

Cobalt Ferrite Supported on Reduced Graphene Oxide as a T₂ Contrast Agent for Magnetic Resonance Imaging

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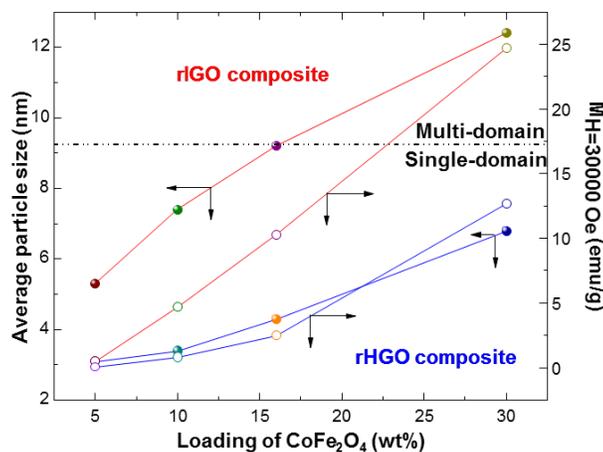
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As the magnetization strength is maximized by the uniform directionality of the magnetic field, it has been assumed that superparamagnetic behavior is the most favorable condition for solid-state magnetic resonance imaging (MRI) contrast agents [1]. At the nanoscale, there is a higher probability to observe particles that constitute a single magnetic domain, thus candidates for next-generation MRI contrast agents include small-sized particles of spinel-structured ferrites. However, with size reduction (and the associated increase in surface-to-volume ratio), unintended phenomena such as colloidal instability, agglomeration and spin-glass-like behavior become more pronounced under physiological conditions.

To circumvent these issues, graphene flakes have been proposed as anchoring supports for ferrite nanoparticles [2]. While promising results have been reported, it remains unknown if and how the surface texture and chemistry of the graphene supports affect the magnetic properties and relaxation time (T₂) of the MRI-active nanoparticles.

Here, it is shown that the type of graphene oxide (GO) precursor used to make composites of cobalt ferrite (CoFe₂O₄) and reduced GO, influences greatly not just the T₂ but also the average size, dispersion and magnetic behavior of the grafted nanoparticles [3]. In fact, some of the properties measured were similar in magnitude and manner to those of the stand-alone nanoparticles despite the smaller mass of CoFe₂O₄ present in the composites. Accordingly, and without compromising biocompatibility, a judicious choice of the initial GO precursor can result in doubling of the proton relaxivity rate in this system.



References:

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