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STRUCTURAL AND OPTICAL CHARACTERIZATION OF BETA-GALLIUM OXIDE

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Demands for higher performance of solar cells have led researchers to non-sophisticated, low temperature crystal-growth processes like spray pyrolysis and sol-gel spin coating as the future of efficient solar cells technology as stability remains challenge. This project seeks investigation of Beta-Gallium Trioxide (β-Ga2O3) for solar cells passivation to improve their stability and PCE, insulating barrier in light junctions, gas sensors, luminescent phosphors and dielectric coating for solar cells. In spray pyrolysis, precursor Tetrahydroxogallate (III) Ammonium from Gallium Nitrate with 32% concentrated ammonium hydroxide was deposited on 1cm2-Sapphire substrate at 3200C and 2.4kPa. In spin coating, precursor viscosity was improved by the addition of Monoethanolamine. Monocrystalline β-Ga2O3 was obtained by post annealing films at 7500C and investigated using XRD to determine crystallite size and orientation, Raman spectroscopy, EDX to determine percentage of elements composition and SEM to image film morphology. Film thicknesses were determined by profilometry, transmittance and absorbance were determined by UV-Vis spectroscopy and used to determine optical band gaps by Tauc technique. Spin coated films had orientation along (-201) with thickness range 165nm-354nm having 16.08nm grain size and optical band gap range 4.59eV-4.99eV. Films from spray pyrolysis had (-201) orientation with thickness range 158-255nm, grain size of 15.52nm and band gap 4.60eV-4.93eV that showed a broad emission in UV-blue region originating from oxygen and gallium vacancies in lattice; an essential component for good photodetectors and vital for solar cells passivation since dielectric coating with β-Ga2O3 will reduce refractive index between air and solar cells, hence improve solar energy absorption.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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