Peculiarities of the excitation energy transfer in europium and terbium aromatic carboxylates and nitrate complexes with sulfoxides: blocking effect.

Autorzy

Vera I. Tsaryuk

Konstantin P. Zhuravlev

Valentina A. Kudryashova

V. F. Zolin

Janina Legendziewicz

I. Pekareva

Paula Gawryszewska

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The influence of modification of the aromatic ligands on the excitation energy transfer to Ln^{3+} ions in europium and terbium carboxylates and nitrates was examined. The luminescence excitation spectra of three groups of the europium and terbium compounds: phenyl-, diphenyl-, triphenylacetates, phenoxyacetates and triphenylpropionates; 1- and 2-naphthylcarboxylates and 2-naphthoxyacetates; lanthanide nitrates with diarylsulfoxides (diphenyl- and dibenzylsulfoxides) and dialkylsulfoxides were investigated. The spectra of adducts of terbium phenylcarboxylates with 1,10-phenanthroline were also analyzed. The effect of the aliphatic bridges, which decouple the π–π- or p–π-conjugation in the ligand, on the energy transfer to Ln^{3+} ions (so-called blocking effect) was investigated. It was shown, that this decoupling leads to significant lowering of the energy of “ligand–metal ion” charge transfer states (LM CTS) in the europium carboxylate salts, just down to ∼27,800 cm^{-1} in europium 2-naphthoxyacetate. As a consequence, the probability of the LM CTS participation in the excitation energy dissipation processes increases. A channel of the excitation energy dissipation in the region of ∼31,750 cm^{-1} related to ligand electronic transitions was found in the europium and terbium nitrates with sulfoxides. It was demonstrated that a part of the energy absorbed by the aromatic ligand having aliphatic bridge can be emitted as the ligand fluorescence.

Słowa kluczowe

Tb3+, Eu3+, Luminescence, LM CTS, Aromatic carboxylates, Nitrates

Adres publiczny

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