Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B


# Multifunctional PEG encapsulated $Fe_3O_4$@silver hybrid nanoparticles: antibacterial activity, cell imaging and combined photothermo/chemo-therapy

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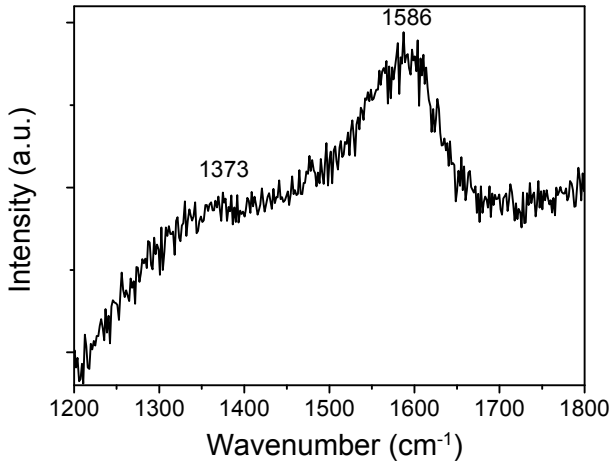


Fig. S1. Raman spectrum of the as-obtained $Fe_3O_4$@PEG NPs.

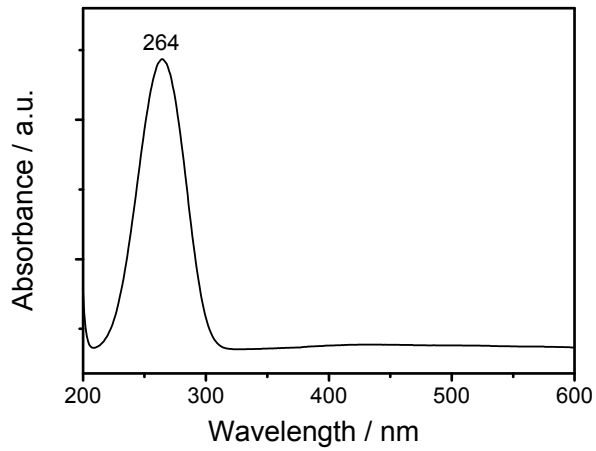


Fig. S2. Typical UV–visible absorption spectrum of the as-obtained $Fe_3O_4$@PEG NPs.

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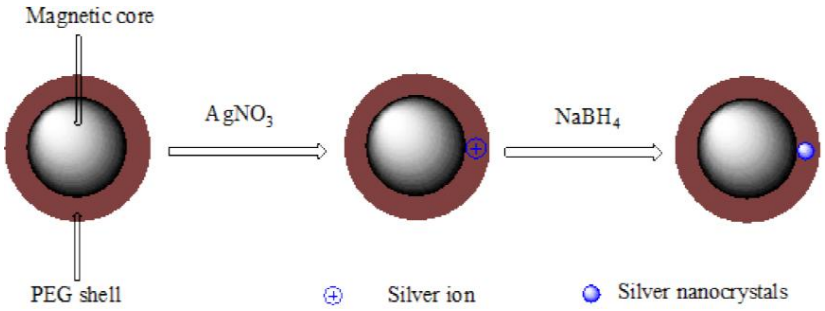


Fig. S3. Schematic illustration of the synthesis of $Fe_3O_4$@Ag-PEG hybrid NPs.

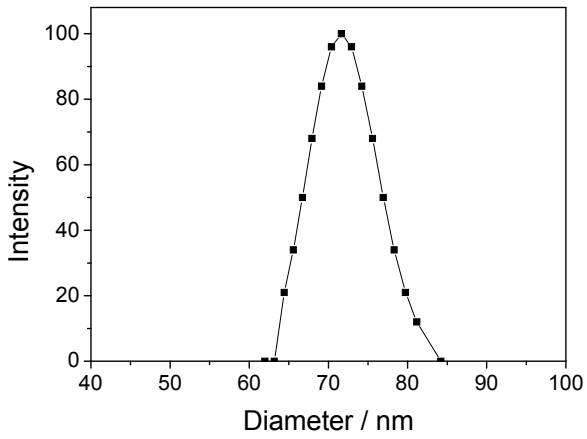


Fig. S4. Hydrodynamic diameter distribution of the $Fe_3O_4$@Ag-PEG hybrid NPs synthesized at 30 °C and $[Ag^+]$ = 0.19 mM for 1h.

