

Study of Substrate Temperatures effects on Optical TiO₂ Nano-films Properties deposited by RF Magnetron Sputtering for Gas Sensor application

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Abstract : Titanium dioxide (TiO₂) is a non-toxic material and chemically stable. It has a high optical transmittance, electrical conductivity and high refractive index. It is widely used in many fields such as photo catalysis, electro catalysis. It can be used serves as self-cleaning coatings. Similarly, TiO₂ can be used as bio-sensor coatings, biomedical materials, antibacterial applications. Furthermore, it can be used in water purification, solar cells and gas sensors. This work deals with deposition of TiO₂ onto heated glass substrates in a temperature range of 200 to 450 ° C via radio frequency (RF) reactive magnetron sputtering. We used a metal target of pure Ti of 3" diameter and 0.250" thickness with a purity of 99.99%. Optical properties of TiO₂ are substrate temperature dependent. Those are investigated in the UV-Visible range of the specter. Transmission characterization confirmed the transparent character of the films. The highest transparency was achieved for deposition temperature of 300 °C. The yielded gaps varied in the range 3.75–3.92 eV.

Keywords : Thin films, sputtering, semiconductor, TiO₂films, gas sensors, carbon dioxide, Optical properties.