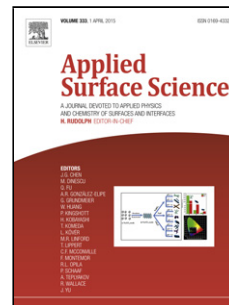


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Influence of precursor concentration on the structural, optical and electrical properties of indium oxide thin film prepared by a sol-gel method

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Abstract

This research was carried out to study the effect of different precursor concentrations on the physical properties of indium oxide (In_2O_3) thin film. In_2O_3 is a promising n-type semiconductor material that has been used in optoelectronic applications because of its highly transparent properties. It is a transparent conducting oxide with a wide band gap (~ 3.7 eV). The experiment was started by preparing different precursor concentrations of indium nitrate hydrate ($\text{In}(\text{NO}_3)_3 \cdot \text{H}_2\text{O}$) solution and followed by the spin coating technique prior to an annealing process at 500°C . Indium oxide thin films were characterized using an X-ray diffractometer, an ultraviolet-visible spectrophotometry, a field emission scanning electron microscope and a Hall Effect Measurement System in order to determine the influence caused by the different molarities of indium oxide. The result showed that the film thickness increased with the indium oxide molarity. Film thicknesses were in the range of 0.3 to 135.1 nm and optical transparency of films was over 94 %. Lowest resistivity of $2.52 \Omega \text{ cm}$ with a mobility of $26.60 \text{ cm}^2 \text{ V}^{-1} \text{ S}^{-1}$ and carrier concentration of $4.27 \times 10^{17} \text{ cm}^{-3}$ was observed for the indium oxide thin film prepared at 0.30 M.

Keywords: In_2O_3 , Molarity, Spin coating technique

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