

Abstract Submitted
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Determination of the electronic state of Er in sputtered AlN:Er films by magnetic measurements V. NARANG, M.S. SEEHRA, Department of Physics and Astronomy, West Virginia University, Morgantown, WV, 26506, USA, D. KORAKAKIS, Lane Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown, WV, 26506, USA — The optoelectronic [1] and piezoelectric [2] properties of AlN:Er thin films for device applications have been of great recent interest. The magnitude of optical activity depends on local crystalline environments of Er [3]. Here we focus on the electronic state of Er in AlN:Er (1.6 at.%) films prepared by reactive magnetron sputtering on Si substrate. X-ray diffraction of the films shows that Er doping expands the lattice and XPS studies confirm the presence of Er. To determine if Er is present as Er metal, Er₂O₃ or Er³⁺ substituting for Al³⁺, magnetization was measured vs. temperature (2 K to 300 K) in H = 1kOe and data is found to fit the Curie law with a magnetic moment $\mu = 4.85 \mu_B$ per Er, in good agreement with expected value for Er³⁺ substituting for Al³⁺ in AlN [4]. The presence of Er₂O₃ and Er metal is ruled out since magnetic transitions expected for Er₂O₃ (Er metal) at 3.4 K (~30 K) are not observed, thus establishing that Er substitutes for Al as Er³⁺ in the AlN:Er films.

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