Supporting Information

Three-dimensional Porous Microspheres Comprising Hollow Fe_2O_3 Nanorods/CNT Building Blocks with Superior Electrochemical Performance for Lithium Ion Batteries

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(Yun Chan Kang)

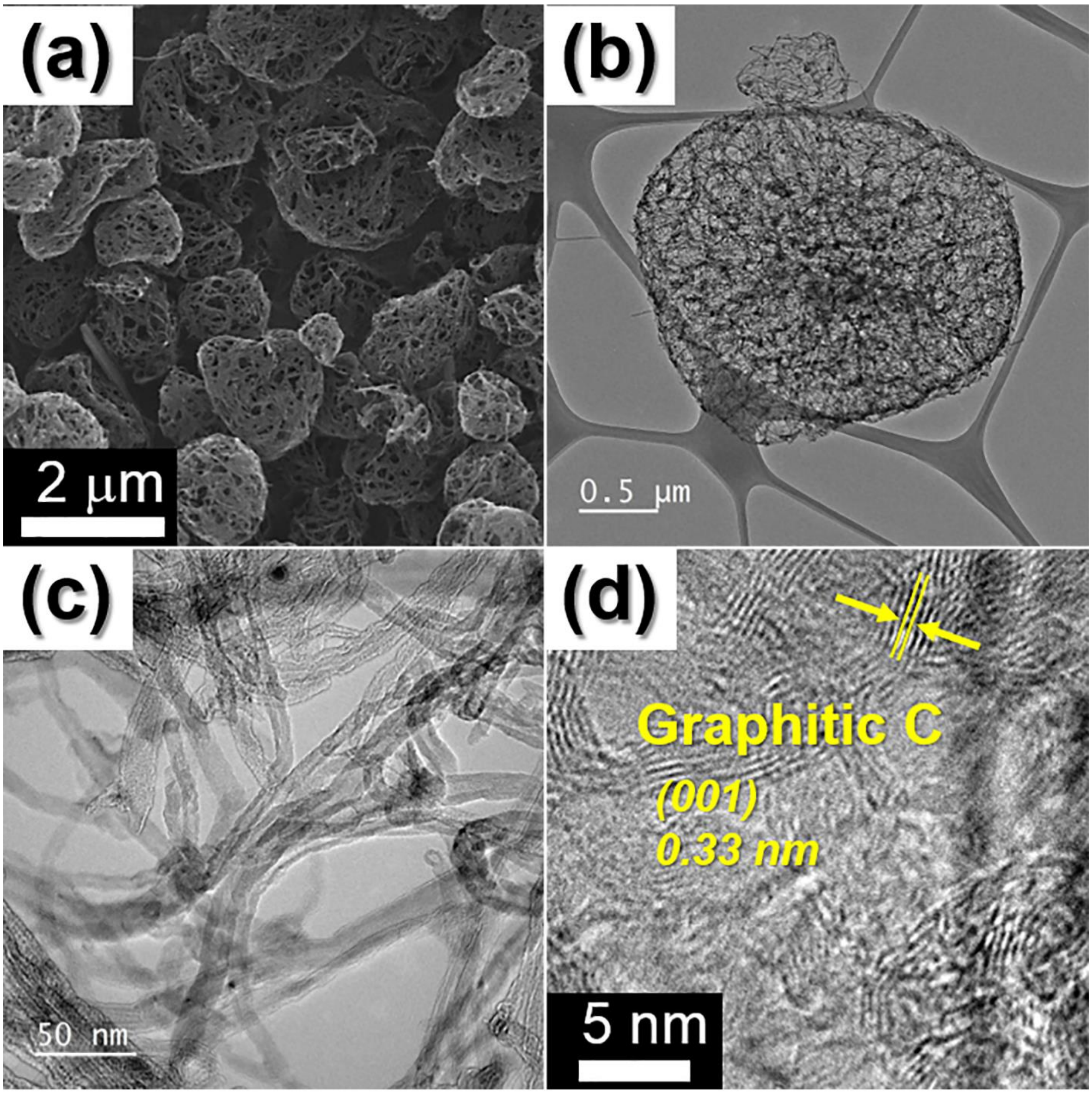


Fig. S1 (a) SEM, (b,c) TEM and (d) HR-TEM images of CNT porous microspheres.

