PHOTOLUMINESCENCE AND CRYSTAL STRUCTURE OF OXYNITRIDE PHOSPHORS

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Abstract: Phosphors are substances that exhibit light due to fluorescence. These materials emit light due to their electronic configuration and pose as advancement in the industry for lighting techniques. Y₂Si₃O₃N₄ and Lu₂Si₃O₃N₄ were doped with Ce³⁺ in 2 mol % using a solid state reaction method. Ce³⁺ luminescence was studied in both systems. These phosphors can be paired with commercial light emitting diodes (LEDs) to produce white light. LEDs are very efficient and helps battle global warming due to less energy consumption. Oxynitride phosphors are known to have great thermal and chemical stability because of the tetrahedrons share corners giving great stability. We optimized the flux; heating time and temperature need to synthesize the two systems. We also studied Characterization of all three systems was done with X’Pert X-Ray Diffraction (XRD) to obtain its crystal structure. We used Rietveld Refinement to refine their crystal structure and Perkin Elmer LS 55 Fluorimeter to obtain their luminescence characteristics. We found Y₂Si₃O₃N₄ to be emitted at 471 nm when excited with blue light. Although we could not synthesize the Lu₂Si₃O₃N₄:Ce³⁺ system we plan to continue the research but at higher temperatures. Luminescence studies on YAG:Ce³⁺ showed that it was excited at 450 nm (blue) and 540 nm (green) in emission. The characterization on the phosphors that we synthesized proves that they can be paired with LEDs to produce solid state lighting devices.