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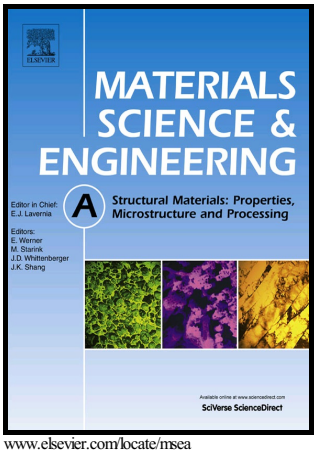

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Abstract

The effects of Ultrasonic Nanocrystal Surface Modification (UNSM) on the gas nitriding behavior of Ti6Al4V alloy have been investigated. Gas nitriding was performed at 700 and 800 °C. The microstructure after UNSM and gas nitriding was characterized using X-ray diffraction, scanning electron microscopy and transmission electron microscopy. Microstructural investigations revealed the formation of an approximately 10 μm thick severe plastic deformation (SPD) layer as well as nano-grains after UNSM treatment. The UNSM-treated Ti6Al4V alloy formed 0.26 μm and 1.35 μm thick nitride layers after nitriding at 700 °C and 800 °C, respectively, and UNSM resulted in an increased layer thickness relative to untreated samples at both temperatures. The results suggest that nitrogen adsorption and reaction capability were enhanced in the UNSM-treated Ti6Al4V alloy. This enhancement can be attributed to high-density dislocations and grain boundaries that were introduced by UNSM and served as efficient channels for nitrogen diffusion.