

STUDY ON THE PROPERTIES OF TiO₂ THIN FILMS DEPOSITED BY ULTRASONIC SPRAY PYROLYSIS

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Abstract

In present work, we have studied the structural, optical and electrical properties of TiO₂ thin films deposited at different substrates temperature for solar cell applications. Ultrasonic spray pyrolysis method was used to fabricate TiO₂ thin films because of its low-cost operation, absence of vacuum system and convenience of use. The films were sprayed from solution containing titanium(IV) isopropoxide, acetylacetone in molar ratio of 1:4 in ethanol and deposited onto substrate of microscopy glass and n-type Si (100) wafer at temperatures of 200 to 500 °C. The resulting films were annealed at 500 °C and 700 °C for 1 hour in air. The films were characterized by UV-vis spectroscopy, XRD, Raman, and I-V measurements. Results showed that the total transmittance of TiO₂ thin films decreased after annealing. The annealed film thickness increased from 80 to 510 nm with increasing deposition temperature from 200 to 500 °C. The optical properties showed the band gap for TiO₂ thin films decreased as the deposition temperature increased. As deposited films prepared below 500 °C were amorphous, whereas crystalline anatase films were obtained at 500 °C. Further annealing at 700 °C in air led to anatase crystalline formation when films were deposited below 500 °C whereas the films deposited at 500 °C consist of anatase and rutile phases.



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