Production of Titanium Alloys for Surgical Implants by Powder Metallurgy

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The research of artificial materials for implants has assumed an important role in the implants development. The trend of the current research in orthopedic implants is based in the development of titanium alloys with low modulus of elasticity, close to the bone, and toxic elements free. Powder metallurgy is an advantageous alternative for titanium parts production with complex geometries at a relative low cost. Despite that, it is verified that the introduction of interstitial elements (oxygen, nitrogen and carbon) during the processing of these alloys, though can provide an increase in hardness and mechanical resistance, frequently is related to the reduction of ductility and fragility. In this work, results of the Ti-13Zr-13Nb alloy sintering are presented including foam specimens. Samples were produced by mixing of hydrided metallic powders followed by uniaxial and cold isostatic pressing with subsequent densification by sintering between 900-1400 °C, in vacuum. Sintered samples were characterized for phase composition, microstructure and microhardness by X-ray diffraction, scanning electron microscopy and Vickers indentation, respectively. The interstitial content was analised by Leco equipment. It was shown that the samples were sintered to high densities with a Widmanstätten-like microstructure. It was observed an improvement in the microhardness values in samples with high oxygen content and this fact seems to be related with the milling time.