

FABRICATION AND CHARACTERIZATION OF CONDUCTIVE AND TRANSPARENT TIN (IV) OXIDE THIN LAYER WITH DIRECT HEATING OF TIN (II) CHLORIDE COMBINED WITH MECHANICAL EXFOLIATION METHOD FOR DEVELOPING ADVANCED AND FUNCTIONAL MATERIALS FOR SENSORS AND DYE-SYNTHESIZED SOLAR CELLS APPLICATIONS

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ABSTRACT

Mechanical exfoliation (ME) using a duct tape has been conducted upon SnO₂ thin film. The film is synthesized from direct heating of SnCl₂ powder. The SnCl₂ powder is deposited upon a special arrangement of glass slides and directly heated using an electric stove with a temperature of around 350 °C. The material resulted from the heating process occurs on glass slides adjacent to the heated powder glass slides. The materials are then analyzed using scanning electron microscope (SEM) and energy dispersive X-ray (EDX) to confirm the presence of SnO₂ material. The SEM results show stacking of spherical particles with sizes in the ranges of 700 nm to 1 μm. The EDX result confirms the occurrence of 20% and 66% of Sn and O, respectively, as well as 13% of carbon and a very small percentage (0.99%) of chlorine remaining. The thin films are then mechanically exfoliated using a duct tape for as many as 5, 10, and 20 times. For each ME variation, the thin films are analyzed and compared using X-ray diffraction (XRD). The XRD results show semi-crystalline structure of SnO₂ in cubic phase. The XRD results after ME show peaks, which are characteristics to SnO₂ and tend to shift the peaks to higher 2 *theta*. Furthermore, the intensity of the peaks is highest for 10 times ME showing crystalline improvement of the thin film after the ME treatment.

Kata Kunci: *SnO₂ thin film, SnCl₂ powder, direct heating, mechanical exfoliation, SEM, EDX, XRD*