High-resolution spectral study of Er3+ crystal-field levels and magnetic ordering in (ErxY1-x)2BaNiO 5 chain compounds

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Abstract

A family of linear chain nickelates $(Er_xY_{1-x})_2BaNiO_5$ (x = 1, 0.8, 0.6, 0.4, 0.2, and 0.1) was studied by high-resolution spectroscopy of the Er^{3+} ion. Energies of 38 crystal-field levels of Er^{3+} and exchange splittings for most of them in a magnetically ordered state were measured. Composition-dependent Néel temperatures were found. Crystal-field calculations were performed starting from the analysis in the framework of the exchange-charge model. The wave functions found were used to calculate magnetic g factors for crystal-field levels of Er^{3+} and the magnetic susceptibility $\chi(T)$ of the concentrared x = 1 compound. The latter was compared to the detailed $\chi(T)$ curve (2.0 K