

Structure, stability and spectroscopic features of the neodymium(III) complex of the octadentate polypyridine ligand 6,6'-bis[bis(2-pyridylmethyl)aminomethyl]-2,2'-bipyridine.

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Streszczenie

The synthesis, crystal structure and spectroscopic properties of the neodymium(III) complex $[\text{Nd}(\text{btpa})\text{Cl}_2]\text{Cl}\cdot 5\text{H}_2\text{O}$ with btpa being the octadentate polypyridine ligand 6,6'-bis[bis(2-pyridylmethyl)aminomethyl]-2,2'-bipyridine are reported. The structure shows that the Nd^{3+} ion is coordinated to seven nitrogen atoms of btpa and two chloride ions, leaving one uncoordinated pyridine group. The coordination polyhedron is best described as a monocapped cube. The btpa ligand forms a stable 1:1 complex with $\text{Nd}(\text{CF}_3\text{SO}_3)_3$ and other selected triflates of the lanthanides(III) ions (Ln) in anhydrous acetonitrile. The stability constants of the $\text{Ln}(\text{btpa})^{3+}$ complexes are quite similar along the series, due to a compensation between ligand-metal interaction and lanthanide desolvation. High resolution absorption spectroscopy at 4 K shows one equivalent crystallographic position of the Nd^{3+} ion in the structure. The Nd-btpa complexes in the solid-state and in AN solution upon excitation wavelength from the range of ligands absorption bands display NIR luminescence with the characteristic $^4\text{F}_{3/2} \rightarrow ^4\text{I}_J$ ($J = 9/2, 11/2$ and $13/2$) transitions of the Nd^{3+} ion. The decay times of the $^4\text{F}_{3/2}$ state of Nd^{3+} equal 1.4 (293 K) and 2.3 μs (77 K) ($\lambda_{\text{exc}} = 350$ nm) for the complexes in the solid-state as well as 0.43 (293 K) and 0.46 μs (77 K) ($\lambda_{\text{exc}} = 266$ nm) for AN solution.

Słowa kluczowe

neodymium, NIR emission, crystal structure, stability constants, organic solvent

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