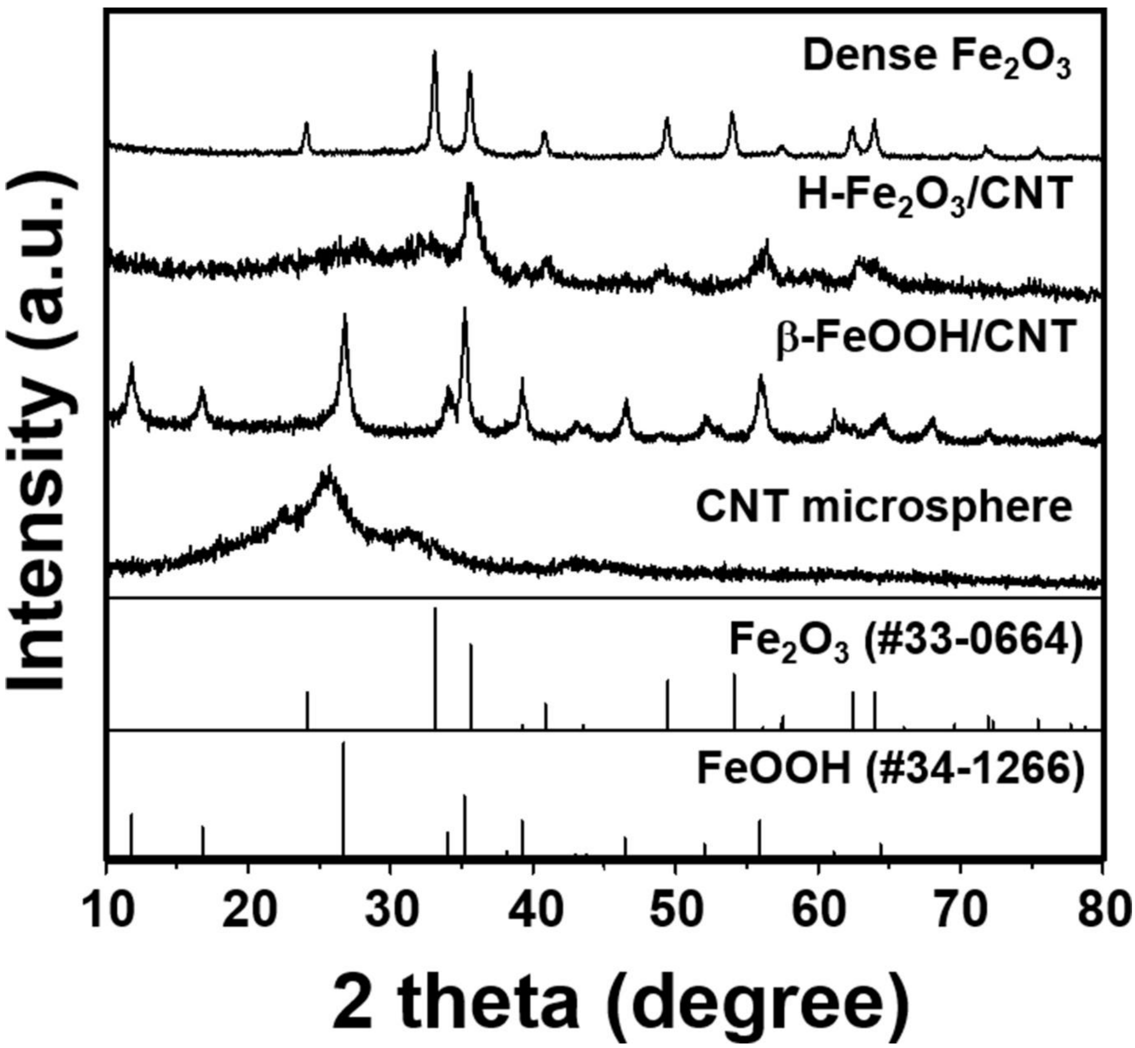


Fig. S2 XRD patterns of β-FeOOH/CNT microspheres, H-Fe_2O_3/CNT microspheres, dense Fe_2O_3 nanorods and CNT porous microspheres.

