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Spectral selectivity of doped Zinc and Aluminium oxide thin films prepared by spray pyrolysis for Solar Energy applications

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Abstract content
   (Max 300 words)

Metal oxide thin films have been used in thin film solar cells and other solar energy applications. The main concern now is to improve their physical, electrical and optical properties in order to increase their efficiency and lower their production costs. In this presentation, thin films of zinc oxide doped with aluminium (ZnO:Al)and aluminium oxide doped with zinc (Al2O3:Zn) have been synthesized by spray pyrolysis onto standard microscope glass slides. The spectral selectivity of these oxide thin films and their applicability in producing efficient solar energy devices has been investigated. Optical measurements in the ultraviolet, visible near infrared and infrared ranges were performed using UV/VIS/NIR spectrophotometers. Further optical characterizations in the far infra-red were done using FT-IR measurements. Structural characterization for determination of surface morphology and film thickness was carried out using Atomic Force Microscopy and the Tencor Alpha Step IQ Profiler. The electrical properties were investigated using the four-point probe method. The film thicknesses fall in the range 0.14 - 87.7µm. Solar transmittance of ˜88% has been achieved for the ZnO:Al films whereas ˜72% has been obtained for Al2O3:Zn samples. The films have generally been found to have low reflectance of ˜10%. Peak reflectance of 25% was recorded for the wavelength range 8-12µm. The film sheet resistance values of 0.75-9.5 Ω and 5.56 -12 Ω, and the corresponding resistivity values of 2.43 x 10-4- 9.59x 10-4Ωm and 4.47 x 10-4 - 11.80 x 10-4Ωm have been obtained for ZnO:Al and Al2O3:Zn, respectively. Features of the film surface microstructure have been analyzed in terms of how they affect the general properties of the films. These film properties have been correlated to applications in thin film solar cells.

Key words: characterization, spectral selectivity, production cost, thin film.

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