THESIS: Visible and infrared emission from Er_2O_3 nanoparticles, and Ho^{+3}, Sm^{+3} and Tm^{+3}, doped in AlN for optical and biomedical applications

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ABSTRACT

Rare-earth ions holmium (Ho^{+3}), Thulium (Tm^{+3}), and Samarium (Sm^{+3}) were investigated for infrared emission and their possible biomedical applications by a photoluminescence (PL) system. Holmium's (Ho^{+3}) emission peaks were the result of transitions $^5S_2 \rightarrow {}^5I_7$, and $^5S_2 \rightarrow {}^5I_5$ respectively. Samarium's (Sm^{+3}) emission peaks were 936 nm and 1863 nm. Thulium's (Tm^{+3}) emission peaks were the a result of transitions $^3H_4 \rightarrow {}^3H_6$, $^3H_5 \rightarrow {}^3H_6$, and $^3F_4 \rightarrow {}^3H_6$ respectively.

Erbium Oxide nanoparticles (Er_2O_3) mixed with water by a photoluminescence (PL) system. Erbium Oxide' (Er_2O_3) nanoparticle's emission peaks were the a result of transitions $^4I_{15/2} \rightarrow {}^4S_{3/2}$, $^4I_{15/2} \rightarrow {}^4I_{13/2}$ respectively. The process was also repeated in vacuum and it was found that the green emission enhances tremendously when the nanoparticles are excited in vacuum. This enhanced luminescence from the Erbium Oxide nanoparticles shows their potential importance in the optical devices and Biomedical applications.