Tunable performance of manganese oxide nanostructures as MRI contrast agents

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Magnetic resonance imaging (MRI) is a medical imaging technique perfectly suited for human healthcare applications. The lack of ionizing radiations, its high spatial/anatomical resolution and non-invasiveness make it an attractive tool for diagnostic purposes and to follow the progression of a disease/treatment.[1] To date the main limitation of MRI is its low sensitivity compared to radioactive-based and optical imaging modalities. To increase its sensitivity, contrast agents (CAs) are administered in about 50% of scans.[2] Clinically used CAs are based on a paramagnetic ion, Gd3+, that due to its toxicity has to be administered strongly chelated to limit its interference with biological proceses.[3] Other species are being studied as potential substitutes for Gd3+ chelates. MnO2 nanostructures present several advantages over traditional Gd chelates. First, Mn is less toxic than Gd. Also, MnO2 is not particularly active by MRI. This means that once administered it won´t produce significant changes in MR images. However, MnO2 is very sensitive to biologically relevant conditions. For example, under deregulated redox conditions, MnO2 will be easily reduced into Mn2+ which is highly paramagnetic and significantly enhances T1w MR signal.[4,5] This OFF-ON MR behavior can be exploited for diagnostic purposes. In this talk the synthesis and functional characterization of several MnxOy nanostructures will be discussed as well as their combination with reporter molecules for other imaging techniques as a step further towards multimodal and unequivocal imaging diagnosis.

References

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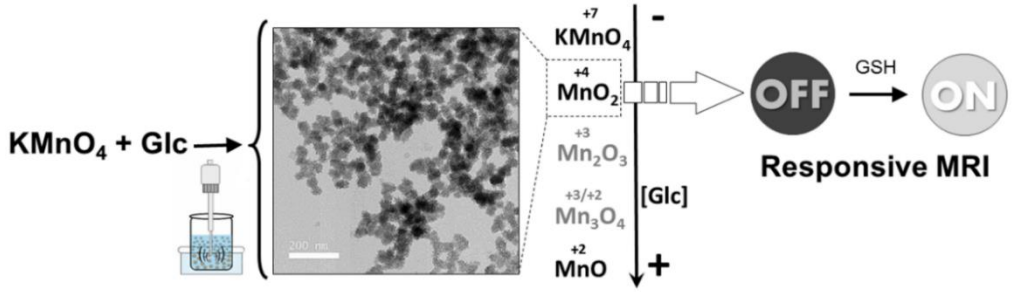

Figure 1: Schematic representation of the aim and results of this work.