Development of a bimodal paraCEST-^{19}F contrast agent for MRI

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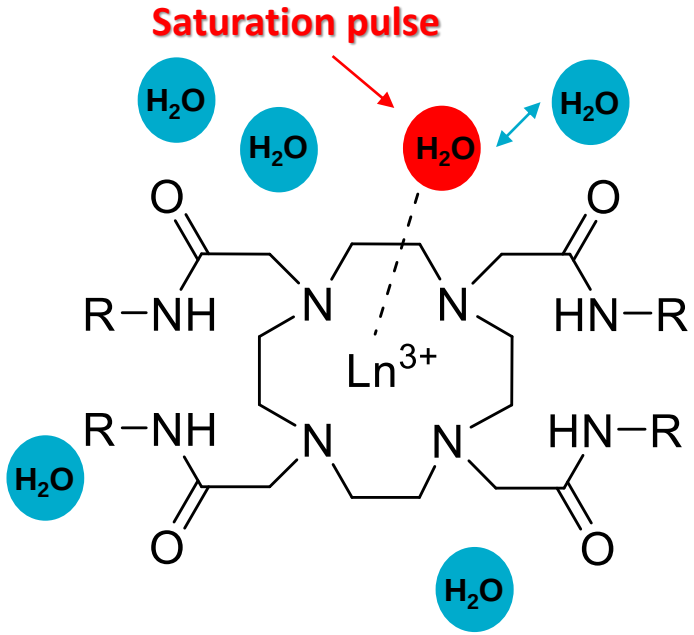
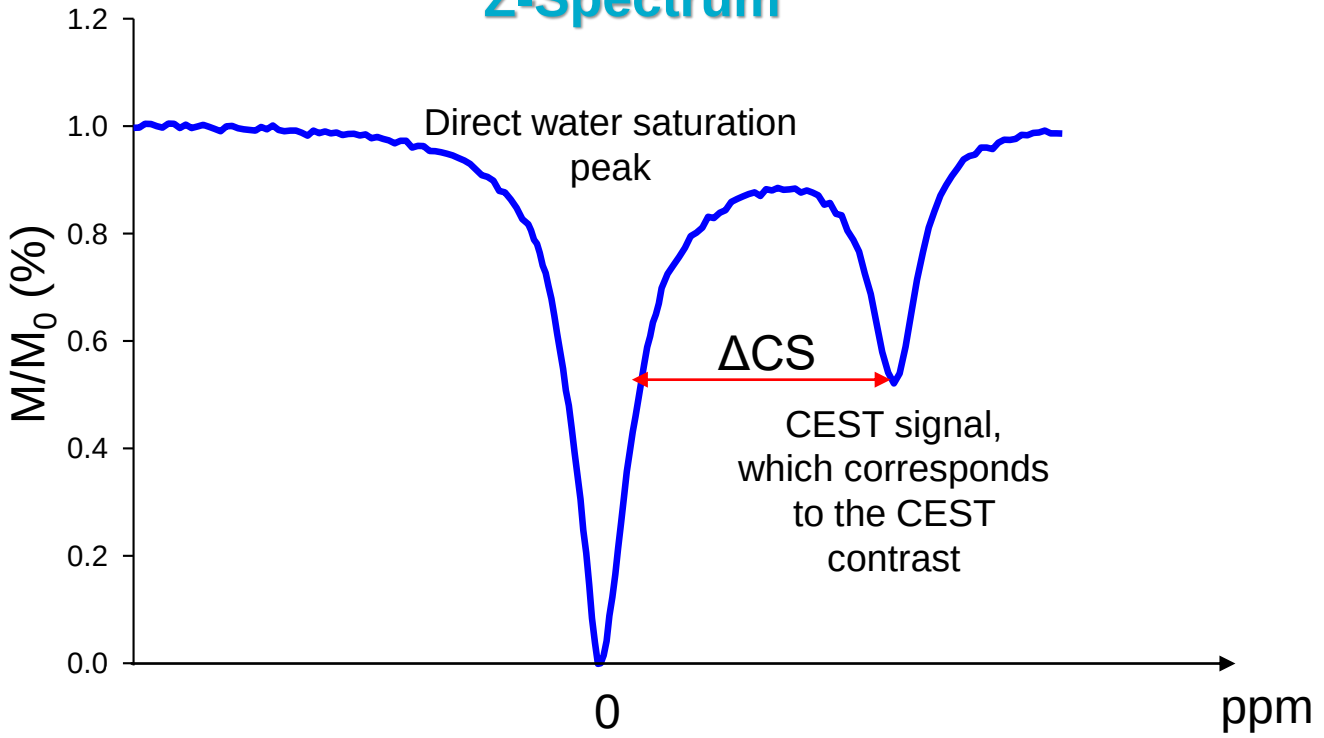
CEST MRI

Chemical Exchange Saturation Transfer



Saturation transferred from innersphere water molecules to bulk water to generate the CEST contrast

