

# Obtaining of Ti-13Nb-13Zr powder from chips of the alloy using HDH process

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Bone defects on lower limbs have been treated using a synthetic structure named scaffold [1]. This structure must present interconnected pores with size in the range of 400 to 500  $\mu\text{m}$ , with porosity ideally considered around 55 vol.%. Powder metallurgy coupled with space-holder technique is a simple method that allows control over the porous structure, also allowing the reduction of the scaffolds production costs [2]. The present work has the main objective to produce powder of the Ti-13Nb-13Zr alloy (percentages in weight) from its chips using the hydrate-dehydrate (HDH) method and milling. For this purpose, arc melting was used for Ti-13Nb-13Zr alloy production. Then, the resulting ingot was heat-treated at 1000°C by 1 hour and quenched in water. Following the quenching process, the sample was forged in a swage rotary forging, and the cylindrical bar was etched in an acid solution 40 mL of HNO<sub>3</sub> and 10 mL of HF. To allow HDH process, alloy chips were produced by machining the cylindrical bar. After that, they were placed in a furnace with a 2 Bar Hydrogen and 900°C for 30 minutes. The hydride chips were milled in a planetary ball mill using balls and jars of WC, a ball-to-powder mass ratio of 5:1, mill rotation velocity 284 rpm for 2 hours, and isopropyl alcohol as the process controlling agent. Finally, the powder was classified by sieves and characterized using DRX and SEM+EDS. Results showed the process feasibility to obtain the Ti-13Nb-13Zr alloy powder from its chips using HDH method. The HDH powders will be used to produce scaffolds by powder metallurgy coupled with space-holder technique.

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References:

- [1] U. Cottino, F. Rosso, F. Dettoni, M. Bruzzone, D.E. Bonasia, R. Rossi, 2016, 1-14, (2016).
- [2] B. Arifvianto, J. Zhou, 7, 3588-3622, (2014).