

Electronic Supplementary Information

Multiferroic Ferrite/Perovskite Oxide Core/Shell Nanostructures

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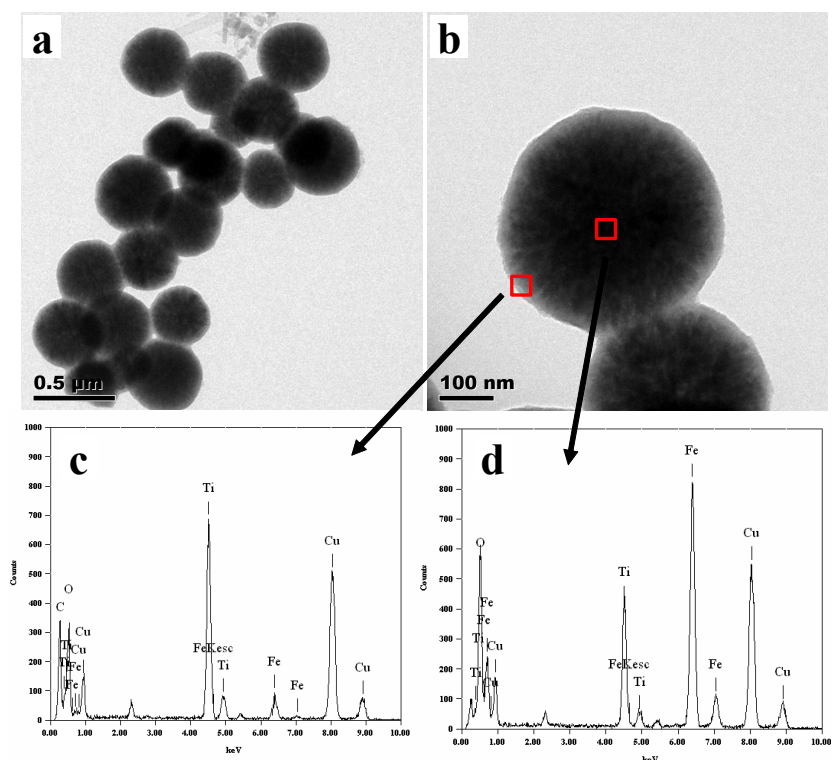


Fig. S1 (a), (b) TEM images of the Ti-hydroxide coated Fe_3O_4 particles and the corresponding EDS analysis from the edge (c) and center (d) of a Ti-hydroxide coated Fe_3O_4 particle (the signals of Cu and C are resulted from the Cu grids and carbon support film, respectively).

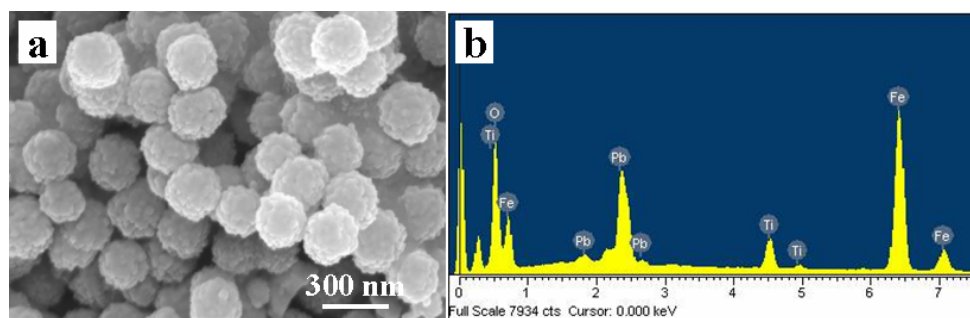


Fig. S2 (a) SEM image and (b) EDX spectrum of the $\text{Fe}_3\text{O}_4/\text{PbTiO}_3$ core/shell particles.