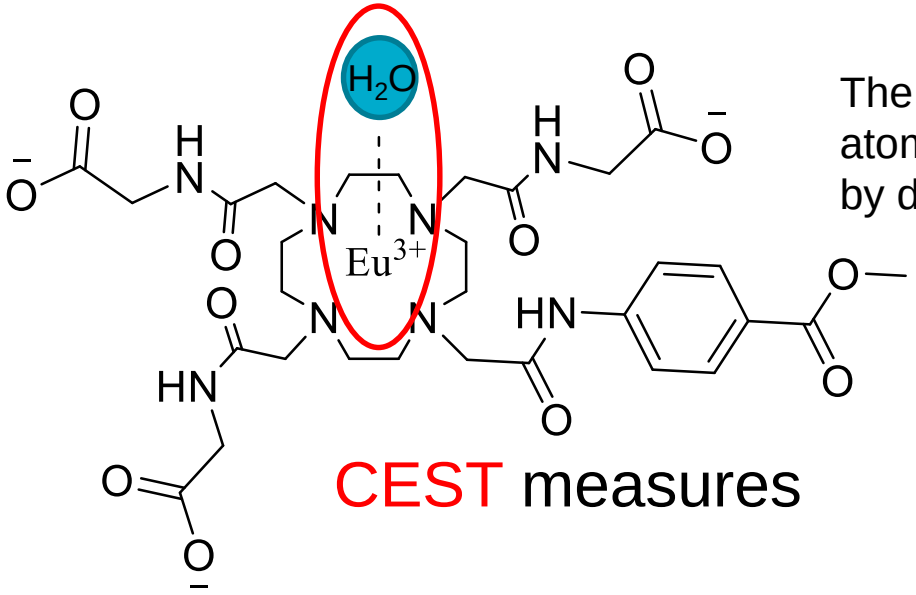
Z-Spectrum



Advantages of paraCEST MRI:

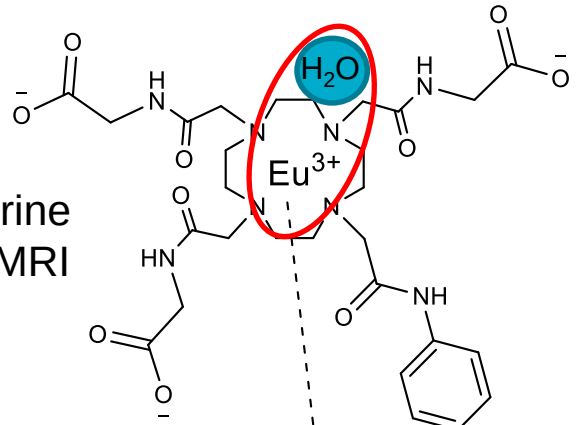
- No need for a pre-contrast image
- Multi-contrast Imaging of several agent injected simultaneously
- Design of agent responsive to different physiological stimuli

Goal of the thesis



CEST measures

The interaction of a lanthanide with the fluorine atoms increases the sensitivity in fluorine MRI by decreasing the ^{19}F relaxation times



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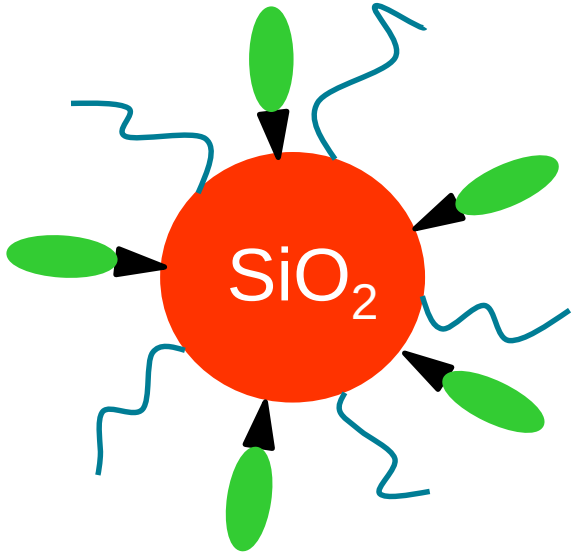
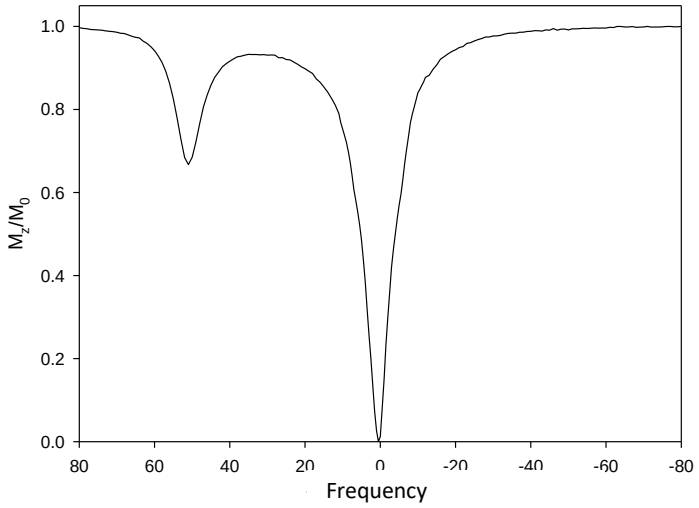


