

Effect of annealing temperature on structural, optical and electrical properties of β -V₂O₅ thin films prepared by spray pyrolysis

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Abstract: β -V₂O₅ thin films have been deposited by spray pyrolysis technique on pre-cleaned glass substrates. Ammonium Vanadate (NH₄VO₃) and Triton X-100 are used as starting precursors. By using the clear precursor, thin films are deposited with different deposition parameters. After the deposition, the films are annealed at different temperatures from 350°C to 450°C to investigate the variation in structural, morphological, electrical and optical properties. X-ray diffraction (XRD), UV-Vis spectroscopy, scanning electron spectroscopy (SEM) and two probe resistivity methods are used to characterise the films. X-ray diffraction data shows the film to be composed of V₂O₅ in β -phase with tetragonal structure and shows the orientation is along with the (200) direction at high annealing temperatures. The SEM images reveal the morphological changes in films concerning the increase in annealing temperature. The optical band gap is determined using Tauc plot, and the effect of annealing temperature on the optical band gap has been discussed and reported. The resistivities of the films are measured using two probe methods, and it is found that increased with increasing annealing temperature.

Keywords: V₂O₅, TritonX-100, XRD, SEM, spray pyrolysis