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PRODUCTION AND CHARACTERIZATION OF A NEW METASTABLE BETA Ti-23.6Nb-5.1Mo-6.7Zr ALLOY WITH ULTRALOW ELASTIC MODULUS FOR BIOMEDICAL APPLICATIONS

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SUMMARY

A low Young's modulus is required for titanium alloys be used in orthopedic implants, such as hip prosthetic stems. This requirement is mandatory in order to avoid stress shielding due the large difference in Young's modulus between the prosthetic stem and the cortical bone. This study aimed to design, produce, process and characterize a new Beta titanium alloy, Ti-23.6Nb-5.1Mo-6.7Zr, on an industrial scale to be used in the manufacture of orthopedic implants. This alloy was produced in a vacuum arc remelting furnace (VAR) and thermomechanically processed under different conditions. The samples were characterized by X-ray diffractometry, optical and scanning electron microscopy, elastic moduli measurements and Vickers microhardness tests. Among the different processing conditions, the Ti-23.6Nb-5.1Mo-6.7Zr alloy annealed at 950 ° C for 1 h, after 90% of cold rolling, with a β single-phase microstructure composed by refined grains, was the one that presented the highest hardness / elastic modulus ratio and lowest elastic modulus (31 GPa).

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