Lanthanide complexes with phosphorylated 2-naphthylsulfonamides ligands as electromagnetic radiation converters.

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Streszczenie

The lanthanide complexes of the type Na[Ln(L)$_4$] (**LnL1**) (Ln=Nd^{3+}, Eu^{3+}, Tb^{3+}, Yb^{3+}), with di(4-methylphenyl) (2-naphthyl)sulfonylamidophosphate (**HL^1**), as well as sodium salt (**NaL**), were synthesized. Single-crystal X-ray diffraction, IR, absorption and emission spectroscopies at 300, 77 and 4K were used to characterize the compounds. The ligand-to-metal energy transfer processes were analyzed. The dominant role of the ligand singlet state in intramolecular energy transfer processes was discussed and the main channels of the ligand-to-metal energy transfer for **EuL1** are proposed as $S_1 \rightarrow {}^5G_3$, ${}^5G_6$, ${}^5D_4$,${}^5L_6$ with a fast contribution and $S_1 \rightarrow T_1 \rightarrow {}^5D_1$ with a slow contribution. The calculations of nonradiative rates of energy transfer covered the higher lying excited levels of Eu^{3+} (${}^5D_J$, ${}^5L_J$, ${}^5G_J$).

The participation of both the multipolar and exchange mechanisms was considered. The number of parameters determined for **LnL1** such as: experimental intensity parameters (Ω_λ), radiative (A_{rad}) and non-radiative (A_{nrad}) decay rates, emission lifetimes (τ), theoretical and experimental quantum yields were compared with the data for lanthanide complexes with dimethyl (2-naphthyl)sulfonylamidophosphate (**LnL2**). The strong temperature dependence of the excited ${}^5D_4$ level lifetime of **TbL1** was recorded in the range of 30μs– 2ms, in the temperature range 300–77K. This phenomenon could be used in chemical thermometry.

Słowa kluczowe

Lanthanide, Phosphorylated sulfonamides, energy transfer, spectroscopy, crystal structure, Judd–Ofelt theory

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