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ABSTRACT

The effects of oxygen content, deposition rate and annealing towards electrical, optical and microstructure properties in manufacturing thin film of indium tin oxide

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This film of indium tin oxide (ITO) with 90 % of In_2O_3 and 10 % of SnO_2 has been manufactured with thickness 611,4 nm and 606,9 nm by means of dc sputtering in vacuum by pressure of 10^{-5} mBar on the glass substrate. The study was conducted to find out the effect of oxygen content change, deposition rate while coating and annealing after coating in vacuum room toward the changes of electrical, optical and microstructure properties in thin film of indium tin oxide.

The measurement of electrical properties was performed by using four point probe and Hall effect, optical properties using UV-Vis spectrophotometry and microstructure using X-ray diffraction. The result of the analysis showed that oxygen content, deposition rate and annealing could cause microstructure changes of ITO thin film. This changes could result in the changes of electrical and optical properties of ITO thin film.

The lowest electrical resistivity was 3,06 x 10^{-4} Ω cm on thin film thickness of 611,4 nm with the oxygen content of 3,70 %, deposition rate 4,21 nm/s and annealing temperature 250°C with transmittance 84,71 %. Whereas the highest transmittance was 87,12 % on the oxygen content of 3,70 %, deposition rate of 4,21 nm/s and annealing temperature 250°C with electrical resistivity 6,72 x 10^{-4} Ω cm.

The optimum oxygen content which resulted the best electrical resistivity was achieved on the oxygen content of 3,70 % and the optimum transmittance was on oxygen content of 8,90 % with deposition rate 4,21 nm/s and annealing temperature 250°C.

Key word : dc sputtering, deposition rate, oxygen content, annealing, electrical resistivity, transmittance, crystal size, crystalinity, and doping