CHARACTERIZATION OF A Ti-29Nb-13Ta-4.6Zr ALLOY

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Ti-based alloys are widely used in a broad range of applications due to the outstanding properties, ranging from applications in the airspace industry to biomedical field. Ti alloys are classified according to their microstructure in α, β and α + β alloys. Ti β alloys have a lower elastic modulus and nowadays are receiving greater attention, mainly due to their recent insertion in the biomedical field. Currently some alloys known as Gum Metal has been highlighted among the Ti β alloys. These alloys possess excellent properties, such as an elastic modulus of approximately 55 GPa, superelasticity and superplasticity, as well as a high tensile strength. The Gum Metals need to follow three rules, which are related to their electronic structure: (i) electron/atom ratio (e/a) of about 4.24, (ii) bond order (B_o value) of about 2.87 and (iii) "d" electron-orbital energy level (M_d value) of about 2.45. A new composition that meets these electronic requirements is the Ti-29Nb-13Ta-4.6Zr alloy (% wt.). This alloy possess only β stabilizing elements, all of which are non-toxic. Considering this, the present work aims to produce this new alloy by casting. The objective is to investigate the microstructure generated from the casting process, analysing the phases formed, as well as their morphology and fraction. This work also aims to evaluate the microhardness of the alloy produced. The microstructural evolution will be investigated by optical (OM), scanning (SEM), X-ray diffraction (XRD), energy-dispersive X-ray spectroscopy (EDS) and the hardness will be evaluated by Vickers microhardness.