

Nanomechanical Characterization of Titanium Alloy Modified by Nitrogen Ion Implantation

Authors : Josef Sepitka, Petr Vlcak, Tomas Horazdovsky, Vratislav Perina

Abstract : An ion implantation technique was used for designing the surface area of a titanium alloy and for irradiation-enhanced hardening of the surface. The Ti6Al4V alloy was treated by nitrogen ion implantation at fluences of $2 \cdot 10^{17}$ and $4 \cdot 10^{17}$ cm^{-2} and at ion energy 90 keV. The depth distribution of the nitrogen was investigated by Rutherford Backscattering Spectroscopy. The gradient of mechanical properties was investigated by nanoindentation. The continuous measurement mode was used to obtain depth profiles of the indentation hardness and the reduced storage modulus of the modified surface area. The reduced storage modulus and the hardness increase with increasing fluence. Increased fluence shifts the peak of the mechanical properties as well as the peak of nitrogen concentration towards to the surface. This effect suggests a direct relationship between mechanical properties and nitrogen distribution.

Keywords : nitrogen ion implantation, titanium-based nanolayer, storage modulus, hardness, microstructure

Conference Title : ICAMN 2016 : International Conference on Advanced Materials and Nanotechnology

Conference Location : Bangkok, Thailand

Conference Dates : December 12-13, 2016