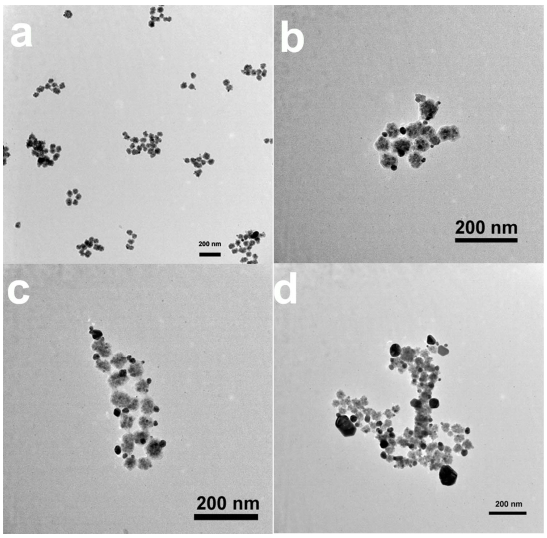


Fig. S5. TEM images of the $Fe_3O_4$@Ag-PEG hybrid NPs synthesized at 30 °C and initial $[Ag^+]$ = 0.19 mM, but for different reaction time: (a) 1 h, (b) 3 h, (c) 6 h, and (d) 12 h.

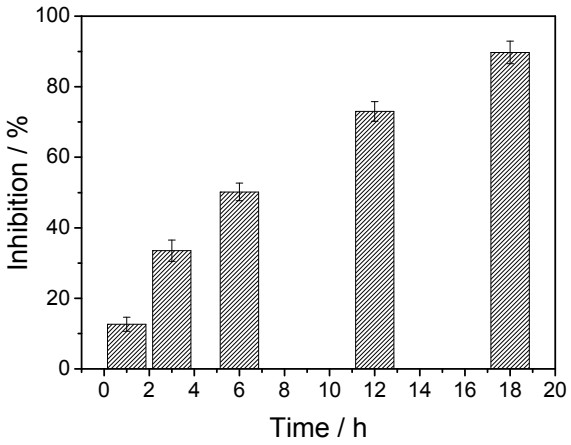


Fig. S6 The bacterial inhibition efficiency of the dumbbell-like structured $Fe_3O_4$@Ag-PEG hybrid NPs (the average size of Ag NPs = 22 nm, concentration = 160 μg/mL) at different interaction time with bacteria.

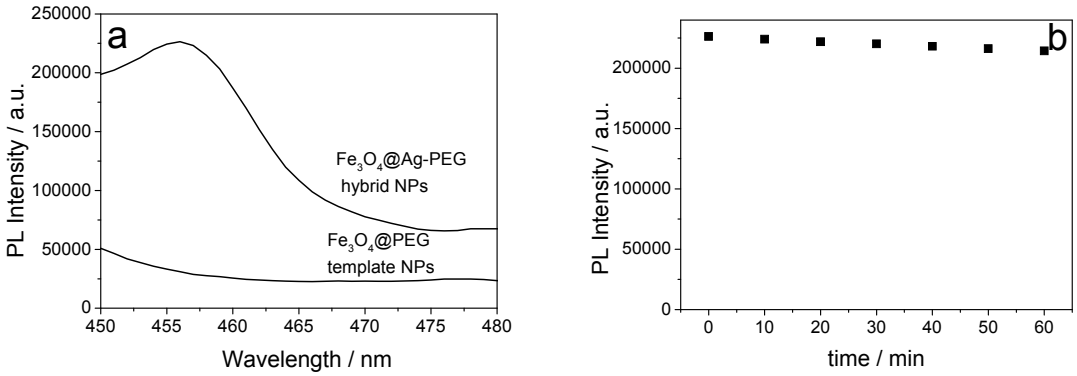


Fig. S7. (a) The PL spectra of the $Fe_3O_4$@PEG template NPs and $Fe_3O_4$@Ag-PEG hybrid NPs synthesized at $[Ag^+]$ = 0.19 mM and 30°C for 1 h. (b) The fluorescence intensity of the $Fe_3O_4$@Ag-PEG hybrid NPs used in (a) under different excitation time. Excitation wavelength = 390 nm.

