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Mechanical and structural behaviour of TiAlV nanocrystalline elaborated bymechanical milling technique

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Abstract: The aim of this study is to fabricate the Ti50Al40X1 0 nanostructured alloy (X: V) from pure titanium,aluminium, and vanadium powders by using a high-energy planetary ball mill with increasingmilling time from 10 to 80 h. Morphology, structural, and mechanical properties of this alloy wereinvestigated by a SEM, XRD, and nano-indentation testing. The effect of milling time on structural,morphological, and mechanical properties has been investigated. Microstructural characterisationshowed a decrease of average particle size during milling time. Crystallite size decreased from 49to 6.02 nm and lattice strain increased from 0.15% to about 0.89% during mechanical alloying. Inaddition, the mechanical properties of Ti50Al40V1 0 nanostructured materials were stronglydepended on the microstructure and crystallite size of new phases that appear during mechanicalmilling. Microhardness of the Ti50Al40V1 0 alloy increases with milling time from 261 to 738 Hv.These changes could be attributed to the crystallite size and the strain variations during milling.

Keywords : crystal microstructure, Mechanical milling, Microstructural properties, nanostructured alloy, hardness testing