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**Optical Characterization of the $Ho^{3+}$ Complex in HEMA**[1]
MANUEL RODRIGUEZ III, DHIRAJ SARDAR, KELLY NASH, RAYLON YOW, JOHN GRUBER, University of Texas at San Antonio — The spectroscopic properties of the $Ho^{3+}$ complex embedded in 2-hydroxyethyl methacrylate (HEMA) are investigated. The intensities of the room temperature absorption spectra of the $Ho^{3+}(4f^{10})$ transitions in $Ho(NO_3)_3.5H_2O$:HEMA have been analyzed using the Judd-Ofelt (J-O) model to obtain the phenomenological intensity parameters, $\Omega_2$, $\Omega_4$, and $\Omega_6$. These parameters are used to calculate the spontaneous emission probabilities, radiative lifetimes, and branching ratios of the $Ho^{3+}$ transitions from the upper multiplet manifolds to the corresponding lower-lying multiplet manifolds of $^{2S+1}L_J$ $Ho^{3+}(4f^{10})$, which include $^5G_4$+$^3K_7^{(2)}$, $^5G_5$, $^5G_6$+$^5F_1$, $^5F_2$+$^3K_8^{(2)}$, $^5F_3$, $^5F_4$+$^5S_2$, and $^5F_5$. The predicted room temperature fluorescence lifetime of $^5I_7$ to $^5I_8$ is about 0.5 ms, suggesting a reasonably strong interaction between the complex and the polymer. A comparative study of $Ho^{3+}(4f^{10})$ ions in different host materials suggests that $Ho(NO_3)_3.5H_2O$:HEMA could be an excellent candidate for certain applications such as narrow band pass filters, especially in the visible-to-near infrared region of the spectrum.

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