Electronic Supplementary Information

More Stable Structures Lead to Improved Cycle Stability in Photocatalysis and Li-ion Batteries

Wei Zhou,[a] Lijuan Lin,[a] Wei Wei,[a] Hong Jin,[a] Jinghong Li,*[b] and Lin Guo*[a]

[a]School of Chemistry and Environment, Beihang University, Beijing 100191, China;

[b]Department of Chemistry, Beijing Key Laboratory for Microanalytical Methods and Instrumentation, Tsinghua University, Beijing 100084, China

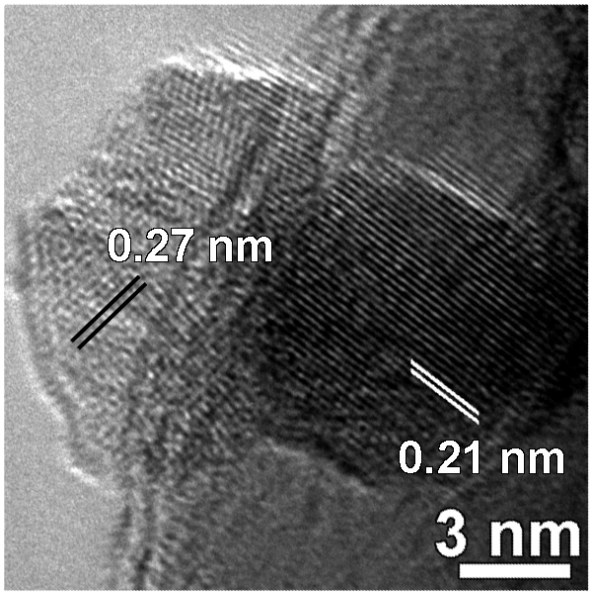

Fig. S1 HRTEM image of NPs ~5-10 nm in diameter. The spacing of 0.21 and 0.27 nm can be indexed to the planes of $(110)_{Fe}$ and $(104)_{Fe2O3}$, respectively. Obviously, the NP with spacing of 0.21 nm was pure iron while the surface NP was oxidized to Fe_2O_3.

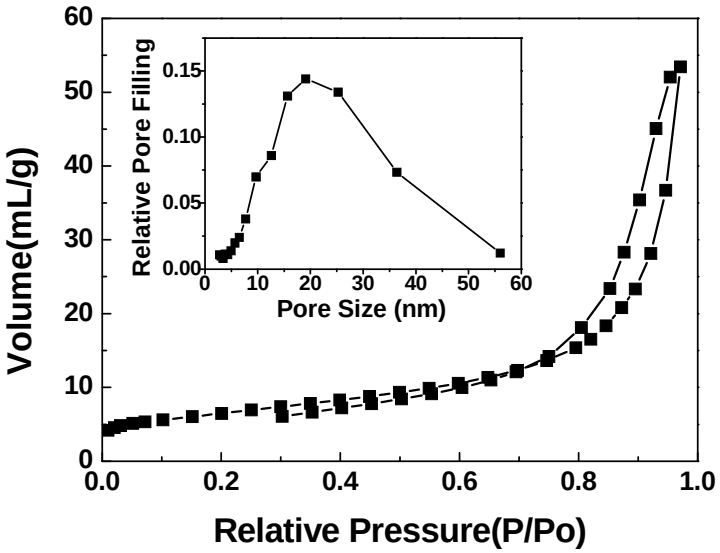

Fig. S2 Nitrogen adsorption-desorption isotherms and pore size distributions (the inset) of the Fe_2O_3 networks, showing the specific surface area of 23 m^2/g with an average pore size of 15.65 nm.

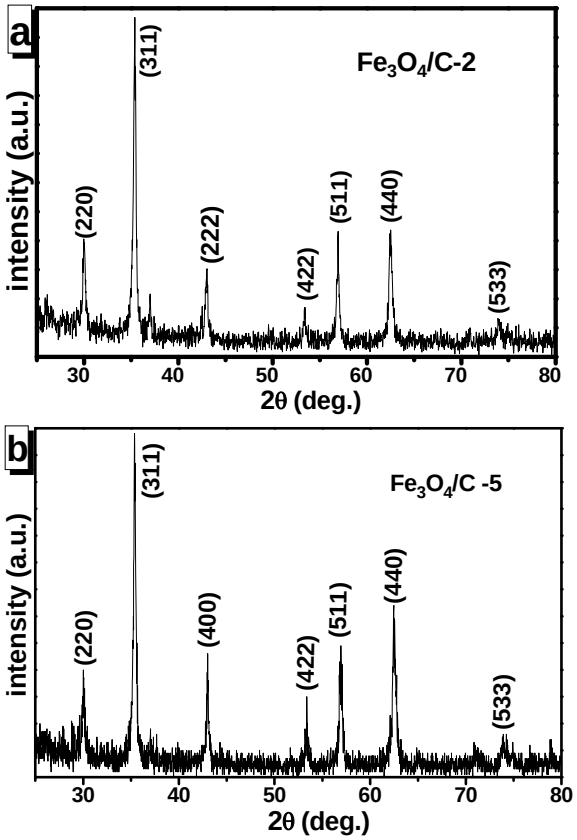

Fig. S3 XRD patterns for (a) the Fe_3O_4/C-2 sample and (b) the Fe_3O_4/C-5 sample. The samples were pure Fe_3O_4 with amorphous carbon layers.