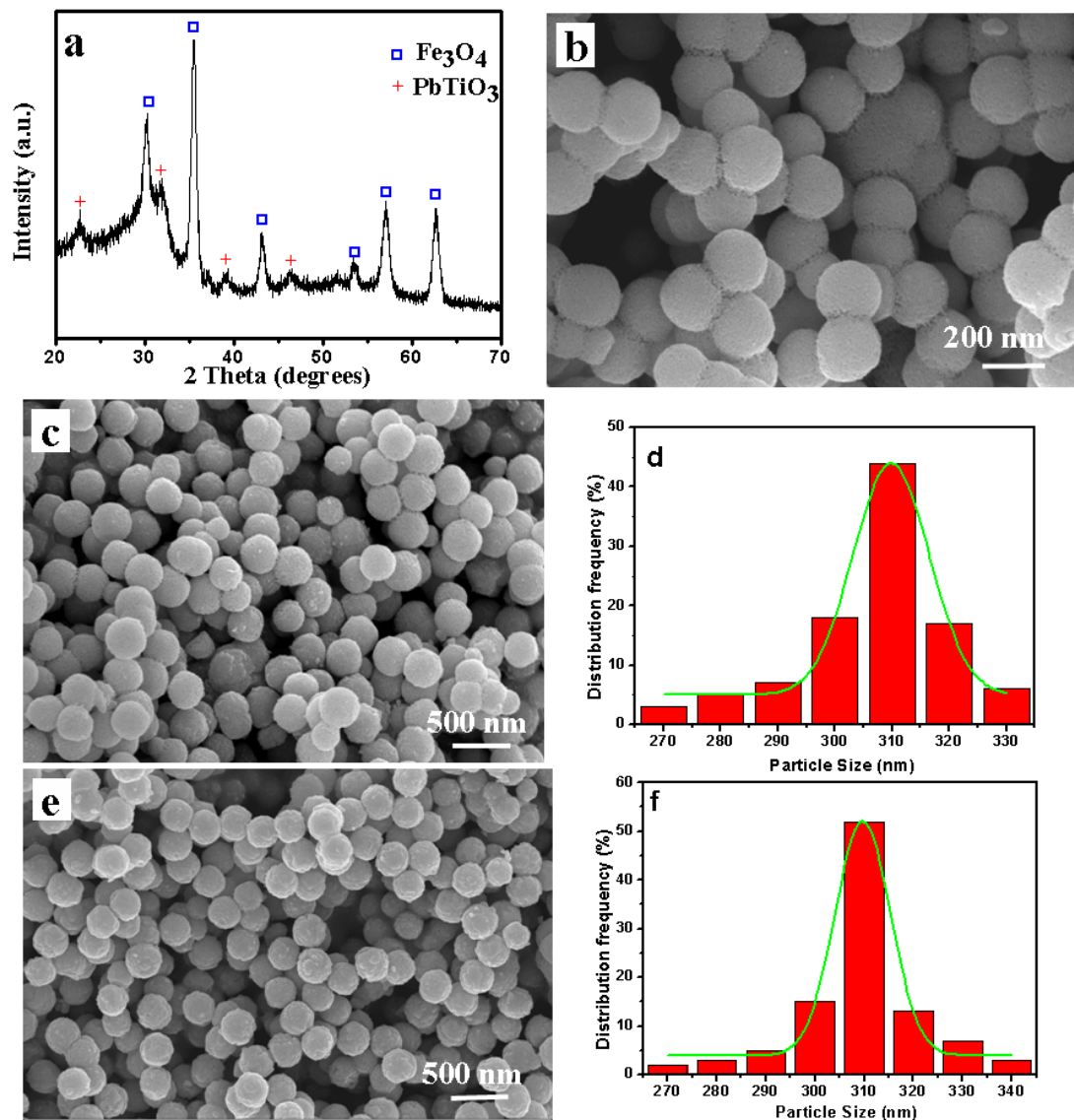


Fig. S3 (a) XRD pattern and (b) SEM image of Fe_3O_4 particles coated with weak crystalline PbTiO_3 layer synthesized at 140 °C for 4 h. SEM image and particle size distribution of $\gamma\text{-Fe}_2\text{O}_3/\text{PbTiO}_3$ core/shell particles after annealed in air at (c) and (d) 600 °C and (e) and (f) 700 °C for 2 h.

