Supplementary Material (ESI) for Chemical Communications

Supplemental Information

Experimental

Characterisation of DNA-magnetite composites

Characterisation of the material was carried out by transmission electron microscopy (TEM), infrared (IR) spectroscopy, Raman spectroscopy, X-ray diffraction (XRD) and nuclear magnetic resonance dispersion (NMRD) studies. PCS measurements confirm the presence of stable aggregates of the order of 70-100nm (equivalent spherical diameter).

NMRD measurements

The NMRD response of the disperse superparamagnetic phase was simulated using the model of Muller and Roch, which is available from the website (http://www.cerm.unifi.it/relax/relaxometry2.html). The displayed curve is the sum of weighted NMRD curves for a population of particles with size ranging from 5.0, 6.0,..12.0 nm. The weightings were taken from the TEM size distribution for this sample. The other parameters for the fit were kept constant for all particle sizes at the reasonable values suggested by Roch and Muller for magnetite. The maximum in the simulated NMRD response between 1-2 MHz is broader than that predicted for a monodisperse (single-size) sample. Note that it is not possible to generate a good fit to the data with a simulation for a sample of single size particles by adjusting the parameters of the model; particle size, water diffusion coefficient, Neel correlation time (τ_N), etc. The resulting fits invariably deviate systematically from the data, and suggest unrealistically low τ_N values, given the particle size.

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Figure S1: (a) Infra-red spectrum of denatured hs-DNA-magnetite nanocomposites

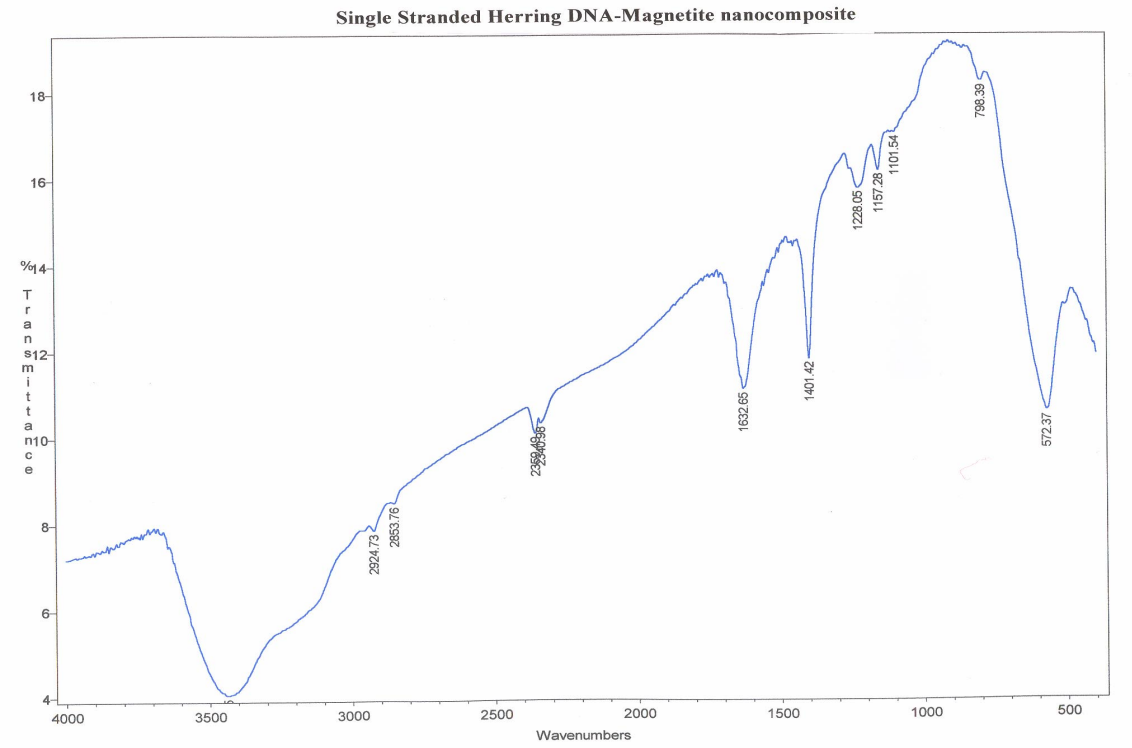

Figure S2: (a) Raman spectrum of magnetite nanocomposites.

