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The role of oxygen in deposition gas on optical properties of radio frequency sputtered nanocrystalline (Mg0.95Zn0.05)TiO3 thin films

Nanocrystalline (Mg0.95Zn0.05)TiO3 thin films were deposited on to quartz and Pt/TiO2/SiO2/Si substrates by radio-frequency reactive magnetron sputtering. The (Mg0.95Zn0.05)TiO3 sputtering target was prepared by solid state reaction method. The effect of deposition gas ratio i.e. ratio of oxygen and argon (O2/Ar) on structural and optical properties of (Mg0.95Zn0.05)TiO3 thin films were investigated. The optical properties of the films were calculated using the optical transmittance spectra. The Wemple-DiDomenico single oscillator model is used to understand the dispersion phenomenon of the refractive index of the (Mg0.95Zn0.05)TiO3 thin films. Significant variations in the optical and dielectric properties of the films are observed with the O2/Ar ratios. The Urbach energy was calculated for all the films deposited on to quartz substrates and found to decrease with an increase in O2 content in O2/Ar ratio. Furthermore, the observed optical properties and wettability of the thin films are promising for optoelectronic applications.

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