From structural properties of the Eu^{III} complex with ethylenediaminetetra(methylenephosphonic acid)(H_8EDTMP) towards biomedical applications.

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Streszczenie

Crystals of Eu^{III} with ethylenediaminetetra(methylenephosphonic acid) (H_8EDTMP) and with ethylenediaminetetraacetic acid (H_4EDTA) have been synthesized in the same experimental conditions and their X-ray analyses have been performed. The EDTMP ligand wraps the Eu^{III} ion in a fashion similar to its carboxylic analogue, EDTA, *i.e.* coordinating through two nitrogen atoms and four oxygen atoms in such a way that only one oxygen atom from each phosphonate group is bonded to the central ion. The coordination sphere is completed by two oxygen atoms of the bidentate carbonate anion in the case of the Eu^{III}–EDTMP complex, whereas the inner sphere of the Eu^{III}–EDTA crystal is completed by three water molecules. Spectroscopic studies (UV-Vis and ^{31}P NMR spectra) of Eu^{III}–EDTMP solutions at controlled pH showed that the replacement of inner sphere water molecules and/or OH hydroxy groups by a carbonate anion in the Eu^{III}–EDTMP complex at physiological pH results in the formation of $[Eu(EDTMP)(CO_3)]^{7-}$ species which is thermodynamically stable and kinetically inert. The affinity of the carbonate anion towards the Eu^{III}–EDTMP species was studied by analysis of f–f intensities and luminescence decay rates. The dissociation constant of the Eu^{III}–EDTMP–carbonate complex was found to be approximately 43 mM. The presented results may be helpful in understanding the role played by the $^{153}Sm^{III}$–EDTMP complex known as Quadramet® in the seeking of metastatic tissue in bones as well as possibly giving some premises for future ligand design of these types of complexes with lanthanide radionuclides.

Adres publiczny

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