Table S1 Bulk density of the of pressed samples

Samples	Fe ₃ O ₄	γ-Fe ₂ O ₃	Fe ₃ O ₄ /PbTiO ₃	Fe ₃ O ₄ -PbTiO ₃	γ-Fe ₂ O ₃ /PbTiO ₃	γ-Fe ₂ O ₃ -PbTiO ₃
Bulk density (g/cm ³)	2.97	3.06	3.57	3.61	3.61	3.64

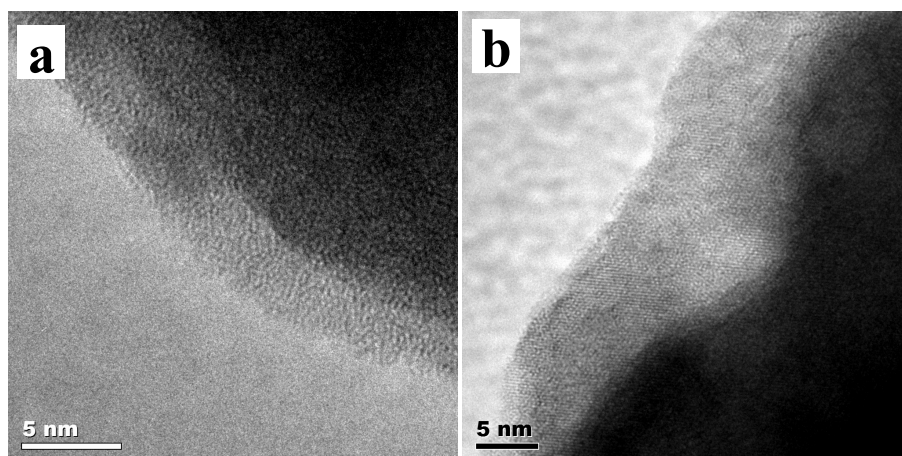


Fig. S4 TEM images of γ-Fe₂O₃/PbTiO₃ particles with different thickness of the shells: (a) 3 nm (0.6 g of Fe₃O₄ and 0.5 mmol of PbTiO₃) and (b) 8 nm (0.6 g of Fe₃O₄ and 1.5 mmol of PbTiO₃).

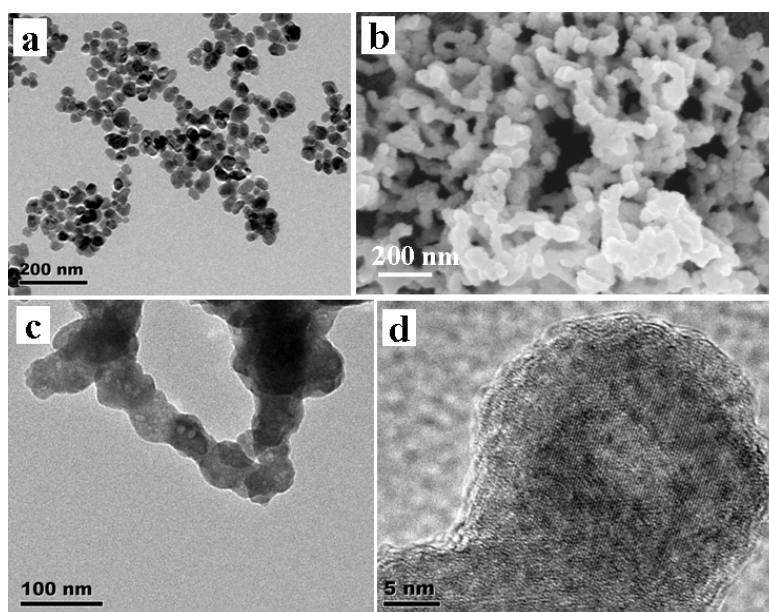


Fig. S5 (a) TEM image of the Fe₃O₄ particles with average diameter of 30 nm. (b) SEM image of γ-Fe₂O₃/PbTiO₃ core/shell nanochains. (c) and (d) TEM images of γ-Fe₂O₃/PbTiO₃ core/shell chains.

