Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

Supporting Information

Three Dimensional Koosh Ball Nanoarchitecture with Tunable Magnetic Core, Fluorescent Nanowire Shell and Enhanced Photocatalytic Property

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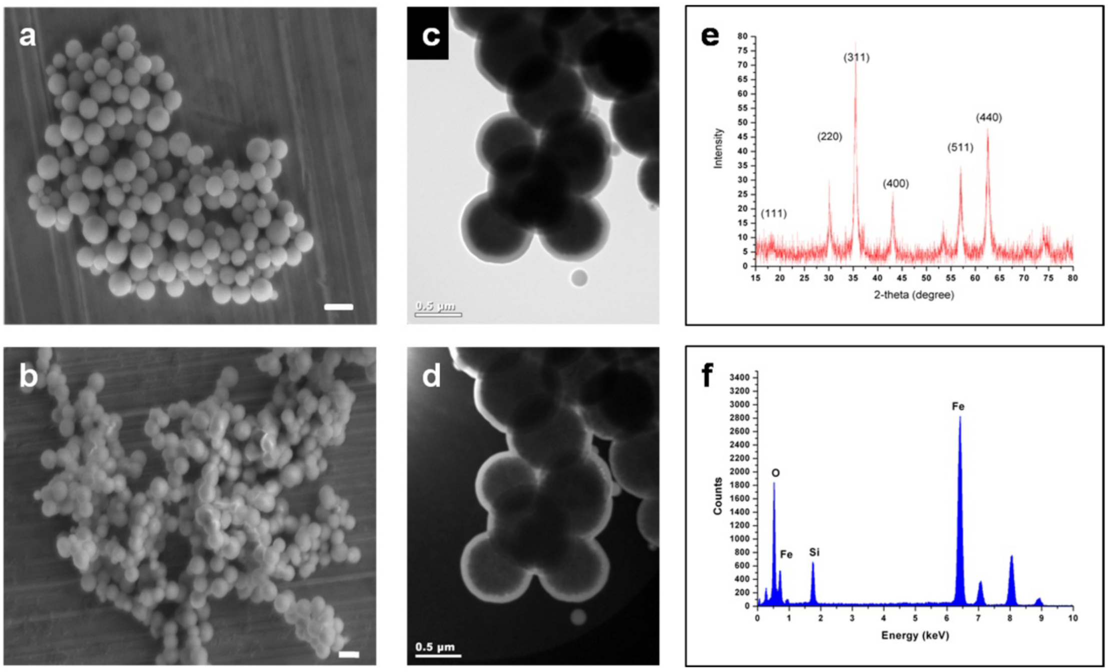


Figure S1. (a)A typical SEM image of Fe_3O_4 particles; (b) An SEM image of Fe_3O_4@SiO_2 core-shell structure; (c) Bright field TEM image of Fe_3O_4@SiO_2 core-shell structure; (d) Dark field TEM image of Fe_3O_4@SiO_2 core-shell structure; (e) XRD pattern of Fe_3O_4@SiO_2; (f) An EDX spectrum of Fe_3O_4@SiO_2. Scale bars in (a) and (b): 1μm.

