Nuclear magnetic resonance in hexaferrite/maghemite composite nanoparticles

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Due to their bio-compatibility and non-toxicity, iron oxides are suitable for magnetic drug delivery or as materials for hyperthermia. Compounds of spinel structure (magnetite/maghemite) are most frequently used, however, the desired magnetic properties can be reached by combining more phases (e.g., maghemite and hexaferrite) into a composite material. We employed NMR to investigate strongly inhomogeneous nanoparticle composites. Frequency-swept ^{57}Fe NMR spectra of nanoparticle samples containing maghemite, hematite and M-phase of strontium hexaferrite were measured in zero external magnetic field at 4.2 K. Utilizing differences in optimal excitation field strengths and in relaxation times, we were able to resolve NMR signal assigned to hexagonal phase from signal which showed features attributed to maghemite.