Abstract Submitted
for the TSF07 Meeting of
The American Physical Society

Spectroscopic properties of Ho$^{3+}$ in Ho$^{3+}$:Y$_2$O$_3$ Nanocrystals

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are investigated for Ho$^{3+}$ in nanocrystalline Ho$^{3+}$:Y$_2$O$_3$. Room temperature
absorption intensities of Ho$^{3+}$(4$f^{10}$) transitions in synthesized Ho$^{3+}$:Y$_2$O$_3$nanocrystals
have been analyzed using the Judd-Ofelt (J-O) approach in order 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 Ho$^{3+}$ transitions from the upper multiplet manifolds to the corre-
ponding lower-lying multiplet manifolds $2S+1L_J$ of Ho$^{3+}$(4$f^{10}$). An 8K absorp-
tion spectra was also taken. From that spectra an in-depth crystal field splitting analysis was performed on selected manifolds. A comparison of the manifold
splittings for Ho$^{3+}$:Y$_2$O$_3$ (nano) was made to that observed for Ho$^{3+}$ in large sin-
gle crystals of Y$_2$O$_3$. Presently we are investigating the fluorescence properties
of this nanocrystal. A comparative study of Ho$^{3+}$(4$f^{10}$) ions suggests that syn-
thesized Ho$^{3+}$:Y$_2$O$_3$nanocrystals could be an excellent alternative to single-crystal
Ho$^{3+}$:Y$_2$O$_3$ for certain applications especially in the visible region.

1This research was supported in part by the National Science Foundation Grant
No. DMR-0602649 and the Petroleum Research Fund by the American Chemical
Society: PRF # 43862-B6.

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Date submitted: 28 Sep 2007