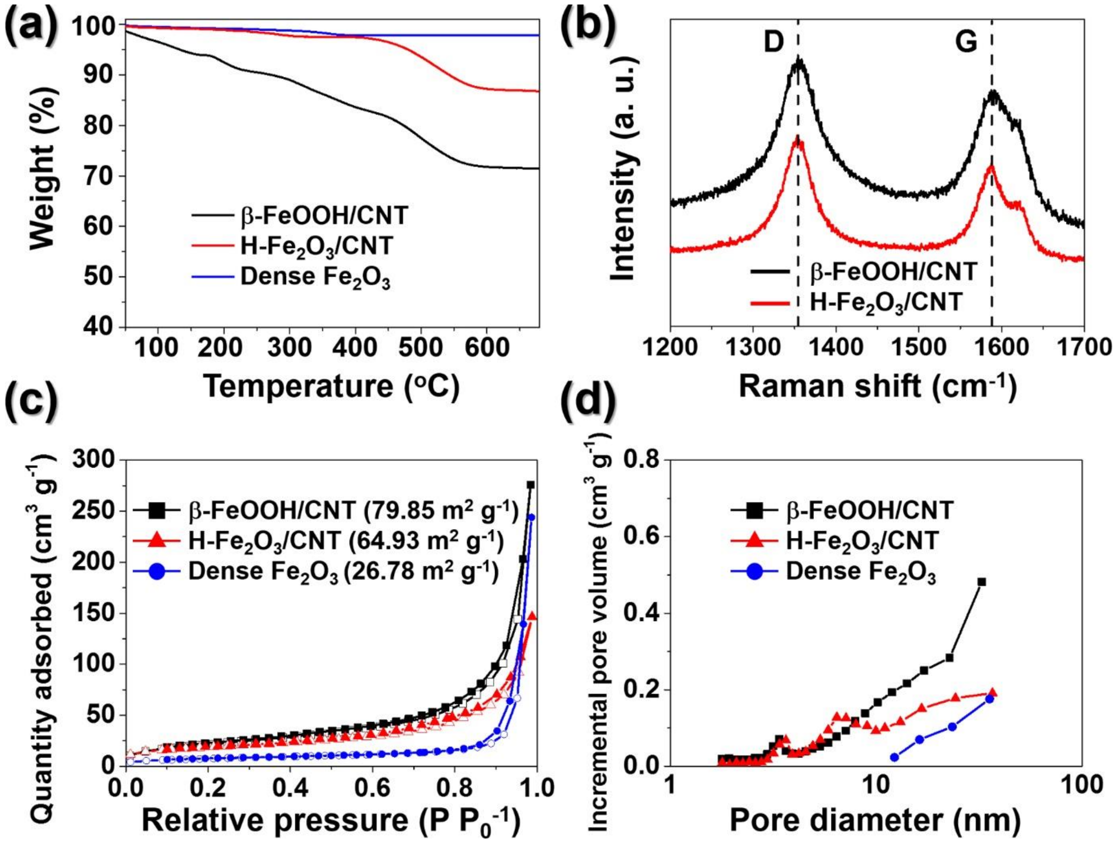


Fig. S3 (a) TGA curves, (b) Raman spectra, (c) N_2 adsorption and desorption isotherms and (d) BJH pore size distributions of β-FeOOH/CNT microspheres, H-Fe_2O_3/CNT microspheres and dense Fe_2O_3 nanorods.