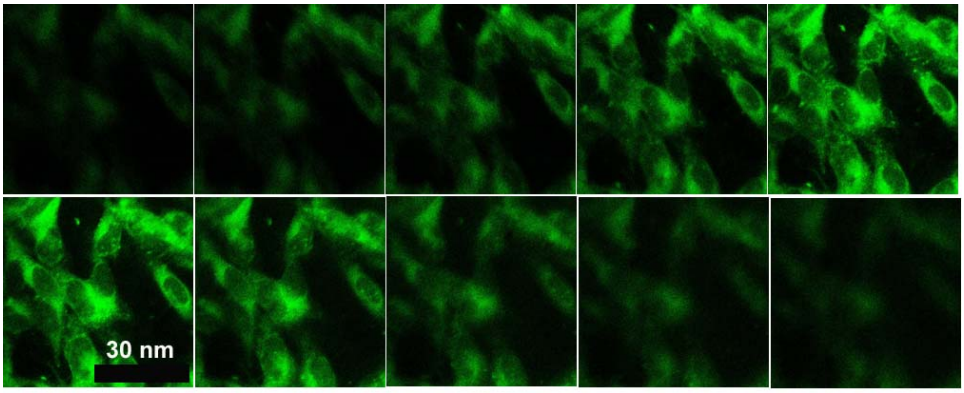


Fig. S8. Z-Scanning confocal fluorescence images of the B16F10 cells incubated with the $Fe_3O_4$@Ag-PEG hybrid NPs containing multiple Ag nanocrystals in the shell. Excitation wavelength = 405 nm.

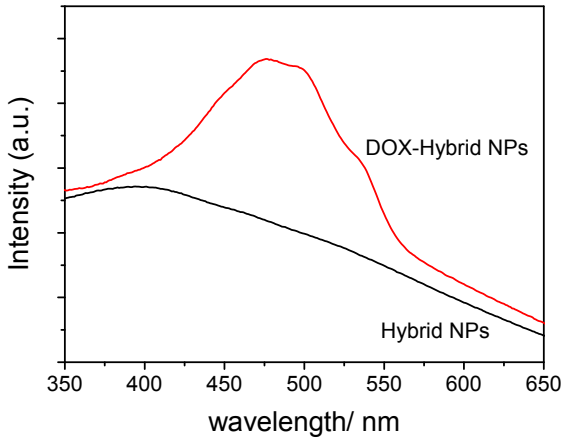


Fig. S9. Typical UV–visible absorption spectra of the as-obtained $Fe_3O_4$@Ag-PEG hybrid NPs and DOX-loaded $Fe_3O_4$@Ag-PEG hybrid NPs.

