Application of Microscopy and X-ray Diffraction in Optimization of the Production of NiTi Alloy by Powder Metallurgy

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This paper describes the dependence of microstructure of NiTi shape memory alloy on the conditions of non-conventional powder metallurgy processing routes – reactive sintering of compressed Ni+Ti powder mixture and mechanical alloying with consequent compaction by Spark Plasma Sintering. First method was chosen as the process enabling to yield the high-purity NiTi alloy, while the second one aimed to reach the ultrafine-grained microstructure. The microstructure and phase composition of the products are compared in this work. The positive effects of high heating rate (> 300 K.min-1) and high temperature (at least 900 °C) on the reactive sintering process were recognized. Microstructure of the product is composed by NiTi matrix with dispersed Ti_2Ni particles. Similar microstructure can be also obtained by mechanical alloying for at least 120 min and consequent compaction by Spark Plasma Sintering.

Keywords: powder metalurgy, NiTi, mechanical alloying, reactive sintering

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