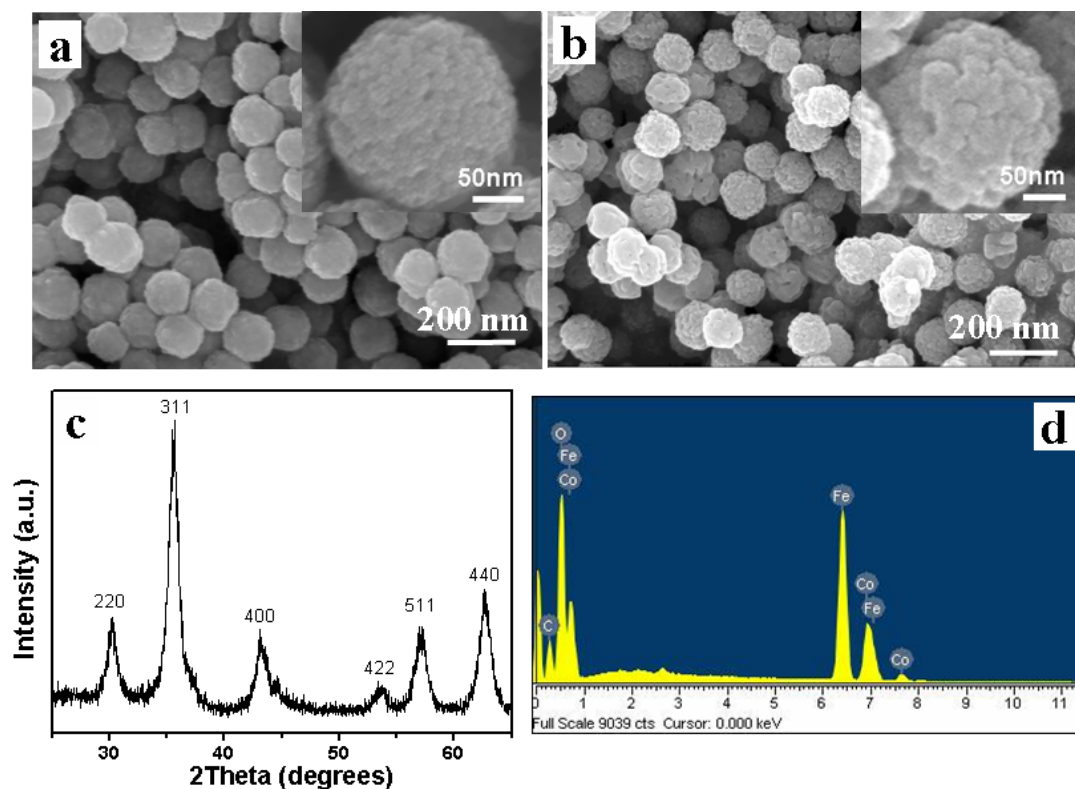


Fig. S6 (a) SEM images of CoFe_2O_4 particles prepared by hydrothermal method. The inset shows the grain size of the agglomerated elementary particles about 10 nm in average. (b) SEM images of the CoFe_2O_4 particles after heated in air at 600 °C for 2 h. The inset shows the grain size of the agglomerated elementary particles about 30 nm in average. (c) XRD pattern and (d) related EDX spectrum of CoFe_2O_4 particles prepared by hydrothermal method.

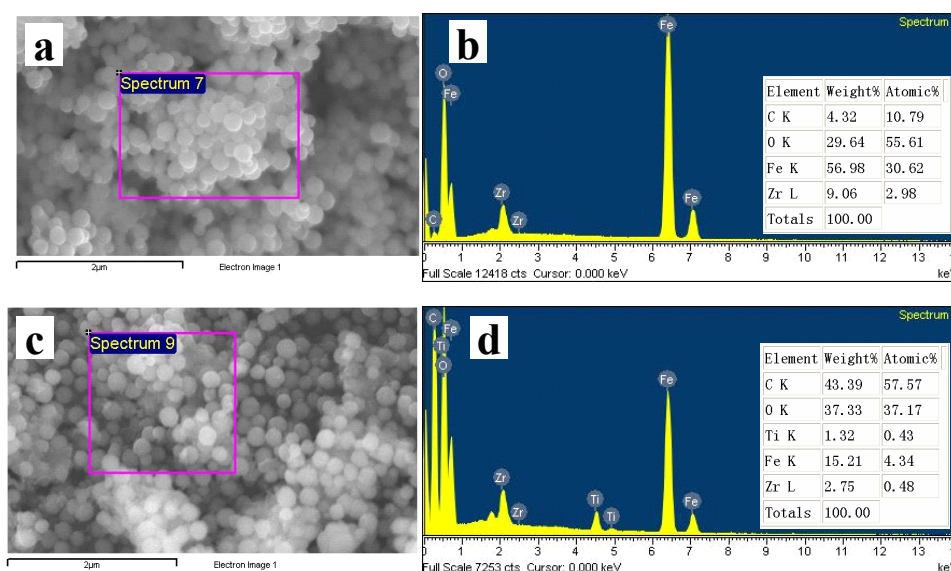


Fig. S7 EDS analysis of (a) and (b) Zr-hydroxide coated Fe_3O_4 particles, (c) and (d) Ti-hydroxide/Zr-hydroxide/ Fe_3O_4 core/shell particles.

