Europium and terbium pyrrole-2-carboxylates : structures, luminescence, and energy transfer.

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Streszczenie

Lanthanide pyrrole-2-carboxylates $[\{Ln(L)_3(H_2O)_2\}\cdot H_2O]_n$ (Ln=Eu, Gd, Tb) were synthesized and investigated using single crystal X-ray diffraction and optical spectroscopy (luminescence, luminescence excitation and vibrational IR spectra). The europium pyrrole-2-carboxylate crystallizes as a 2D network structure in the $P2_1/c$ space group. The Eu^{3+} coordination polyhedron formed by five carboxylic groups and two water molecules can be described as a distorted single-capped square antiprism. The luminescence spectra indicate a low symmetry of the charge distribution around the Ln^{3+} ion that corresponds to the C_1 symmetry of the coordination environment of Eu^{3+} ion in the $[\{Eu(L)_3(H_2O)_2\}\cdot H_2O]_n$ crystal lattice. The low-energy ligand–metal charge transfer (LMCT) state was identified in the europium compound. The shortening of the $^5D_0$ (Eu^{3+}) lifetime in the 230–295K temperature region, when the compound is heated from 77 to 295K, and the low luminescence intensity of the europium pyrrole-2-carboxylate are caused by the participation of the LMCT state in quenching processes. The energy of activation determined for the $^5D_0$ – LMCT crossover is 3900±100cm^{-1}.

Słowa kluczowe

Eu3+, Tb3+, Pyrrole-2-carboxylate, Luminescence, LMCT, X-ray crystal structure

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