

Correlation between structural and optical properties of SiO₂/TiO₂ multibilayers processed by sol-gel technique and applied to Bragg reflectors

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Abstract: SiO₂ and TiO₂ thin layers processed by sol-gel technique have been deposited, alternatively, on glass substrates and Si (111) wafer. Dip-coated multibilayers were characterized by different experimental techniques: XRD, SEM, FTIR and UV-VIS-NIR. The obtained X-ray diffraction patterns analysis have shown that our films crystallize in anatase and rutile phases whatever is the number of bilayers and the corresponding grain sizes increase from 5.48 nm to 16.11 nm. The SEM micrograph shows that our layers are homogeneous without any visual cracks. The FTIR spectra have shown that the vibration of Si-O-Ti bonds becomes intense by the increase in the number of bilayers. This increase, on the one hand, decreases the transmission coefficient from 4.58% to 0.55% and increases the width of the stop band shown in UV-VIS-NIR spectra. On the other hand, the band-gap decreases from 3.73 eV to 3.59 eV. In addition, a pseudo band-gap is located between 300 nm and 400 nm increasing from 1.76 eV to 2.29 eV. © 2013 Trade Science Inc. - INDIA

Keywords : Sol-gel; Anatase; Rutile; Stop band; Si-O-Ti; Band-gap.