Relations between structure and physicooptical properties of Eu^{3+} and Tb^{3+} tetraphosphonates.

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The crystal structure of the Tb^{3+} complex with ethylenediaminetetra(methylenephosphonic acid) (H_8EDTMP) was determined and it was found that the compound is isostructural with the previously studied $[C(NH_2)_3]_7[Eu(EDTMP)(CO_3)]\cdot 10H_2O$ crystal. The Eu^{3+} and Tb^{3+} complexes with *trans*-cyclohexane-1,2-diamine-*N*,*N*,*N′*,*N′*-tetrakis(methylenephosphonic acid) (H_8CDTMP) of known crystal structures were also obtained. As it results from the X-ray analyses both tetraphosphonate ligands (EDTMP and CDTMP) bind the Ln^{3+} ion with 2 nitrogen atoms and 4 oxygen atoms in such a way that only one oxygen atom from each phosphonate group is linked with the central ion. The coordination sphere is completed by two oxygen atoms of the bidendate carbonate anion in the case of Ln^{3+}–EDTMP complexes, whereas two monomeric Ln^{3+}–CDTMP complex anions are connected by two hydroxyl ions and one water molecule. The spectroscopic (FTIR and emission) studies of crystals are presented and discussed with respect to their structures. It was shown that OH oscillators present in the inner-sphere of Eu^{3+} and Tb^{3+} complexes with CDTMP do not quench lanthanide emission. The reasons of that are three very short hydrogen bonds (~2 Å) formed between two hydroxyl groups and a water molecule. The luminescence lifetimes and quantum yields of lanthanide tetraphosphonates were compared with those obtained for Ln^{3+} tetracarboxylates.

Słowa kluczowe

Lanthanide, phosphonate, radiopharmaceutical, crystal structure, luminescence

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