Supporting Information

Synthesis of lipophilic core-shell Fe₃O₄@SiO₂@Au nanoparticles and polymeric entrapment into nano-micelle. A novel nanosystem for in vivo active targeting and magnetic resonance/photoacoustic dual-imaging.

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Figure S1. Dynamic Light Scattering (DLS) characterization of the size (a) and of the Zeta Potenzial (b) of the multifunctional nano-system Fe$_3$O$_4$@SiO$_2$@Au NPs.
Figure S2. (a) TEM image of Fe$_3$O$_4$@SiO$_2$ (scale bar 100 nm) and (b) Fe$_3$O$_4$@SiO$_2$ NPs (scale bar 500 nm).

Figure S3. EDX mapping of Fe$_3$O$_4$@SiO$_2$@Au NPs. The graph confirmed the presence of the three different shells: iron in the core, silica in the middle, gold onto the surface.
Figure S4. Thermal gravimetric analyses of Fe$_3$O$_4$ NPs (brown line) and Fe$_3$O$_4$@SiO$_2$ (grey line)

Figure S5. Thermal gravimetric analyses of Fe$_3$O$_4$ NPs (brown line), Fe$_3$O$_4$@SiO$_2$ (grey line) and Fe$_3$O$_4$@SiO$_2$@Au

Figure S6. Thermal gravimetric analyses of hydrophilic Fe$_3$O$_4$@SiO$_2$@Au (grey line) and lipophilic Fe$_3$O$_4$@SiO$_2$@Au-1 NPs
Figure S7. Dynamic Light Scattering (DLS) characterization of the size (a) and of the Zeta Potential (b) of the polymeric nanomicelles after the lipophilic FeO$_4$@SiO$_2$@Au NPs entrapment.
Figure S8. UV-Vis characterization of Fe$_3$O$_4$@SiO$_2$@Au@PMs-FA (a) and Fe$_3$O$_4$@SiO$_2$@Au@PMs-FA/fluo (b).

Figure S9: Absorption (left) and photoacoustic (right) spectra recorded for Fe$_3$O$_4$@SiO$_2$@Au@PMs.
Figure S10. Comparison of *in vitro* cytotoxicity of Fe₃O₄@SiO₂@Au@PMs-FA and Fe₃O₄@SiO₂@Au@PMs on IGROV cells after incubation for 24 hours. Note: Cell viability was evaluated by MTT assay. Results are expressed as means ± SD of experiments performed in triplicate.

Figure S11: The % Signal Intensity reduction measured in liver, spleen and kidneys after the i.v. injection of Fe₃O₄@SiO₂@Au@PMs (left panel) or Fe₃O₄@SiO₂@Au@PMs-FA (right panel) at different time points. Error bars represent SE of the mean (n=3).