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Phase Transition in Laser Irradiated TiO_2 Thin Films

I. Lungu[1], L. Ghimpu[2], T. Potlog[1], A. Medvids[3] and C. Moise[4]
[1]*Research and Innovation Institute, Moldova State University, Chisinau, Republic of Moldova*
[2]*Institute of Electronic Engineering and Nanotechnologies, Academy of Sciences of Moldova, Chisinau, Republic of Moldova*
[3]*Department of Semiconductor Physics, Institute of Technical Physics, Riga Technical University, Riga, Latvia*
[4]*Center for Surface Science and Nanotechnology, University Politehnica of Bucharest, Bucharest, Romania*

In this study, the laser processing of thermally annealed TiO_2 thin films at 420 °C in hydrogen atmosphere, utilizing an pulsed fourth-harmonic generation Nd: YAG laser employing different laser intensities in the atmosphere at room temperature, has been reported. Further, the surface morphology and crystalline structure have been investigated by means of atomic force microscopy [AFM], X-ray diffraction [XRD], Raman analysis. The AFM images obtained show that the film's surface changes as the effect of the laser processes. Moreover, XRD and Raman analysis of the TiO_2 thin films indicate at the threshold laser intensity, I_{th} = 66 MW/cm^2 of the fourth-harmonic generation Nd: YAG laser phase transition from atanase-rutile to a crystalline 100% rutile.