

# ADVANCES IN MATERIALS ENGINEERING

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## Volume 2

Edited By:  
Md Abdul Maleque  
Iskandar Idris Yaacob  
Zahurin Halim



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## Electrical Property of ITO Thin Film Deposited by Rf Magnetron Sputtering

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**Keywords:** ITO, Thin film deposition, Magnetron sputtering.

**Abstract.** Thin films of ITO were deposited on glass substrate using d.c magnetron sputtering in this experiment and their electrical and mechanical properties were investigated. Different rf values of 50 W, 60 W and 70 W were chosen with 1 hour sputtering time to deposit the ITO thin film on the glass substrate in room temperature with a constant pressure. Increase in conductivity up to  $8.9 \times 10^5 \text{ S.m}^{-1}$  were found when 70 W is used and Ra value increased from 0.02  $\mu\text{m}$  to 0.06  $\mu\text{m}$  for 50 W to 70 W rf power. Experimental results show processing parameter such as the rf power gives great influence on its electrical properties and mechanical properties.

### Introduction

As the demand of miniaturization components increasing, the potential application of one-dimensional nanostructures of functional oxides also increasing. Transparent conducting oxides (TCOs) have been widely used in various applications because of its unique combination of high electrical conductivity and optical transparency [1]. The most well known of Tacos material is tin-doped indium oxide (ITO) This material is a solid solution of indium(III) oxide ( $\text{In}_2\text{O}_3$ ) and tin(IV) oxide ( $\text{SnO}_2$ ), typically 90%  $\text{In}_2\text{O}_3$ , 10%  $\text{SnO}_2$  by weight. It is transparent and colorless in thin layers. In the infrared region of the spectrum it is a metal-like mirror [2]

ITO is also used for various optical coatings, electrode for displays, solar cells and TFT (Thin-Film-Transistor) for LCD displays [3-4]. Besides that, ITO also being used as coating materials on glass or ceramic substrate for various applications and research works [5-6]. The preparation and characteristic of ITO materials has been studied well

Thin films of indium tin oxide are most commonly deposited on surfaces by electron beam evaporation, physical vapor deposition, or a range of sputter deposition techniques. Different target material also have been used such as ceramic to deposit ITO thin films prepared by d.c magnetron sputtering method [7]. Besides, the structure of thin film produced are normally amorphous that have short-range atomic arrangement [8].

Sputtering process is done in a low pressure condition to allow mean free path of the atoms so that the high energy will not dissipated in gas-phase collisions. Magnetron sputtering used magnetic field to release gas discharge plasma close to the target where this method have a great advantage in reaction, adhesion, structural effects and cleaning [9]. The influence of sputtering process on electrical properties and mechanical properties such as rf power was discussed in this experiment.