

**Highly magnetizable superparamagnetic iron oxide nanoparticles
embedded mesoporous silica spheres and their application for efficient
recovery of DNA from agarose gel****

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Fig. S1. Hydrodynamic diameters of the emulsion droplets(a) and autocorrelation function ($C(t)$) versus the delay time (t) (b). It is seen that the average diameter of the emulsion droplets is 223 nm with a narrow size distribution. The autocorrelation function curve is very smooth, indicating the good stability of the emulsion droplets.

Fig. S2. XRD patterns of (a) the oleic modified iron oxide nanoparticles and (b) the iron oxide nanoparticles embedded mesoporous silica spheres.

Fig. S3. TG/DTA curves of (a) pure magnetite and (b) the composite spheres without calcination. Pure magnetite underwent two exothermic reactions at 140 °C and 580 °C. The exotherm at 140 °C is attributed to the formation of γ -Fe₂O₃, which result in an increment in weight. The exotherm at 580 °C is related to the phase transformation from γ - to α -Fe₂O₃. The composite spheres presented a broad exotherm between 210 to 480 °C, corresponding to a mass loss of 21% which might result from the thermal decomposition of the CTAB surfactants. It is noted that there is no exotherm below 210 °C for the composites and the exotherm at 330 °C is likely to be attributed to the formation of γ -Fe₂O₃.

Fig. S4. Raman spectra of (a) pure magnetite and (b) the composite spheres after calcination at 600 °C for 6 h. The spectrum of pure magnetite after the calcination is in consistent with the reported data of hematite (α -Fe₂O₃) which belongs to the D_{3d}^6 crystal space group (see D. L. A. de Faria, S. V. Silva and M. T. de Oliveira, *J. Raman Spectrosc.*, 1997, **28**, 873-878; T. ohtsuka, K. Kubo and N. Sato, *Corrosion*, 1986, **42**, 476-481). The bands at 225 and 498 cm⁻¹ belong to the A_{1g} modes and the bands at 247, 293, 412, and 613 cm⁻¹ belong to the E_g modes (see S. P. S. Porto and R. S. Krishnan, *J. Chem. Phys.*, 1967, **47**, 1009-1012). The presence of γ -Fe₂O₃ phase as the main composition of the iron oxide in the mesoporous silica was characterized by the features at 350, 495, and 665-720 cm⁻¹, and the appearance of the characteristic peak around 1400 cm⁻¹ further confirms that the main composition of the iron oxide phase is γ -Fe₂O₃ but not Fe₃O₄ (see K. Mori, Y. Kondo, S. Morimoto and H. Yamashita, *J. Phys. Chem. C*, 2008, **112**, 397-404; M. H. Sousa, F. A. Tourinho and J. C. Rubim, *J. Raman Spectrosc.*, 2000, **31**, 185-191). These results indicate that the mesoporous silica shell is effective to protect the iron oxide phase from being transferred into α -Fe₂O₃ during the calcination and the iron oxide phase in the calcinated composite spheres is mainly γ -Fe₂O₃.







