ADVANCES IN MATERIALS ENGINEERING

Volume 2

Edited By:
Md Abdul Maleque
Iskandar Idris Yaacob
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68100 BATU CAVES
SELANGOR DARUL EHSAN
TEL: +603-6188 1542 / 44 / 45 FAX: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

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Chapter 033

Thin Film of Indium Tin Oxide and Its Deposition Technology Deposition

Agus Geter Edy Sutjipto, Sugrib Kumar Shaha
Kulliyyah of Engineering – International Islamic University Malaysia
✉ : agus@iium.edu.my

Keywords: ITO, Magnetron sputtering, Diode sputtering, Triode sputtering

Abstract. ITO is tin doped indium oxide which can be used to produce transparent conductive film. The main objective of the experiment is to investigate the effect of power in depositing ITO thin film on glass substrate. In the present study, Indium Tin Oxide (ITO) films were deposited on glass substrates using magnetron sputtering system. With a constant gas flow rate and deposition time, sputtering was done by changing power. All the deposition had been done in room temperature. After deposition the surface of the film was characterized using scanning electron microscopy (SEM), and the electrical characteristics of the ITO thin film was measured using Low Resistivity Meter. The experiment shows that higher the powers better the properties in terms of resistivity or conductivity.

Introduction

Sputtering was discovered in 1852 when Grove observed metal deposits at the cathodes of a cold cathode glow discharge. Until 1908 it was generally believed that the deposits resulted from evaporation at hot spots on the cathodes. However, between 1908 and 1960, experiments with obliquely incident ions and sputtering of single crystals by ion beams tended to support a momentum transfer mechanism rather than evaporation.

Sputtering was used to coat mirrors as early as 1887, finding other applications such as coating fabrics and phonograph wax masters in the 1920s and 1930s. The subsequent important process improvements of radio frequency (rf) sputtering, allowing the direct deposition of insulators, and magnetron sputtering, which enables much higher deposition rates with less substrate damage, have evolved more recently. These two developments have allowed sputtering to compete effectively with other physical vapor deposition processes such as electron beam and thermal evaporation for the deposition of high quality metal, alloy, and simple organic compound coatings, and to establish its position as one of the more important thin film deposition techniques.

Indium Tin Oxide (ITO) film has been widely used-as-a transparent conductor due to its high transparency to visible light and its low electrical resistivity. Applications of IT0 as a transparent conductor include transparent electrodes, antireflection coating, heat-reflecting mirrors, transparent electromagnetic shield coatings, display devices, and optoelectronic and photovoltaic devices [1-3]. A variety of techniques have been used for depositing ITO films. Among these deposition methods, reactive sputtering deposition is widely used for ITO film deposition. Desirable features of reactive sputtering employing alloy targets for practical uses are: a high deposition rate, accurate control of the film thickness, highly conducting and transparent films with good uniformity and excellent adhesion to the substrate. In general, a