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# Structural and optical properties of β-$Ga_2O_3$ thin films obtained by spray pyrolysis

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Beta gallium oxide (β-$Ga_2O_3$) thin films have attracted considerable research interest due to their wide bandgap, high thermal and chemical stability, and high breakdown voltage making them suitable for power electronics, UV photodetectors, solar cells, and sensors [1]. In this work, β-$Ga_2O_3$ thin films were deposited on c-plane sapphire substrates via spray pyrolysis [2]. This approach is cost-effective and can be further used in large-scale production.

For spray pyrolysis, we used $Ga(NO_3)_3$ dissolved in a 1 : 1 water-ethanol mixture or water with 1% polyethyleneimine (PEI), followed by annealing at 800 ℃ or 1000 ℃. The films were characterized by SEM, AFM, XRD, Raman spectroscopy, spectroscopic ellipsometry, UV-vis. spectroscopy, and electrical resistance using the four-point probe. The films obtained are stoichiometric $Ga_2O_3$ in the β-phase with thicknesses of ˜70–100 nm (spray from precursor water-ethanol solution) and ˜30 nm (water-PEI solution). The films revealed a preferred orientation $(\bar{2}01)$ in agreement with previous results for β-$Ga_2O_3$ on c-plane sapphire [3]. The samples showed high transparency in the visible range and a sharp absorption edge in the UV range with bandgaps of 4.9 to 5.3 eV. The resistivity of the undoped films was in the GΩ range.

Thus, the current results show that spray pyrolysis allows the fabrication of highly crystalline, transparent, and dielectric β-$Ga_2O_3$ films suitable for further studies as UV photodetectors.

**References**

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## Type of presence

Presence online

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