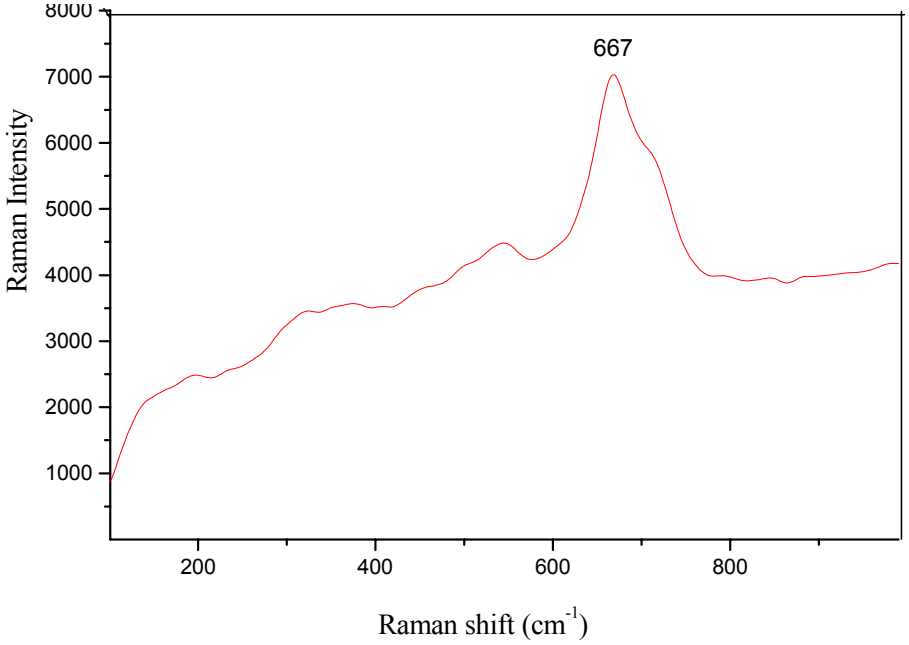

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Figure S3: XRD of single stranded hs DNA-magnetite nanocomposites with diffraction pattern coinciding with JCPDS data for magnetite

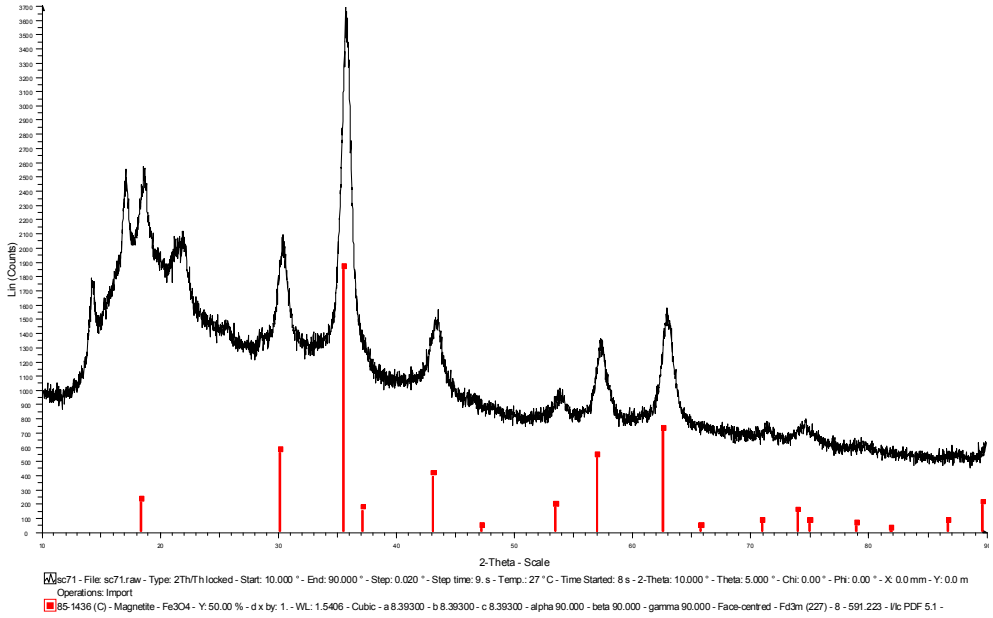

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Figure S4: TEM images of (a) Magnetite nanoparticles prepared by co-precipitation without DNA, (b) Magnetite nanoparticles without DNA subjected to 7T magnetic field, (c) denatured (substantially single-stranded) hs-DNA-magnetite nanocomposites, (d) - (f) denatured hs-DNA-magnetite nanocomposite subjected to a 7T magnetic field.