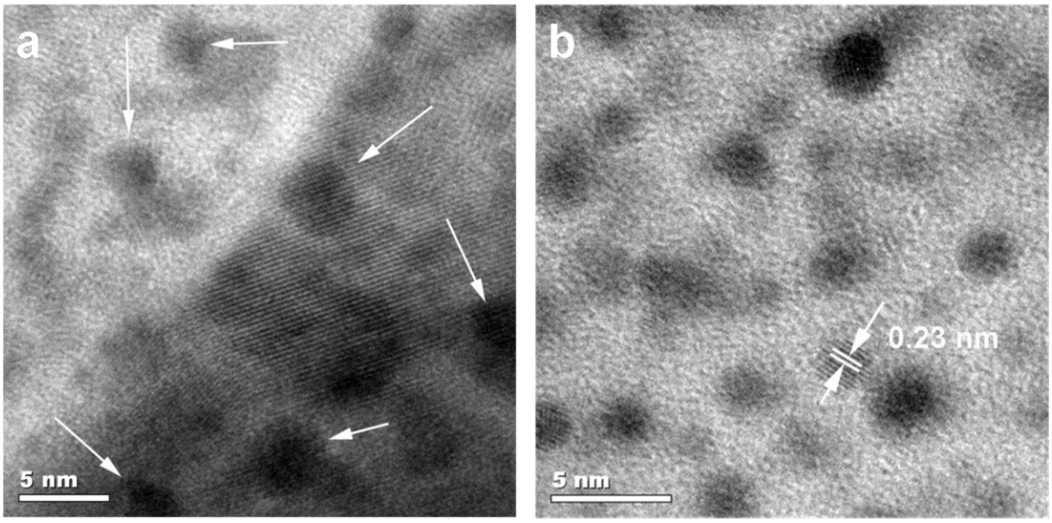


Figure S2. An HRTEM image of a) the interface between polycrystalline Fe_3O_4 core and amorphous SiO_2 shell (arrows indicates the Pt impurity) ; b) embedded Pt within SiO_2 shell. The lattice spacing 0.23nm corresponds to the separation Pt (111) atomic planes.

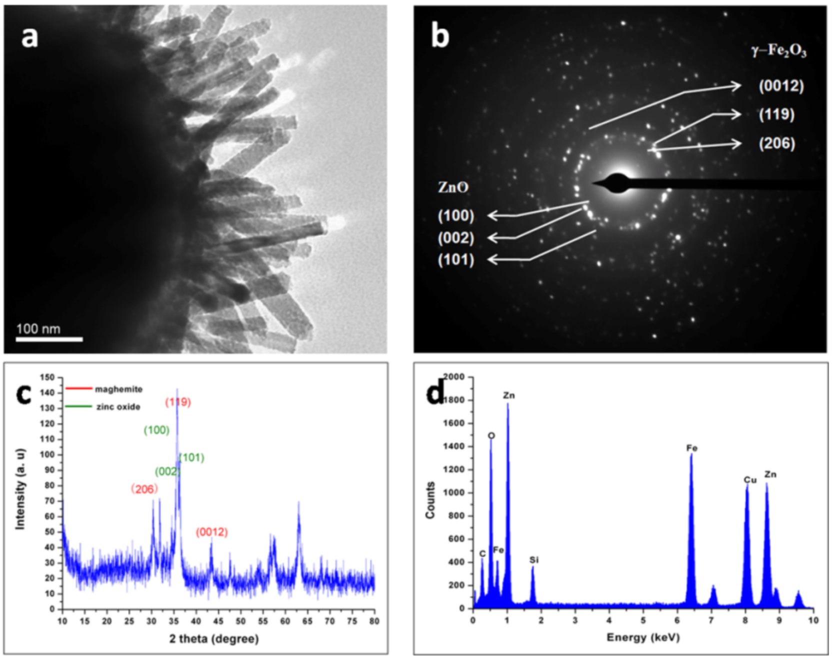
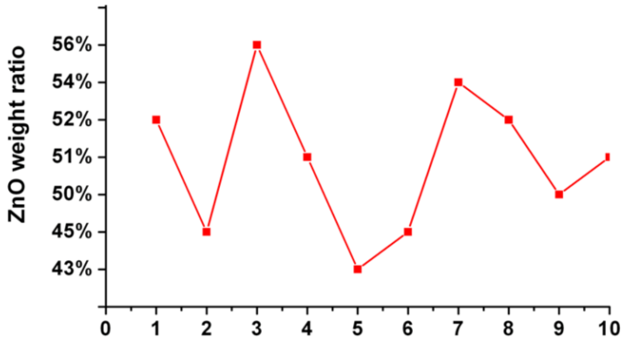


Figure S3. a) A TEM image of a γ–Fe_2O_3@SiO_2-ZnO koosh ball; b) Electron diffraction pattern corresponding to the γ–Fe_2O_3@SiO_2-ZnO koosh ball in a); c) A typical X-Ray diffraction pattern for γ–Fe_2O_3@SiO_2-ZnO koosh balls; d) An energy dispersive X-ray spectrum of γ–Fe_2O_3@SiO_2-ZnO koosh balls.



Before ZnO Growth	After ZnO Growth	ZnO Weight Ratio
2 mg	4.16 mg	52%
2 mg	3.63 mg	45%
2 mg	4.54 mg	56%
2 mg	4.08 mg	51%
2 mg	3.51 mg	43%
2 mg	3.64 mg	45%
2 mg	4.35 mg	54%
2 mg	4.26 mg	52%
2 mg	4.02 mg	49%
2 mg	4.09 mg	51%

Figure S4. The ZnO weight ratios within koosh balls measured by repeated experiments.

