Electronic Supplementary Information:

**High quality self-assembly magnetite (Fe$_3$O$_4$) chain-like core-shell nanowires with luminescent synthesized by a facile one-pot hydrothermal process**

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**Characterization:** The obtained samples were characterized on an (Philips X’Pert Pro Super) X-Ray powder diffractometer with Cu Ka radiation ($\lambda = 1.541874$ Å). The morphology was examined with a JEOL JSM-6700F scanning electron microscope (SEM), and a transmission electron microscope (TEM) performed on a Hitachi (Tokyo, Japan) H-800 transmission electron microscope (TEM) at an accelerating voltage of 200 kV, and high-resolution transmission electron microscope (HRTEM) (JEOL-2010) operated at an acceleration voltage of 200 kV. Photoluminescence emission was performed at room temperature with a Perkin–Elmer LS55 luminescence spectrometer. The magnetic properties of samples were investigated using a superconducting quantum interface device (SQUID) magnetometer (Quantum Design MPMS XL).

![Fig. S1.](image-url) The influence of reaction time on the shapes and sizes of self-assembly Fe$_3$O$_4$@phenol formaldehyde resin core-shell nanowires. SEM images of the samples prepared at 180 °C, showing the morphology evolution of the Fe$_3$O$_4$ composite. The reaction time was, respectively, (a) 6 hours, (b) 12 hours, (c) 36 hours and (d) 48 hours.
**Fig. S2** XRD pattern of the nanowires obtained from reaction sodium at 180 °C for 6 hours.

**Fig. S3.** The hysteresis loops for as-synthesized self-assembly Fe$_3$O$_4$@phenol formaldehyde resin core-shell nanowires recorded at 300 K (a) and 4 K (b).
Fig. S4. (a), (b) Photograph of the self-assembly Fe$_3$O$_4$@phenol formaldehyde resin core-shell nanowires dispersed in the water and response to external magnetic field.