

Supplementary Information For

Magnetic nanoparticles-loaded Polymer Nanospheres as Magnetic Hyperthermia Agent

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S1. Calculation of Intra-Particle Distance between MnFe₂O₄ nanoparticles

Firstly, the average number of MnFe₂O₄ nanoparticles in a sphere was estimated on the basis of MnFe₂O₄ nanoparticles-loading obtained from TGA measurements. The densities of MnFe₂O₄ and the polymer matrix were taken be 5.0 g/cm⁻³ and 1.3 g/cm⁻³, respectively, as adopted from common online resources. (ρ is density, m is mass, and $wt\%$ is MnFe₂O₄ nanoparticles loading (TGA results))

$$\text{Volume of sphere: } V = \frac{4}{3}\pi R^3$$

$$\text{Volume of MnFe}_2\text{O}_4: V = \frac{4}{3}\pi r^3$$

$$\text{Volume: } V = \frac{m}{\rho}$$

$$\frac{V_{MNP}}{V_{MNC}} = \frac{m_{MNP}}{m_{MNC}} \times \frac{\rho_{MNC}}{\rho_{MNP}} = \frac{m_{MNP}}{m_{MNP} + m_{polymer}} \times \frac{\rho_{MnFe2O4} \times wt\% + \rho_{polymer} \times (1 - wt\%)}{\rho_{MnFe2O4}} = n_{MNP} \frac{r^3}{R^3}$$

$$wt\% = \frac{m_{MNP}}{m_{MNP} + m_{polymer}}$$

No. of MnFe₂O₄ nanoparticles per sphere:

$$n_{MNP} = wt\% \times \frac{\rho_{MnFe2O4} \times wt\% + \rho_{polymer} \times (1 - wt\%) R^3}{\rho_{MnFe2O4} r^3}$$

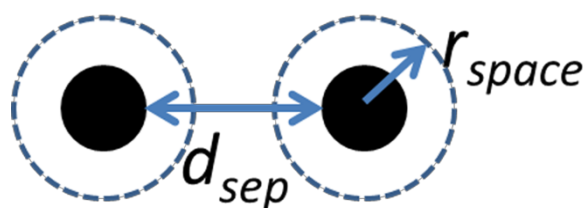
The average separation distance (d_{sep}) between the particles was estimated by assuming that the MnFe₂O₄ nanoparticles were perfectly dispersed within the spherical nanogel matrix. Individual MnFe₂O₄ nanoparticles occupied a volume of space, V_{space} , within the spherical matrix. The maximum volume fraction occupied by closed-packed spheres in a body

$$\text{was } \frac{\pi}{3\sqrt{2}} \approx 0.74$$

$$V_{space} = 0.74 \frac{V_{MNC}}{n_{MNP}}$$

$$r_{space} = \sqrt[3]{0.74 \frac{V_{MNC}}{n_{MNP}} \frac{3}{4\pi}}$$

$$d_{sep} = 2 \times (r_{space} - r_{MNP})$$



S2. Plot of saturation magnetization against loading for MLPNs

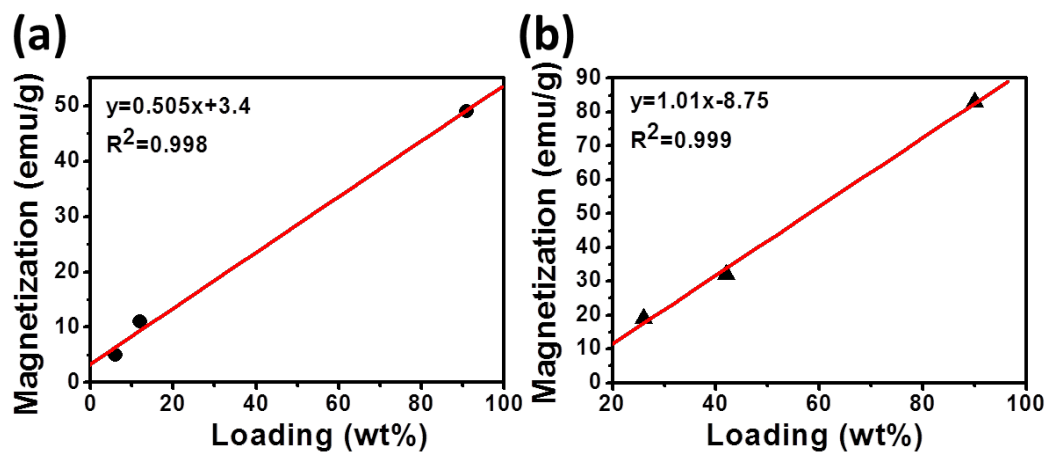


Fig. S2. Plot of saturation magnetization against loading wt% for MLPNs (a) 6 nm loaded samples and (b) 18 nm loaded samples.