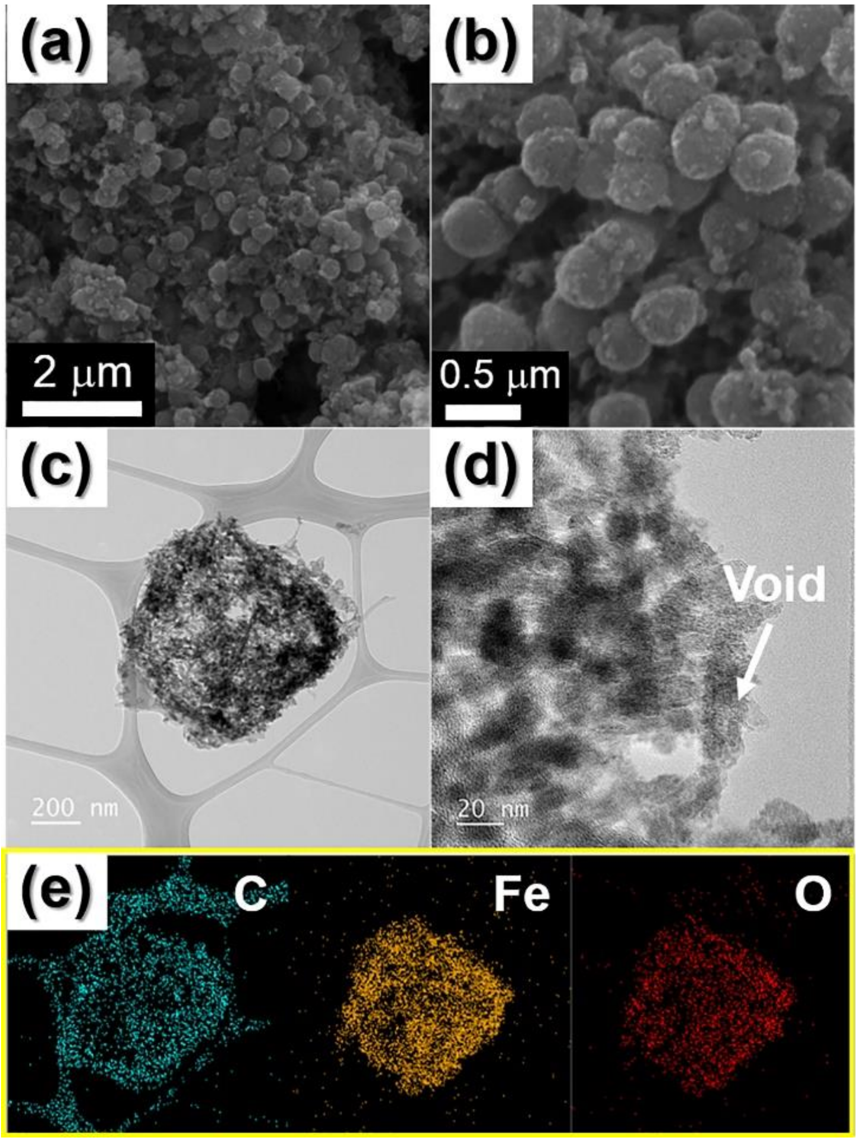


Fig. S4 (a and b) SEM, (c and d) TEM and (e) EDX mapping images of H-Fe_2O_3/CNT microspheres after 200 cycles.

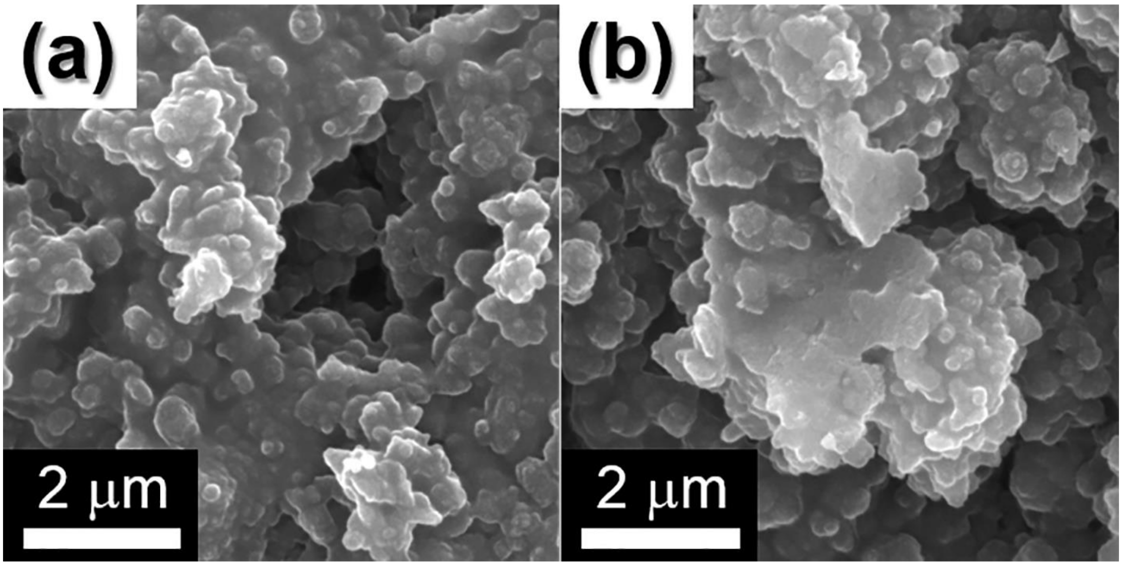


Fig. S5 (a and b) SEM images of dense Fe_2O_3 nanorods obtained after 200 cycles.

