

Characteristics of Al-doped TiO₂ thin films grown by pulsed laser deposition

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Abstract: Al-doped TiO₂ (TiO₂:Al) thin films were deposited at 450°C on glass substrates using pulsed laser deposition method. X-rays diffraction spectra showed that the obtained films are polycrystalline of anatase structure with preferential orientation of (101) direction. AFM images, nanoparticles size and surface roughness mean square values showed that the surfaces of TiO₂:Al films are smoother than that of undoped TiO₂ films. A blue shift in the absorption edge of TiO₂ with increasing Al concentration in the film is noteworthy as it leads to increase in the width of the optical transmission. The optical waveguiding performances of the TiO₂:Al films were demonstrated by using the m-lines spectroscopy technique and the results were correlated to the structural properties. Spectroscopic ellipsometry was used to extract the optical constants of the films. The determined band gap of undoped and Al doped films varies from 3.43 to 3.61 eV, which is in accordance to Burstein-Moss shift.

Keywords : Al-doped TiO₂, structure, morphology, optical properties, waveguide, nanoparticles