Western Illinois University
2021 Thomas E. Helm Undergraduate Research Conference

Abstract

Live Poster Session

Major: Physics

Faculty Mentor: Mark Boley

Title: Photoluminescence of Sulfur Doped Dysprosium Oxide

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Rare-earth (RE) ions such as Dysprosium (Dy3+) have many well-defined luminescence properties that have been extensively studied in the past using glass structures doped with the RE ions, typically found in oxide form, such as Dy2O3. Using the technique of photoluminescence, where laser light is used to excite the sample, and studying the emitted light from the sample, the dominant electronic transitions in the samples can be examined and their sustainability determined for applications in solid-state lasers or light emitting devices. Little research has been done on the powder form of Dysprosium Oxide, which is more practical for real-life applications such as those involving a solid-state laser or light emitting devices. The motivation for this research is to enhance the applicability for this solid-state material. Using previous research on Dysprosium Oxide in our laser lab as a basis for this project, a collaboration was undertaken with the chemistry department in order to synthesize new samples where sulfur is incorporated into the lattice structure of the pure Dysprosium Oxide, producing Dysprosium Sulfide (Dy2O(3-x)Sx) in an attempt to enhance its photoluminescence. The photoluminescence spectra of the samples were collected using laser spectroscopy with an argon-ion laser and a standard GaAs detector. The photoluminescence peaks were studied using Lorentzian curve fitting, and a differential comparison was made to the pure Dysprosium Oxide photoluminescence spectrum in order to analyze the shifts of peak intensity due to doping. X-ray crystallography was also used to confirm the incorporation of sulfur into the sample structure, and the molar mass ratios were calculated.