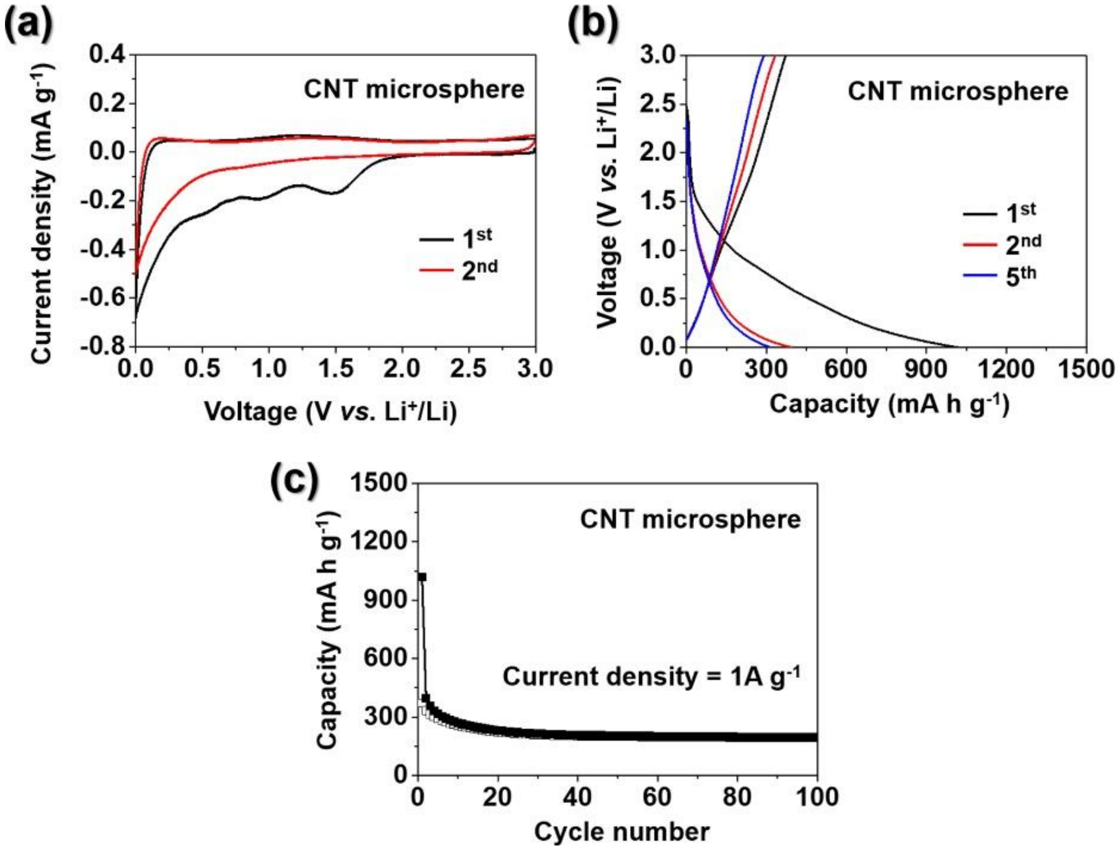


Fig. S6 (a) CV curves, (b) charge-discharge profiles and (c) cycling performance of CNT microspheres.

