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Optical properties of undoped and iron doped TiO2thin films grown by RF magnetron sputtering

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Abstract : Titanium dioxide (TiO2) and iron doped (TiO2: Fe) films have been prepared by direct exposure of Ti and TiFe metallic films to thermal oxidation. Ti and TiFe films were deposited on glass substrates using RF magnetron sputtering technique. In this study we report on the effect of thickness on optical properties of TiO2 and the effect of iron concentration on structural and optical properties of iron doped (TiO2: Fe) films. Structural properties of the obtained TiO2 were presented in a previous paper [1]. The phase structure of TiO2: Fe thin films was identified by grazing incidence X-ray diffraction (GIXRD). The composition of TiO2: Fefilms was extracted from RBS and EDX spectra, the iron concentration in the films varies from 9 % to 35 at %. From X-ray diffraction spectra, it can be seen that all the films present two phases: rutile and anatase . We note also the presence of iron oxide Fe2O3 for the sample with the highest iron concentration (Fe: 35%). Optical properties of TiO2 and TiO2:Fe films were studied by means of UV-Visible spectroscopy.Transmittance spectra of TiO2 films show a good transparency in the visible region with a band gap ranging from 3.44 to 3.66 eV. However Transmittance curves of TiO2: Fe films present a considerable absorption edge shift to long wavelength when the amount of Fe increases from 0 to 35 at %. It was found that the band gap value of TiO2:Fe films decreases from 3.66 to 2.44 eV with iron concentration increasing

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