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Spectral Intensities of Transitions Between Stark Levels of $Er^{3+}(4f^{11})$ in Single Crystal, Ceramic, and Nanocrystalline Y_2O_3 KELLY NASH, JOHN GRUBER, DHIRAJ SARDAR, University of Texas at San Antonio, UYGUN VALIEV, National University of Uzbekistan, NIKOLAI TERGABRIELYAN, LARRY MERKLE, AROCKIASAMY MICHAEL, Army Research Laboratory — Similarities and differences among the optical properties of Er^{3+}:Y_2O_3 in single crystal, polycrystalline (ceramic), and nanocrystalline forms are discussed based on spectra obtained between 400 nm and 1700 nm and temperatures between 8 K and 300K. The observed crystal-field splitting and the measured intensities of transitions between the $^{2S+1}L_J$ manifolds of $Er^{3+}(4f^{11})$ in both the C_2 and C_{3i} sites are analyzed in terms of models that invoke the mixing of states of opposite parity through the odd terms in the crystal-field Hamiltonian. The inversion symmetry of C_{3i} sites limits electronic transitions to magnetic dipole transitions between the $^4I_{13/2}$ and $^4I_{15/2}$ manifolds. For Er^{3+} ions in C_2 sites, the forced electric-dipole transitions along with some magnetic dipole contribution in certain cases, are allowed between the J+1/2 Stark levels within all manifolds. Within the instrumental resolution, there are some important differences between intensities of transitions depending on particle size of the Er^{3+}:Y_2O_3.

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