Abstract #238

Synthesis of a bimodal contrast agent for magnetic resonance imaging and photoacoustic imaging

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Introduction

One of the most used techniques to obtain anatomical information is magnetic resonance imaging (MRI). Although its high resolution, this method has a low sensitivity that can be solved by using a bimodal system where MRI is associated with a more sensitive technique, such as photoacoustic imaging (PAI). In this work, a bimodal contrast agent has been developed. The probe used for MRI is a Gd-PCTA derivative and that used for PAI is a chromophore ZW800-1, derivated from green indocyanine. The two probes have been covalently associated via a spacer based on L-lysine.

Methods

The synthesis starts with a lysine derivative. The protecting groups can be removed selectively to graft the different probes. Different syntheses have been performed to optimize the coupling reaction. The lysine has been functionalized with Gd-PCTA and then with ZW800-1 (figure 1). All of the synthesis intermediates have been characterized by ^{1}H and ^{13}C NMR and mass spectrometry.

Results/Discussion

The mass spectrum of the isolated compound is in agreement with the theoretical spectrum of the desired compound. This spectrum confirms the presence of the gadolinium complex. After the synthesis of the final product, Gd-PCTA-Lys (ZW800-1)OAl, relaxometry measurements were performed to highlight the efficacy of the MRI probe.

The NMRD profile shows a decrease of the relaxivity of the gadolinium complex after the linker coupling, which can be explained by the loss of a coordinated water molecule confirmed by ^{17}O NMR. On the other hand, the coupling with the fluorophore causes a clear increase of the relaxivity which could result from π-stacking interactions confirmed by a modification of the rotational correlation time.

Conclusions

This synthesis allows to obtain a bimodal probe for MRI and photoacoustic imaging. In a close future, in vivo studies will be done and the grafting of specific biovectors will be optimized to prepare a specific probe for molecular imaging of inflammation.

References

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Acknowledgement

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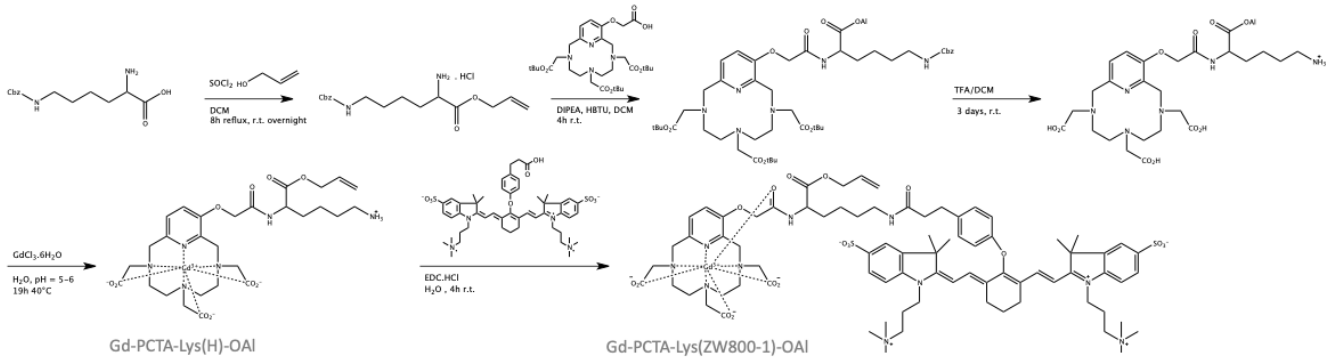
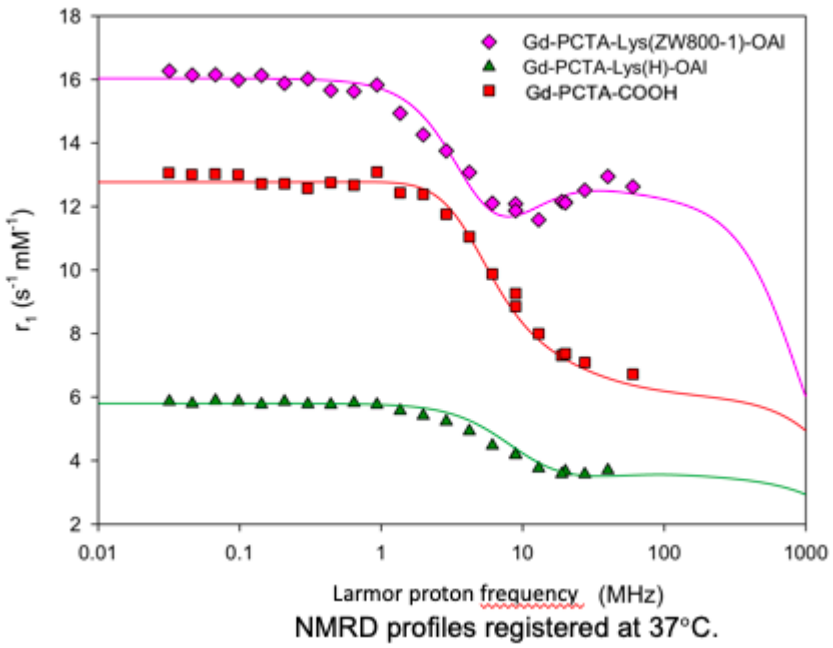


Synthesis of the bimodal probe
Synthetic scheme of the bimodal probe. (Figure 1)



NRMD profils
NMRD profiles at 310 K. The straight lines correspond to the theoretical fitting according to the theory of Solomon and Bloembergen. (Figure 2)