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TITANIUM OXIDE NANOCOATING ON A TITANIUM THIN FILM DEPOSITED ON A GLASS SUBSTRATE

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Abstract

Thin films of titanium were deposited on a glass substrate using electron beam evaporator. Femtosecond laser pulses were focused on the surface of the films, and the samples were scanned while mounted on the motorized computer-controlled motion stage to produce an areal modification of the films. X-ray diffraction of the laser-patterned samples showed evidence of the formation of a γ-Ti_3O_5 with a monoclinic phase. Rutherford backscattering spectrometry simulation showed that there is an increase in the oxygen concentration as the average laser fluence is increased. Time of flight secondary ions mass spectrometry analysis showed an even distribution of the titanium and oxygen ions on the sample and also ionized molecules of the oxides of titanium were observed. The formation of the oxide of titanium was further supported using the UV-Vis-NIR spectroscopy, which showed that for 0.1 J/cm^2 fluence, the laser-exposed film showed the electron transfer band and the d-d transition peak of titanium was observed at lower wavelengths.

Keywords: Femtosecond laser; Microstructure; Rutherford backscattering; X-ray diffraction; TOF-SIMS.