^{68}Ga-DPD-Fe_3O_4 as a dual-modality contrast agent: magnetic resonance imaging on mice

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Dual modality contrast agents (DMCAs), such as radiolabeled Fe_3O_4 nanoparticles, combine the advantages of each imaging modality (i.e., the high sensitivity of positron emission tomography or single photon emission computed tomography (PET or SPECT) with the high spatial resolution of magnetic resonance imaging (MRI)), providing a powerful imaging tool in diagnosis. Thus, taking into account the importance of the application of a DMCA in well-established imaging applications of clinical practice, we aimed to develop and evaluate both *in vitro* and *in vivo* a PET/MRI DMCA for diagnostic purposes. The DMCA we have studied consists of Fe_3O_4 nanoparticles, surface functionalized with 2,3-dicarboxypropane-1,1-diphosphonic acid (DPD) and radiolabeled with ^{68}Ga, that is ^{68}Ga-DPD-Fe_3O_4. Here we demonstrate in detail, the physical properties of the specific DMCA (crystallographic, morphological and magnetic), as well as its *in vivo* imaging efficacy by means of MR imaging in normal mice [1, 2].

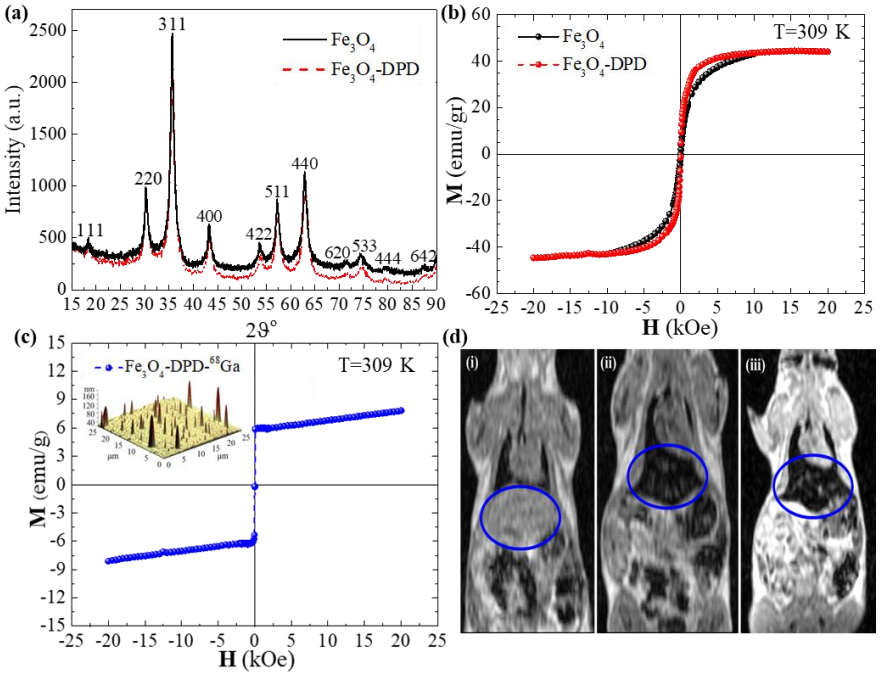

Figure 1: (a) XRD data of Fe_3O_4 and DPD-Fe_3O_4 contrast agents (CAs). (b) Magnetization data, **M(H)**, at T= 309K of Fe_3O_4 and DPD-Fe_3O_4 CAs. (c) **M(H)** measurements at T= 309K of ^{68}Ga-DPD-Fe_3O_4 DMCA. The upper left inset illustrates a representative three-dimensional topographic atomic force microscopy image of the DMCA. (d) Representative T_1-weighted coronal MRI data (6 h post injection) of n = 3 normal mice injected with ^{68}Ga-DPD-Fe_3O_4 DMCA at concentrations of: (i) C_{DMCA}= 0.01 mg/ml and (ii) C_{DMCA}= 0.1 mg/ml, respectively and with (iii) non-radiolabeled DPD-Fe_3O_4 CA at C_{CA}= 0.1 mg/ml. The blue circles indicate the area of interest.

References

[1] Karageorgou M. A. et al., Contrast Media Mol. Imaging 6951240, 1-13 (2017).
[2] Karageorgou M. A. and Stamopoulos D., Sci. Rep. **11**, 9753 (2021).
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