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Microstructure, Mechanical Properties and Superelasticity in Ti-Nb Alloys Manufactured by Powder Metallurgy

Damian Kalita PhD, NOMATEN CoE, NCBJ

Abstract

Ti-Nb alloys belongs to an advanced group of the smart materials exhibiting the superelastic properties. The recent trends in the manufacturing of such materials are focused on the application of the non-conventional techniques such as powder metallurgy and additive manufacturing that offer enormous opportunities for the fabrication of components with complex geometries, difficult or even impossible to obtain using conventional subtractive techniques. However, the most challenging problem in the fabrication of those alloys is associated with their insufficient superelastic properties. In order to overcome this issue, the series of alloys varied in the Nb content were prepared using the classical powder metallurgy route, involving the sintering of the powders prepared by mechanical alloying, and newly developed Laser Engineered Net Shaping additive manufacturing method. The materials were in-deep studied in order to understand the effect of the Nb concentration on the phase composition, microstructure, mechanical properties and superelasticity. The performed research allowed for the development of the fabrication technology and the new compositions of the Ti-Nb alloys exhibited superelastic effect.

Biography

Damian Kalita graduated Materials Engineering from the AGH University of Science and Technology in Cracow, Poland. He received his PhD degree in the field of Materials Engineering at the Institute of Metallurgy and Materials Science of the Polish Academy of Sciences in 2021. He was employed as a specialist in terms of the electron microscopy at the Łukasiewicz Research Network - Institute of Microelectronics and Photonics in Warsaw. Recently, he is employed as Assistant Professor at NOMATEN CoE, National Centre for Nuclear Research, Poland. His scientific interest covers among others the electron microscopy, high entropy alloys, metal matrix composites, additive manufacturing.