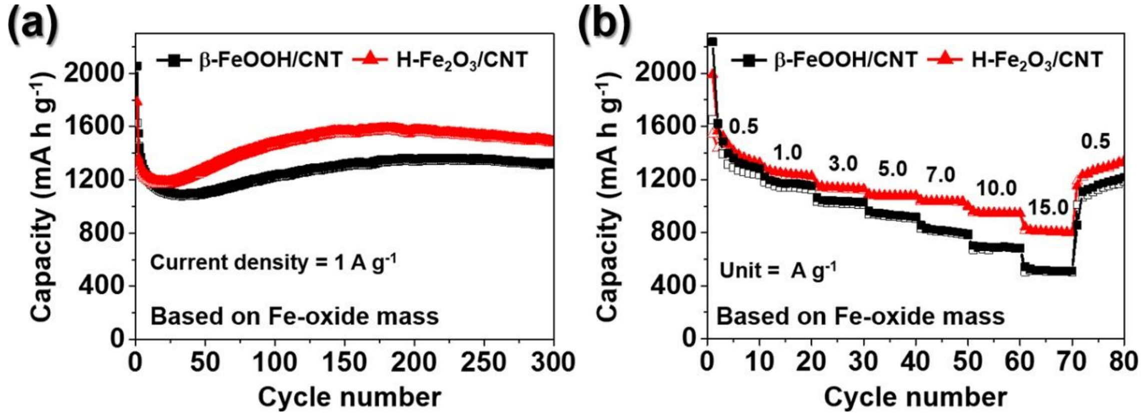
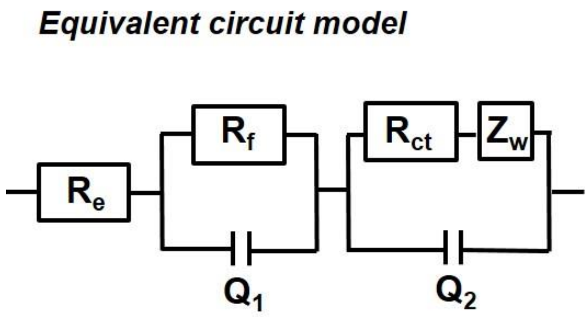


Fig. S7 (a) cycling and (b) rate performances of β-FeOOH/CNT and H-Fe_2O_3/CNT microspheres based on Fe-oxide mass.



R_e: the electrolyte resistance, corresponding to the intercept of high frequency semicircle at Z' axis

R_f: the SEI layer resistance corresponding to the high-frequency semicircle

Q_1: the dielectric relaxation capacitance corresponding to the high-frequency semicircle

R_{ct}: the denote the charger transfer resistance related to the middle-frequency semicircle

Q_2: the associated double-layer capacitance related to the middle-frequency semicircle

Z_w: the Li-ion diffusion resistance

Fig. S8 Randle-type equivalent circuit model used for AC impedance fitting.

Table S1. Electrochemical properties of the Fe_2O_3 materials with various structure s as anode materials for LIBs.

Materials	Voltage range [V]	**Current rate [A g^{-1}]**	**Discharge capacity after cycling [mA h g^{-1}]**	**Rate capability [mA h g^{-1}] /[A g^{-1}]**	**Ref**
H-Fe_2O_3/CNT microspheres	***0.001 – 3.0***	***1.0***	***1307 (300th)***	***703 (15.0 A g^{-1})***	***Our work***
Hollow Fe_2O_3 spheres	0.05-3.0	0.2	710 (100th)	-	[1]
Hierarchical hollow spheres c omposed of Fe_2O_3 nanosheets	0.01-3.0	0.5	815 (200th)	330 (5.0 A g^{-1})	[2]
Hierarchical Fe_2O_3 microboxe	0.005-3.0	0.2	945 (30th)	-	[3]
Hollow Fe_2O_3 nanospheres	0.01-3.0	0.25	490 (50th)	-	[4]
Hollow Fe_2O_3 nanobarrels	0.01-3.0	0.5	916 (100th)	403 (10.0 A g^{-1})	[5]
Multi-shelled hollow Fe_2O_3 sp heres	0.05-3.0	0.4	861 (50th)	294 (4.0 A g^{-1})	[6]
Graphene-constructed hollow Fe_2O_3 spheres	0.01-3.0	0.1	950 (50th)	640 (1.0 A g^{-1})	[7]
Carbon coated hollow Fe_2O_3 sphere	0.01-3.0	0.3	950 (100th)	-	[8]
Fe_2O_3 nanorods	0.005-3.0	0.5	970 (100th)	300 (5.0 A g^{-1})	[9]
Spindle-like Fe_2O_3	0.01-3.0	0.2	911 (50th)	424 (10.0 A g^{-1})	[10]
Fe_2O_3 nanoparticle-loaded car bon nanofibers	0.05-2.8	0.05	488 (75th)	288 (0.5 A g^{-1})	[11]
Fe_2O_3 nano-assembled spindle	0.005-3.0	0.1	~900 (40th)	430 (1.0 A g^{-1})	[12]

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