

Optical transmittance, electrical resistivity and microstructural characteristics of undoped and fluorine-doped tin oxide conductive glass fabricated by spray pyrolysis technique with modified ultrasonic nebulizer

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Abstrak

Fluorine-doped tin oxide (FTO) is one of the conductive glasses that have strategic functions in various important applications, including dye-sensitized solar cell (DSSC). In the current work, the effects of deposition time (5, 10, 20, 30, and 40 minutes) upon the fabrication process of FTO thin film using spray pyrolysis technique with modified ultrasonic nebulizer has been studied in regard to its microstructural, optical, crystallinity, and resistivity characteristics. The variation was also performed by comparing the pure tin chloride precursor and the solution that was doped with fluor (F) at 2 wt% in order to see the doping effect on the properties of thin film. The thin films were characterized using x-ray diffraction (XRD), scanning electron microscope (SEM), ultraviolet-visible (UV-Vis) spectroscopy, and digital multimeter. On the basis of current investigation, it has been found that the best FTO was obtained through the pyrolysis technique of 20-minute deposition time, providing optical transmittance of 74%, a band gap energy (E_g) of 3.85 eV and sheet resistance (R_s) of 7.99 Ω /sq. The fabricated FTO in the present work is promising for further development as conducting glass for dye-sensitized solar cell (DSSC).