Relationships between structural and spectroscopic properties of complexes of o-phenanthroline and 2,2′-bipyridine with lanthanide (Ln = Sm, Eu) thiocyanates.

Autorzy

Katarzyna Kot

Grażyna Oczko

Małgorzata Puchalska

Przemysław Starynowicz

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Streszczenie

Three new complexes, [(NCS)3(phenanthroline)2(H2O)Eu] and [(NCS)3(2,2′-bipyridine)2(H2O)Ln] (Ln = Sm, Eu) have been synthesized as potential candidates for optical materials. The absorption spectra of the [(NCS)3(2,2′-bipyridine)2(H2O)Sm] crystal were measured at 293 K and 8 K. For all of these complexes emission and excitation spectra as well as luminescent decay curves at room temperature and 77 K were recorded. Additionally, the quantum yields of luminescence were determined. The crystal structure of [(NCS)3(phen)2(H2O)Eu] complex was determined by X-ray diffraction analysis. The [(NCS)3(phen)2(H2O)Eu compound crystallizes in a monoclinic system with the space group *P*21/*c*. XRPD patterns of [(NCS)3(2,2′-bipyridine)2(H2O)Ln] (Ln = Sm, Eu) reveals that they are isostructural. The inner sphere coordination of the lanthanide ions is composed of three isothiocyanate nitrogen atoms, four nitrogen atoms from the organic ligand (1,10-phenanthroline or 2,2′-bipyridine) and a water molecule. The luminescent studies of complexes discussed in relation to their crystal structures. The intensities of the f–f transitions in [(NCS)3(2,2′-bipyridine)2(H2O)Sm] crystal were determined and examined in accordance to the Judd–Ofelt theory. The modification of ratio β and Sinha’s parameter δ and their dependence on the nature of lanthanide-ligand bond is discussed for the samarium complex.

Słowa kluczowe

O-phenanthroline, molecule, 2′- bipyridine, Isothiocyanate, UV-ViS spectroscopy, Lanthanides

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