

Conclusions

In my PhD project I synthesized two new polydentate macrocyclic ligands, the monofunctional DO3A-py_{NO} and the bifunctional DO3A-py_{NO-C}. Both compounds are based on the design of DOTA, with one of the acetate pendant arms being replaced with a pyridine-*N*-oxide arm. This structural modification has a tremendous influence on chemical properties of the lanthanide(III) complexes of these compounds. The water exchange rate in the gadolinium(III) complexes is significantly accelerated in comparison with the complexes of DOTA. In fact, the values are almost optimal for use of the Gd(III) complexes as contrast agents for magnetic resonance imaging. Besides, the complexes exist exclusively in the form of square antiprismatic isomers. I investigated the complexes by various physico-chemical techniques in solution and in solid state, in order to elucidate the relationship between their structure and properties. On the basis of these results I found an explanation to the unexpectedly fast water exchange rate observed on the squareantiprismatic isomers.

I established a synthetic protocol that can be used for the attachment of the bifunctional ligand DO3A-py_{NO-C} to any amine-bearing molecule. I prepared a series of conjugates with polyamidoamine dendrimers and a conjugate with per-6-amino- β -cyclodextrine and investigated the properties of these compounds. I found that the dendrimers are not appropriate substrates for synthesis of macromolecular contrast agents, as they display a significant degree of flexibility. However, the ligand DO3A-py_{NO-C} represents a suitable building block for construction of macromolecular contrast agents, provided that it is attached to a rigid molecule, such as in the case of per-6-amino- β -cyclodextrine. In addition to the fast water exchange, the Gd(III) complexes of DO3A-py_{NO-C} are electroneutral after the attachment. This combination of properties makes the ligand DO3A-py_{NO-C} an interesting alternative to other bifunctional chelators.