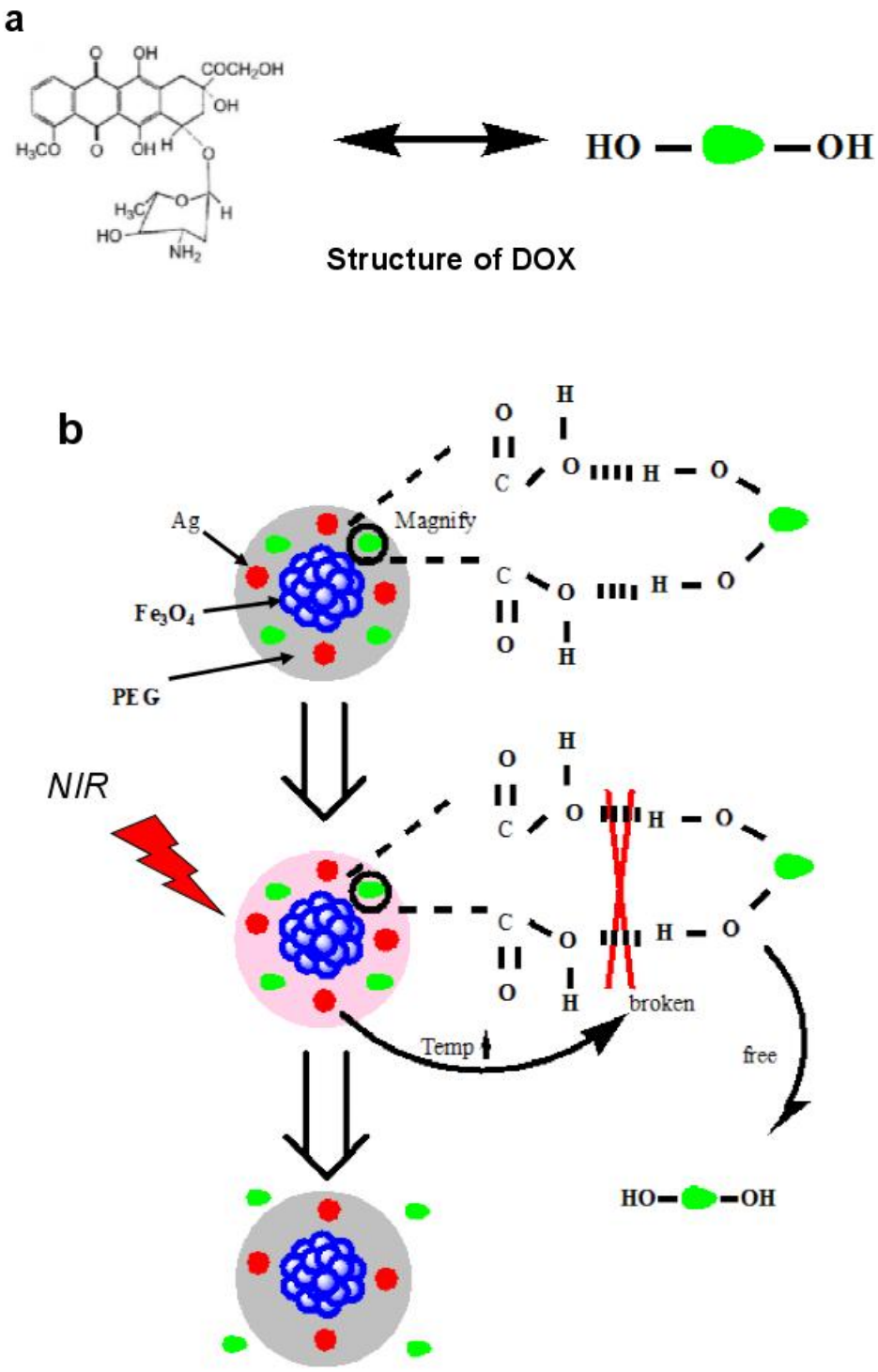


Fig. S10 (a) Structure of DOX; (b) Schematic illustration of the NIR photo-controlled drug release from the DOX-loaded $Fe_3O_4$@Ag-PEG hybrid NPs.

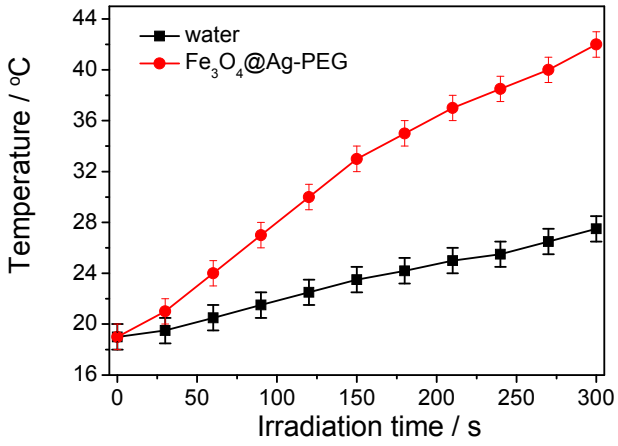


Fig. S11. The heating curves of water and $Fe_3O_4$@Ag-PEG (0.2 mg/mL) hybrid NPs under NIR irradiation.

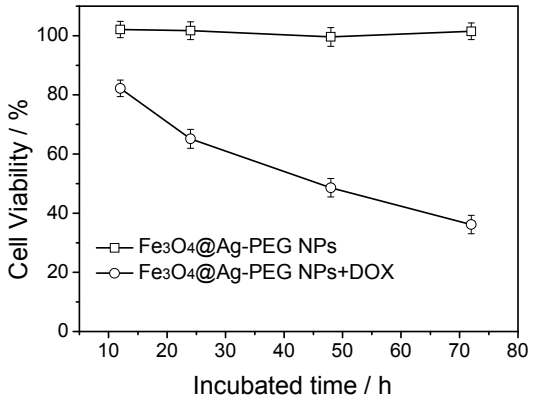


Fig. S12 In vitro cytotoxicity of B16F10 cells incubated with DOX-free $Fe_3O_4$@Ag-PEG NPs and DOX-loaded $Fe_3O_4$@Ag-PEG NPs under different incubation time.

**Table S1**. The loading content of Ag nanocrystals in and/or on the $Fe_3O_4$@Ag-PEG hybrid NPs

| Initial concentration [Ag+]/ mM | Remanent concentration [Ag+]/ mM | Loading content |
|---|---|---|
| 0.19 | 0.0038 | 98% |
| 0.38 | 0.0256 | 93% |
| 0.58 | 0.1276 | 78% |