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EFFECTS OF ANNEALING GROWTH CONDITIONS OF β-Ga_2O_3 THIN FILMS FOR SOLAR BLIND UV PHOTODETECTORS BY USING SOL-GEL DIP COATING METHOD

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ABSTRACT- In this paper, the effects of different annealing growth conditions on the structural, surface morphology and optical properties of the grown β-Ga_2O_3 thin films on *p*-Si(100) substrates via sol-gel dip coating were reported. Field-emission scanning electron microscopy observations shows uniform and densely packed grains as well as decreasing pinholes are formed at annealing temperatures of 900ºC. As the annealing temperatures increase from 700ºC to 1200ºC, the crystallinity of the β-Ga_2O_3 (400) peak at 900ºC shows improved quality as well as increases crystallite size, *D* and decreasing FWHM value. The root-mean-square (rms) surface roughness of the deposited β-Ga_2O_3 thin films increases from 0.479 nm to 91.0 nm when annealing temperature increased from 700ºC to 1200ºC and exhibits nanocrystalline structure at 900ºC. FTIR measurements demonstrated that the reflectivity spectra of β-Ga_2O_3 thin films increases from 700ºC and diminishes above 1000ºC. Finally, all the results revealed that 900ºC in air ambient was the best annealing growth conditions to deposit β-Ga_2O_3 thin film and have high potential for deep UV photodetector applications.

Keywords: Gallium oxide, Sol-gel, Dip coating, Annealing, Thin film.