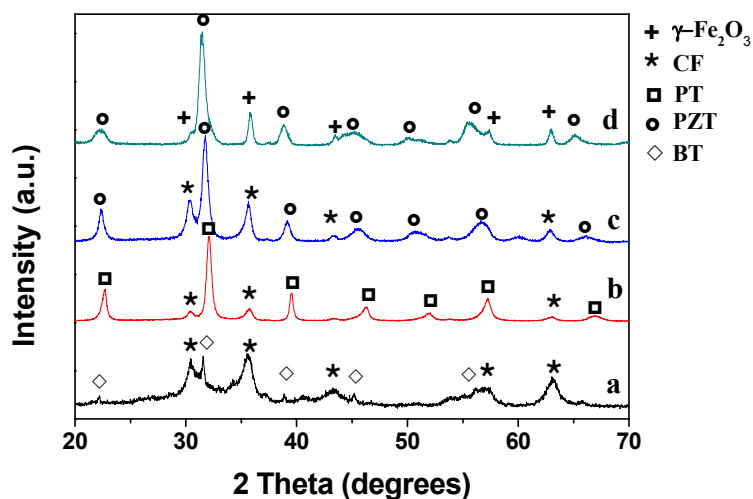


Fig. S8 XRD patterns of the Ferrite/perovskite oxide core/shell structures synthesized via the combined hydrothermal and annealing process: (a) $\text{CoFe}_2\text{O}_4/\text{BaTiO}_3$, (b) $\text{CoFe}_2\text{O}_4/\text{PbTiO}_3$, (c) $\text{CoFe}_2\text{O}_4/\text{Pb}(\text{Zr,Ti})\text{O}_3$ and (d) $\gamma\text{-Fe}_2\text{O}_3/\text{Pb}(\text{Zr,Ti})\text{O}_3$.

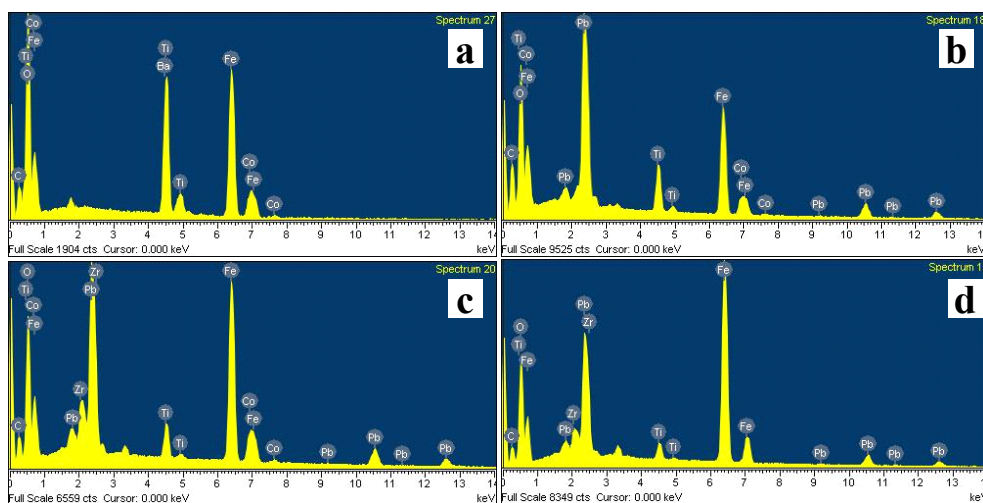


Fig. S9 EDX spectra of the Ferrite/perovskite oxide core/shell structures: (a) $\text{CoFe}_2\text{O}_4/\text{BaTiO}_3$, (b) $\text{CoFe}_2\text{O}_4/\text{PbTiO}_3$, (c) $\text{CoFe}_2\text{O}_4/\text{Pb}(\text{Zr,Ti})\text{O}_3$ and (d) $\gamma\text{-Fe}_2\text{O}_3/\text{Pb}(\text{Zr,Ti})\text{O}_3$.