

(301-186) - Characterization of the Ti-13Nb-13Zr-4 produced by powder metallurgy for use as biomaterial

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Zircaloy is a zirconium based alloy widely used in nuclear reactors due to its satisfactory mechanical strength, high temperature and corrosion resistance and low neutron absorption cross-section. Zirconium based alloys aren't manufactured in Brazil, and therefore, zircaloy-4 (Zr-4) used in power plants are imported. During fabrication process of fuel elements, great amounts of Zr-4 residues are produced, mainly in the machining stage. The process of discard of this material can't be included as common metallic residue, recycling assumes a strategic role for Brazilian Nuclear Politics due to economic and environmental aspects. In this work, through the hydrogenation-dehydrogenation process (HDH) of Zr-4, a route is being developed to recycle technically viable, in particular, avoiding and directing an applying acceptable for dispose this material. Therefore, from the zircaloy production of powders together with titanium and niobium was produced by powder metallurgy (PM) the Ti-13Nb-13Zr alloy, using Zr-4 for substitution of Zirconium and then use it for application of biomaterials. Hydrogenation-dehydrogenation (HDH) process was used to produce Zr-4 powder from machining residues. Titanium and Niobium hydride elemental powders were produced using same route. Powders were submitted to high speed planetary ball milling followed by uniaxial and cold isostatic pressing and sintering under high vacuum. The microstructural characterization was performed by scanning electron microscopy and X-ray diffraction, Archimedes method was used to determine the density, and mechanical properties were evaluated - Vickers hardness and elastic modulus, the bending test by three points with a dynamic mechanical analyzer.
