1. Magnetic hysteresis curves of the MnFe$_2$O$_4$ NPs with different reaction temperature

![Magnetic Hysteresis Curves](image)

**Figure S1** Magnetic hysteresis curves of the MnFe$_2$O$_4$ NPs at 300 K with different reaction temperature (a) 140 °C (b) 160 °C (c) 180 °C

Figure S1. shows the magnetization hysteresis curves of the synthesized MnFe$_2$O$_4$ NPs at 300 K and with the magnetic field of 20 kOe. We can draw from Figure S1 that MnFe$_2$O$_4$ NPs prepared at 140 °C, 160 °C and 180 °C have superparamagnetic properties for their remanence and coercivity are zero. And their saturation magnetization is 30.67, 46.01 and 51.12 emu·g$^{-1}$, respectively. With the increasing of reaction temperature, NPs become larger, which makes the saturation magnetization increasing simultaneously.

2. X-ray diffraction of MFe$_2$O$_4$ NPs
XRD experiments were performed to identify the crystallographic structure and estimated the particle size (Figure S2). All the nanomaterials exhibited a typical ferrite diffractogram pattern, confirming the expected cubic spinel structure (Fd3m). As shown in Figure S2, the discernible peaks can be indexed to the diffraction peaks of the as-synthesized Fe$_3$O$_4$ NPs at 18.1, 30.0, 35.5, 37.0, 43.0, 53.0, 57.0 and 62.6, which are respectively ascribed to the (111), (220), (311), (222), (400), (422), (511) and (440) planes of CoFe$_2$O$_4$ (JCPDS No. 22-1086), NiFe$_2$O$_4$ (JCPDS No. 87-2338) and ZnFe$_2$O$_4$ (JCPDS No. 89-1010), which indicates the obtained NPs are magnetite. The average particle size of the NPs is calculated to be about 6.6 nm for CoFe$_2$O$_4$, 7.8 nm for NiFe$_2$O$_4$, and 7.6 nm for ZnFe$_2$O$_4$ by using Scherer’s equation from the half-maximum width of the (311) X-ray diffraction line.

3. DLS plots of bare MnFe$_2$O$_4$ NPs
Figure 3. DLS plots of bare MnFe$_2$O$_4$ NPs

4. Magnetic hysteresis curves of surfactant coated MnFe$_2$O$_4$ NPs at 300 K

Figure 4. Magnetic hysteresis curves of CTAB, SDBS and SDS functionalized MnFe$_2$O$_4$ NPs.

The magnetic properties of functionalized superparamagnetic particles will also present superparamagnetic properties. The magnetic saturation of functionalized magnetic particles is smaller than that of the bare magnetic particles. Their saturation magnetization is 41.41 (MnFe$_2$O$_4$/CTAB), 41.87 (MnFe$_2$O$_4$/SDBS) and 42.22 (MnFe$_2$O$_4$/SDS) emu·g$^{-1}$, respectively.