Structure and sensitized near-infrared luminescence of Yb(III) complexes with sulfonylamidophosphate type ligand.

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A series of new lanthanide complexes with dimethyl(phenylsulfonyl)amidophosphate (H**SP**) was synthesized ($\{Na[Ln(SP)_4]\}_n$ (**Ln1**), $[Ln(SP)_3phen]$ (**Ln2**) and $[Ln(SP)_3bpy]\cdot H_2O$ (**Ln3**) (where Ln = Gd^{III}, Er^{III}, Yb^{III} and Lu^{III}; phen = 1,10-phenantroline; and bpy = 2,2′-bipyridine) and the crystal structures of $[Er(SP)_3phen]$ and $[Yb(SP)_3bpy]\cdot H_2O$ were resolved. Absorption (at 295, 4 K), emission (at 295, 77, 4 K) and IR (at 295 K) spectra as well as luminescence decay time measurements were used to characterize the photophysical properties of single crystals. Effective energy transfer from a **[SP]**$^-$ ligand to the Yb^{III} ion was demonstrated despite a large energy gap . Replacing one molecule of the **[SP]**$^-$ ligand with the phen or bpy molecule caused reduction of the emission decay time from 35 μs for **Yb1** to 20 and 15.5 μs for **Yb2** and **Yb3**, respectively at the temperature of 295 K. Using the absorption spectra τ_{rad} (1.1 ms—**Yb1**, 943 μs—**Yb2** and 914 μs—**Yb3**) and (3.14%—**Yb1**, 2.19%—**Yb2**, 1.64%—**Yb3**) were estimated. On the basis of low temperature, high-resolution absorption and luminescence spectra, the ligand-field splittings of the excited and ground states of Yb^{III} complexes were determined.

Słowa kluczowe

sulfonyl phosphoramides, Ytterbium chelates, Near-infrared luminescence, energy transfer, crystal structure

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