Abstract

Currently, a number of methods, both diagnostic and therapeutic, find use in the field of nuclear medicine. The importance of macrocyclic ligands, capable of coordination of ions of employed metal radionuclides, is rising for both mentioned areas.

Great potential lies in the area of the so-called theragnostics, *i.e.*, drugs with both diagnostic and therapeutic functions. This thesis makes the first steps towards the concept of a theranostic ligand containing two macrocyclic coordinating centres, each individually optimised for coordinating radioisotopes of one metal ion. The coordination of Ga(III), currently used in diagnostics, is provided in the studied model system by a nine-membered macrocycle with phosphinate pendant arms. The coordination of Lu(III), currently used for radiotherapy, is provided by a twelve-membered macrocycle with phosphinate pendant arms.

The results of the NMR measurements in this thesis show that the studied model system behaves in agreement with requirements placed upon the conceived drug. A macrocyclic ligand **L1e**, optimised for coordination of Lu(III), was prepared with the intended use in the synthesis of the proposed drug. *H*-phosphinic acids and a derivative of cyclene were also prepared as precursor compounds for a series of bifunctional ligands **L1a** – **L1e**.

Keywords

Macrocycles, ligands, gallium(III) complexes, lutetium(III) complexes