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Metalorganic Chemical Vapor Deposition of Ga_2O_3 Thin Films Using Dimethylgallium Isopropoxide and O_2

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Ga_2O_3 thin films have been grown on Si(001) substrates by metalorganic chemical vapor deposition (MOCVD) using dimethylgallium isopropoxide (Me_2GaO^iPr, DMGIP) with oxygen as the reactant gas. Suitability of the precursor for CVD was confirmed by thermogravimetric analysis (TGA) and vapor pressure measurement. Deposition was carried out in the substrate temperature range 450-650 °C. Spectroscopic ellipsometry, X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS) and Rutherford back-scattering spectroscopy (RBS) were used to determine the thickness, crystallinity, and composition and stoichiometry of the films, respectively. From the slope of the Arrhenius plot in the temperature range 500-550 °C, the activation energy of deposition was found to be 225.5 kJ mol^{-1}. As-deposited films were amorphous, but the monoclinic β-Ga_2O_3 phase was revealed after annealing the films in air at 1050 °C. The XPS and RBS analyses indicate that the Ga_2O_3 films obtained by using DMGIP were found to be almost stoichiometric.