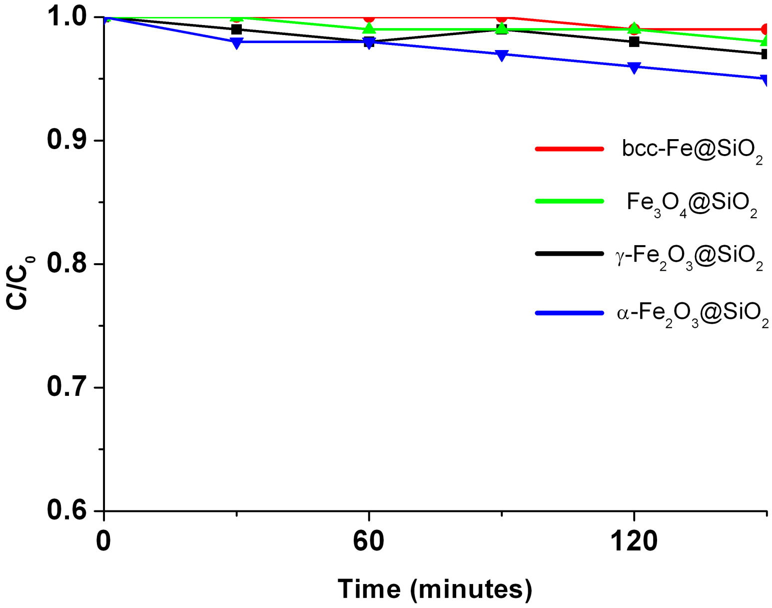


Figure S5. Photodegradation of RhB using various magnetic core-shell particles under UV irradiation.

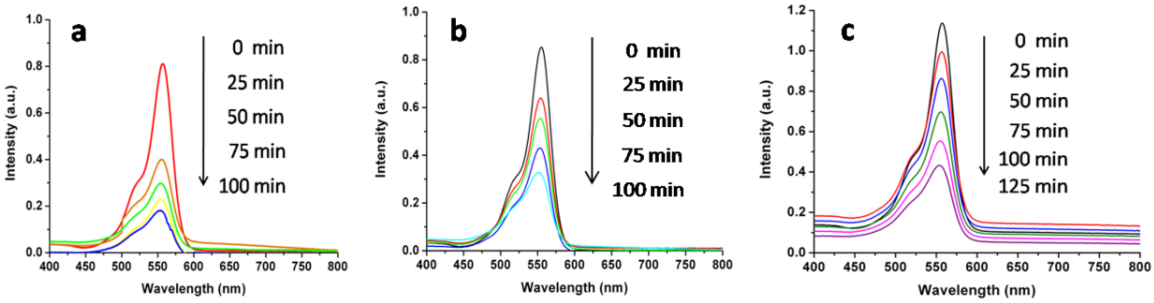


Figure S6. UV-vis-NIR absorption spectra of Rhodamine B solution after different duration of UV irradiation: a) 5 mg γ-Fe_2O_3koosh balls; b) 5 mg bcc-Fe koosh balls; c) 2.5 mg ZnO nanopowder.

Sample	E(X)	E(Y)	$E(X^2)$	$E(Y^2)$	E(XY)	LCC	K (min^{-1})
5 mgγ-Fe2O3 koosh ball	50	0.923827	3750	1.169082	65.72227	0.98329	0.0196
5 mg bcc-Fe koosh ball	50	0.472064	3750	0.330202	35.13595	0.995546	0.00913
2.5 mg ZnO	50	0.32378	3750	0.170626	25.18275	0.99174	0.00651

Figure S7. Computations of linear correlation coefficients and rate constants for different samples, which demonstrates a good linearity between reaction time and the natural logarithm of relative concentration C_0/C. (E: Expectation; statistical average. X: reaction time. Y: $\ln(C_0/C)$. LCC: Linear Correlation Coefficient. K: rate constant)

$$\mathrm{LCC} = \frac{\mathrm{E(XY)} - \mathrm{E(X)E(Y)}}{\sqrt{\mathrm{E(X^2)} - \mathrm{E^2(X)}}\sqrt{\mathrm{E(Y^2)} - \mathrm{E^2(Y)}}}$$