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Effect of Oxygen Pressure on the Structure and Luminescence of Europium Doped Gadolinium Oxide Thin Films PATRICK WELLENIUS, JOHN F. MUTH, NC State University, PAE C. WU, HENRY O. EVERITT, Duke University, ERIC R. SMITH, Digital Fusion — Gadolinium oxide has found uses as a dielectric or passivation layer for novel III-V materials and devices, but more recently has been the subject of study as a rare-earth host. It is believed that Gd_2O_3 makes a good host for these dopants due to the similarity in ionic radii between the gadolinium ion and the rare-earth dopants. The reported long radiative lifetimes of rare earth dopants in this material make it interesting for optically pumped laser materials. In this study, europium-doped gadolinium oxide (Eu:Gd_2O_3) polycrystalline thin films were deposited on sapphire substrates by pulsed laser deposition at 5 and 50 mTorr oxygen pressure. Changes in the crystal structure were observed by x-ray diffraction and photoluminescence. Low-temperature photoluminescence spectra of the $^5D_0-^7F_0$ and $^7F_2$ transitions in the europium ion were recorded with high resolution. Because the $^5D_0-^7F_0$ transition in europium is not subject to fine structure splitting, it provides a useful mechanism for investigation of the local environment. The $^5D_0-^7F_2$ transition is of interest as it results in the most intense emission, making europium doped material useful for red light-emitting phosphors. Radiative lifetimes of the observed transitions are also reported.

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