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Characteristics of thulium doped gallium oxide films grown by pulsed laser deposition

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Abstract

Thulium (Tm) doped Ga₂O₃ films were deposited on sapphire substrates by pulsed laser deposition (PLD) with changing Tm compositions in the targets. Energy dispersive spectroscopy results reveal that films with different Tm compositions can be tailored by changing the Tm composition in the targets. X-ray diffraction and Raman spectra analysis indicate that all films have the monoclinic structure. Photoluminescence measurements demonstrate that the emission peaks at 460, 650 and 800 nm are observed from the Tm³⁺ 4*f* intrashell transitions from ¹G₄ excited states to the ³H₆, ³F₄, and ³H₅ states, respectively. The results suggest that PLD is a promising method for obtaining high quality Tm doped Ga₂O₃ films, which paves the way for the fabrication of optoelectronic devices based on Ga₂O₃ films.

Keywords: Wide bandgap, Gallium oxide, Rare earth element, X-ray diffraction, Photoluminescence

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