

Supporting Information for

Simple and Generalized Synthesis of Oxide-Metal Heterostructured Nanoparticles and their Applications to Multimodal Biomedical Probes

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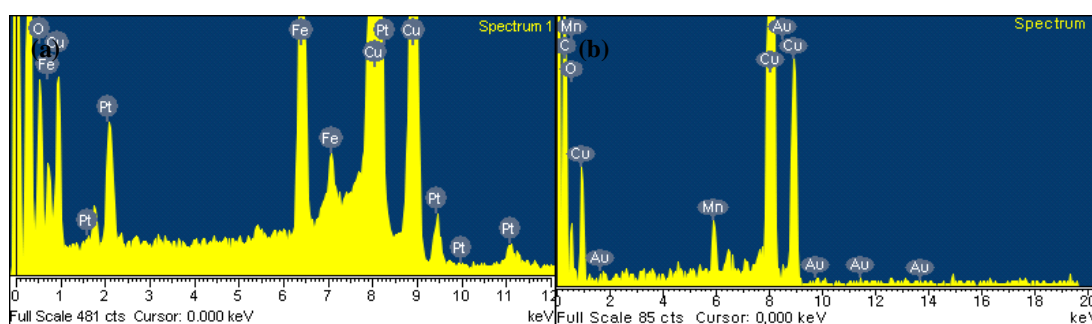


Figure S1. EDS data of (a) Pt-Fe₃O₄, and (b) Au-MnO heterostructured nanoparticles.

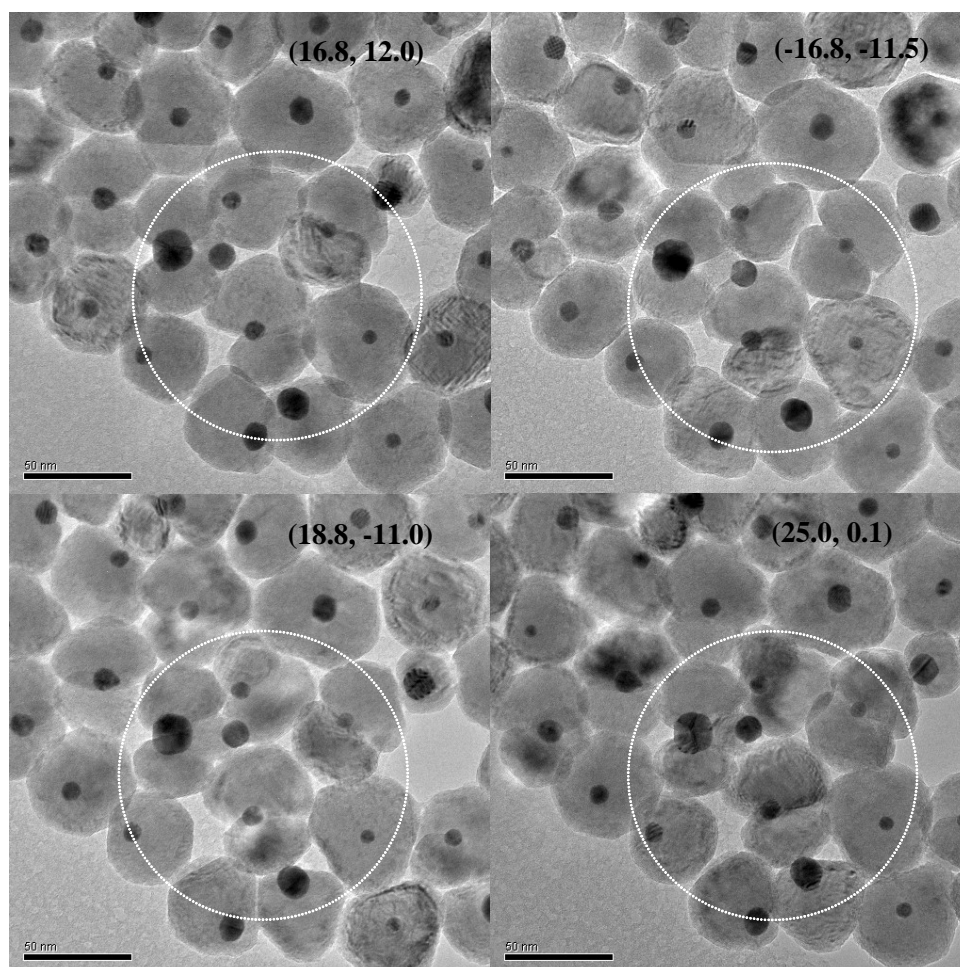


Figure S2. TEM images of dumbbell-like Au-MnO heterostructured nanoparticles at various tilted angles (X° , Y°).