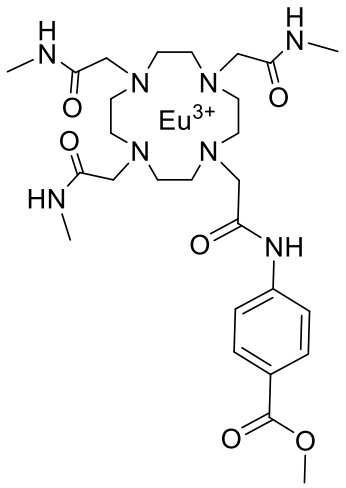
PEG

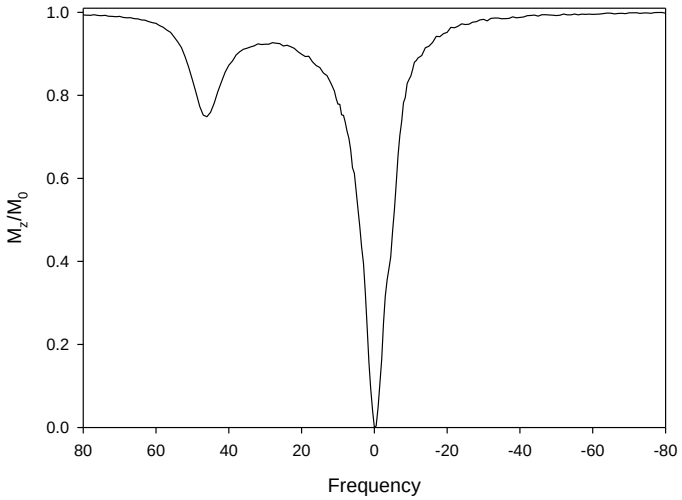
Grafting on silica nanoparticles to enhance the sensitivity

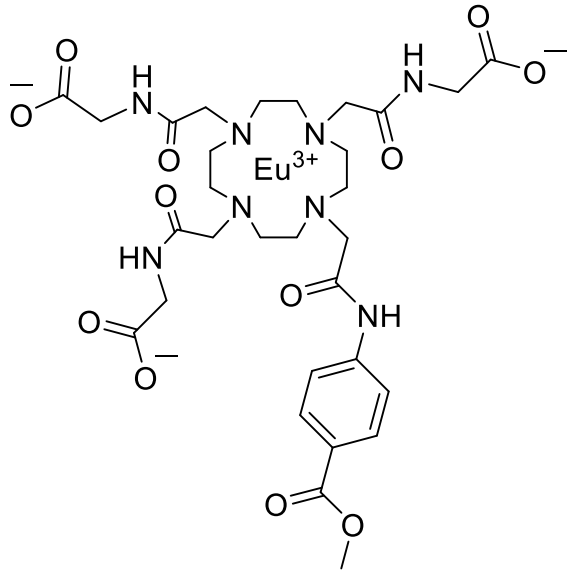
CEST and ^{19}F relaxation measures

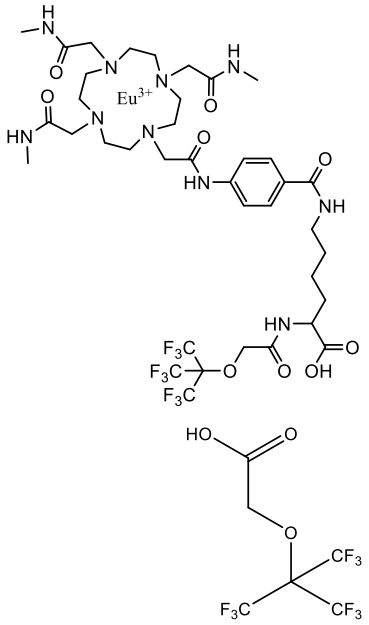
Results











Concentration (mM)	T_1 (ms)	T_2 (ms)
0.25	889,65	463,32
0.125	884,66	473,79

÷2.2 ÷4

Concentration (mM)	T_1 (ms)	T_2 (ms)
10	2021	1832
5	2064	1811

Conclusions and perspectives

Conclusions:

- Important CEST signal intensity of the presented europium complexes
- Decrease of the ^{19}F relaxation times from the bimodal agent after complexation with europium, which generates an increase of sensitivity
- High loss of water solubility after grafting of the fluorine agent

Perspectives:

- Development of other complexes to increase the water solubility
- Use of different lanthanides to optimize CEST signal and ^{19}F relaxation times
- Creation of nanoplatforms as silica nanoparticles or micelles
- Diseases targeting with a peptide