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Preparation of aluminum doped zinc oxide thin films on glass substrate by sparking process and their optical and electrical properties

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Aluminum doped Zinc Oxide (AZO) nanoparticle thin films were deposited on glass substrates by double tips sparking process which is a simple, low cost method and can be done at room temperature. The effect of Al doped ZnO was studied in order to improve electrical and optical transmittance properties. The doping ratios of Al into ZnO were controlled by different sparking power using different capacitor paralleled Al doping tips and were investigated by EDS. The surface morphologies and cross-section images were observed by scanning electron microscope (SEM). The thickness of the films was approximately 600-900 nm. The EDS results showed that Al content into ZnO increased when the capacitance paralleled Al tips increasing. The Al doping ratios were 3, 5, 7, 13 and 22 at.% when capacitances paralleled Zn : Al tips were 40:0.5, 40:1.1, 40:1.5, 40:3.1 and 40:4.7 nF, respectively. SEM images indicated agglomerated particle size increased after annealing treatment. The crystalline structure was characterized by X-ray diffraction and Raman spectroscopy. UV-Vis spectroscopy was used to measure the optical properties. The optical transmittance spectra of the AZO thin film exhibited greater than 50 % in the visible region. Also, their electrical properties were measured by Van Der Pauw technique for transparent conducting oxide glass application.

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