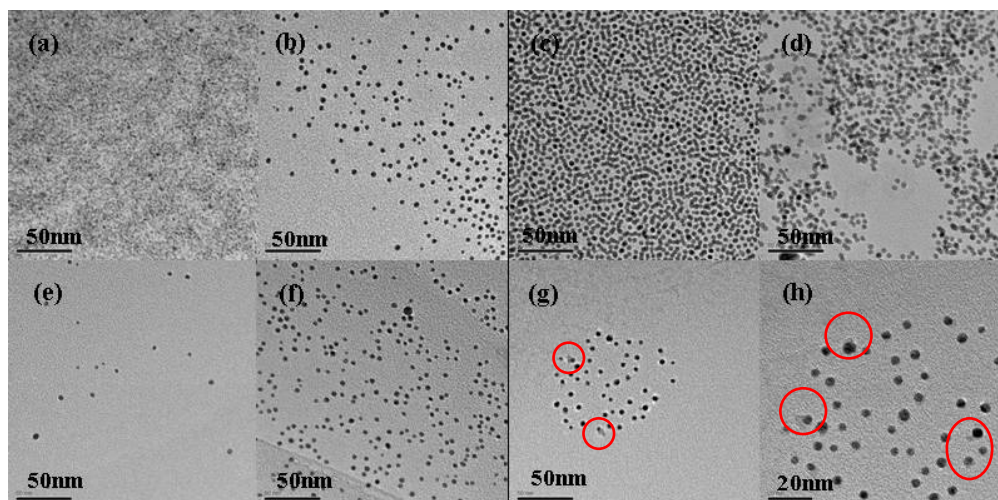


Figure S3. TEM images of the samples taken during the control experiment for the synthesis of heterostructured Au-MnO nanoparticles.

(a) After sonicating (30 min) the reaction mixture composed of 1 ml of oleylamine, 40 mg of hydrogen tetrachloroaurate(III) hydrate (0.1 mmol), and 5 mL of octadecene: only small sized Au nanoparticle seeds were observed.

(b) After aging the reaction mixture prepared in (a) at 140 °C for 20 minute: Au nanoparticles were observed.

(c) After aging the reaction mixture prepared in (a) at 280 °C: many Au nanoparticles were observed.

(d) After aging the reaction mixture prepared in (a) at 300 °C for 1 min: many Au nanoparticles were observed.

(e) The Au-oleylamine complex solution was added into a mixture composed of 1.24 g of Mn-oleate complex (2 mmol), 10 ml of octadecene and 1.30 g of 1,2-hexadecanediol. The resulting reaction mixture was aged at 140 °C for 20 min, and subsequently TEM image was taken: only Au nanoparticles were observed and still no heterostructured nanoparticle was observed.

(f) The reaction mixture prepared in (e) was further heated to 280 °C: still no heterostructured nanoparticle was observed.

(g) The reaction mixture prepared in (e) was further heated at 300 °C for 1 min.

(h) Enlarged TEM image of (g): heterostructured nanoparticles were clearly observed as marked in red circles.

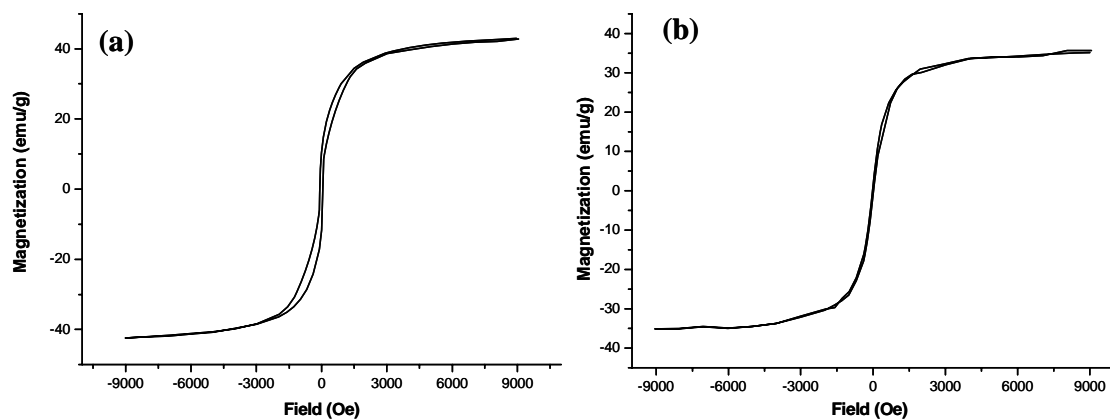


Figure S4. Hysteresis loop of the Pt-Fe₃O₄ heterostructured nanoparticles measured at (a) 5 K and (b) 300K.

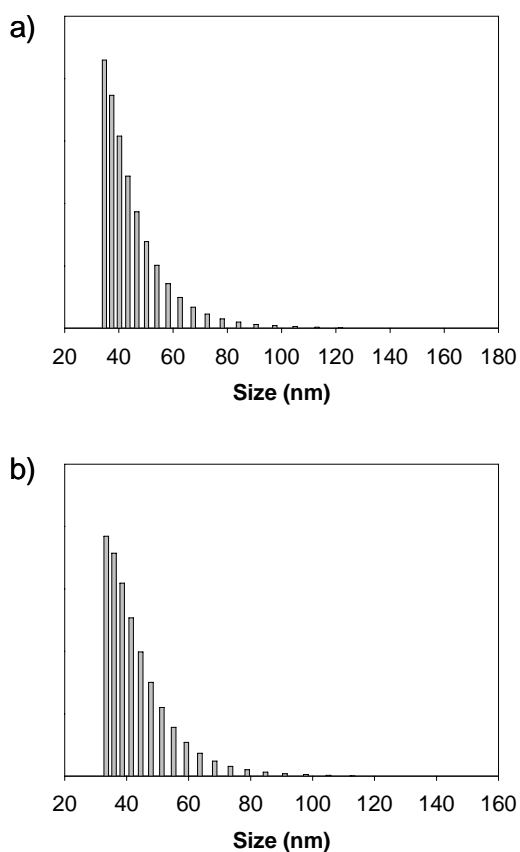


Figure S5. Hydrodynamic diameter distributions of water-dispersed (a) Au-MnO and (b) Au-Fe₃O₄ heterostructured nanoparticles. The data was obtained using light scattering method.