

Vacuum-ultraviolet 5d-4f luminescence of Gd³⁺ and Lu³⁺ ions in fluoride matrices

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Abstract

The VUV 4 f n-1 5d-4 f n luminescence and luminescence excitation spectra of Gd³⁺ (n=7) in LiGdF₄, GdF₃, LiYF₄: Gd³⁺, and YF₃: Gd³⁺, and of Lu³⁺ (n=14) in LiLuF₄, LuF₃, and LiYF₄: Lu³⁺ have been analyzed with high spectral resolution. In systems with intermediate electron-phonon coupling, zero-phonon lines, and phonon sidebands were observed. The excitation spectra of dilute systems exhibit rich fine structure originating from electronic origins of transitions and their phonon replica. Theoretical calculations explicitly taking into account a microscopic model of the crystal field and the crystal lattice vibrational spectra agree well with experimental data and are the basis for a safe analysis of the spectra. © 2007 The American Physical Society.

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