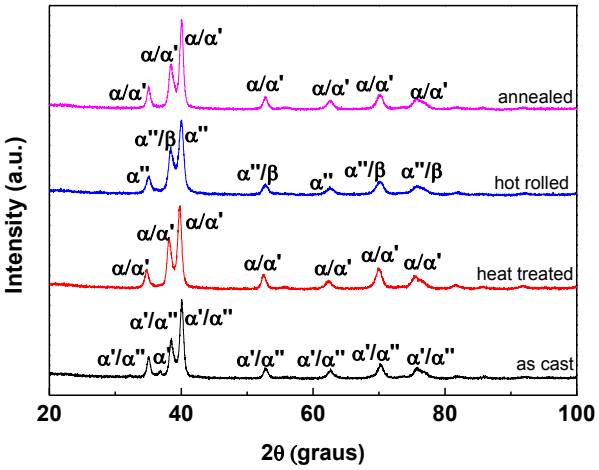

Fig. 1 – XRD for Ti-15Zr-2.5Mo alloy.

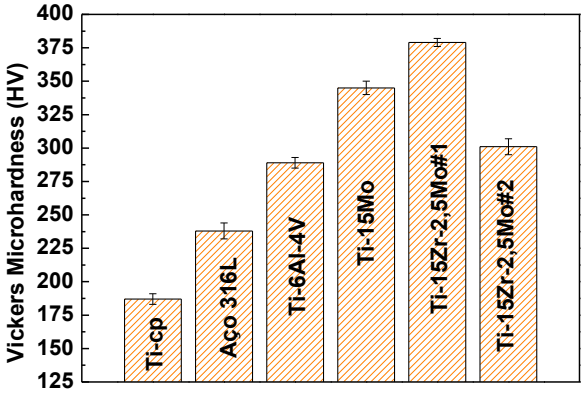

Fig. 2 - Vickers microhardness for Ti-15Zr-2.5Mo alloy.

4. References

[1]- Correa, D. R. N.; Kuroda, P. A. B.; Grandini, C. R. Advanced Materials Research, v. 922, p. 75-80, 2014.
[2]- Kuroda, P. A. B.; Buzalaf, M. A. R.; Grandini, C. R. Materials Science & Engineering. C, v. 67, p. 511-515, 2016.

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