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Intensity analysis and energy-level modeling of Nd^{3+} in Nd^{3+}:Y_2O_3 nanocrystals in polymeric hosts ROBERT DENNIS, KELLY NASH, DHIRAJ SARDAR, JOHN GRUBER, University of Texas at San Antonio — Optical absorption and emission intensities are investigated for Nd^{3+} in nanocrystalline Nd^{3+}:Y_2O_3. Room temperature absorption intensities of $Nd^{3+}(4f^3)$ transitions in synthesized Nd^{3+}:Y_2O_3nanocrystals have been analyzed using the Judd-Ofelt (J-O) approach to obtain the phenomenological intensity parameters. The J-O intensity parameters are used to calculate the spontaneous emission probabilities, radiative lifetimes, and branching ratios of the Nd^{3+}transitions from the upper multiplet manifolds to the corresponding lower-lying multiplet manifolds $^{2S+1}L_J$ of $Nd^{3+}(4f^3)$. The emission cross sections and room temperature fluorescence lifetimes of the important intermanifold $^4F_{3/2} \rightarrow {}^4I_J$(J=9/2, 11/2, 13/2, 15/2)transitions have been determined. We also compare the spectra of the Nd^{3+}:Y_2O_3 nanocrystals to those of the nanocrystals embedded in polymeric matrices of epoxy and chitosan, and we find similarities in terms of the detailed Stark energy levels of the Nd^{3+}ion in the Y_2O_3 nanocrystalline host. The 300 K spectraare analyzed for the energy (Stark) level transitions between the $^{2S+1}L_J$ multiplet manifolds of $Nd^{3+}(4f^3)$. The results of this study are also compared with a crystal-field splitting analysis reported earlier for single-crystal Nd^{3+}:Y_2O_3 grown by a modified flame fusion method.

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