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Growth of Doped-Al ZnO Thin Film under N2 gas as the Electrode for Solar Cell Deposited by Asymmetric Bipolar DC Magnetron Sputtering Technique

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ZnO(Al) thin films were prepared by asymmetric bipolar dc magnetron sputtering technique as the transparent electrode for solar cell. ZnO(Al) target was prepared at the surface ratio ZnO:Al of 45 : 1. ZnO(Al) thin films were grown by the deposition time of 10, 20, 30, 40 and 50 minutes, respectively. Moreover, growth of ZnO(Al) thin films the deposition time for 30 minutes was doped by N2 gas at the flow rate of 5, 10 and 15 sccm, respectively. Optical, structural, morphological and electrical properties of ZnO(Al) thin films were analyzed by UV-vis spectrophotometer, X-ray diffraction (XRD), field emission scanning electron microscope (FE-SEM), linear four-point probetechnique and Hall effect measurement, respectively. Transmission values of a film at doped N2 gas flow rate of 5 sccm is as high as 71% and low reflection. ZnO(Al) thin films has high crystal. The average grain sizes are approximately of 198 −263 nm which the highest average grain size obtains from a film at doped N2 gas flow rate of 5 sccm. The resistivity values of ZnO(Al) thin films are 2.33E-01, 1.63E-01, 1.52E-02 and 4.24E-03 •m. The carrier concentration (n) are 3.48E+18 to 6.42E+18 cm-3 which found that the carrier concentration somewhat highly and behaviours n-type semiconductor-like. ZnO(Al) thin film deposited under doped N2 gas can be generated a carrier more than a films non-doped N2 gas which the suitable for application to fabrication of transparent electrode for solar cell.

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