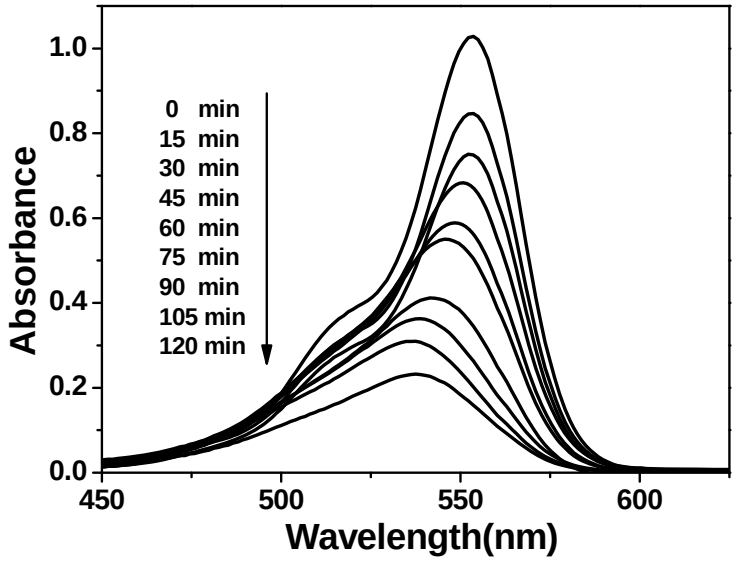

Fig. S4 Absorption spectrum of a RB solution (1.0×10^{-5} M, 60 mL) adding 30 mg network sample as catalyst at the first cycle.

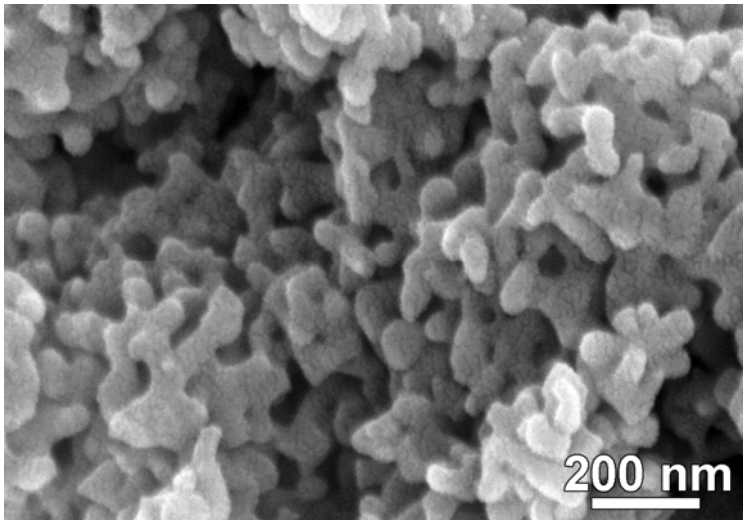

Fig. S5 SEM image for the sample after photocatalytic experiments with 4 cycles, showing its structure stability with unchangeable networks.

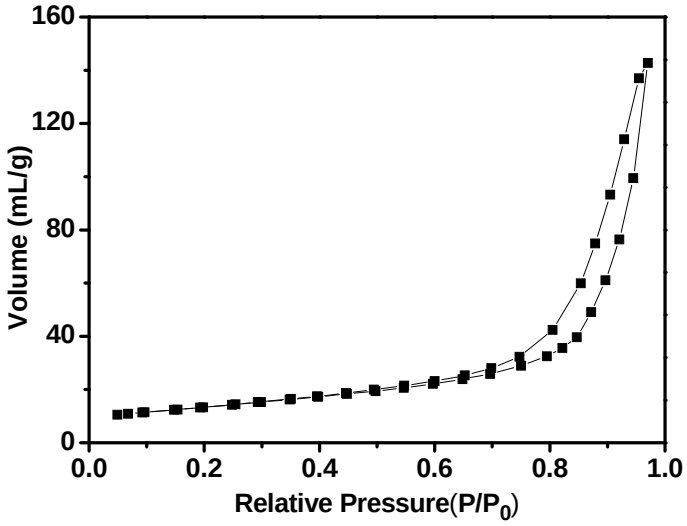

Fig. S6 Nitrogen adsorption-desorption isotherms of the commercial Fe_2O_3 particles, showing the specific surface area of 47 m^2/g.

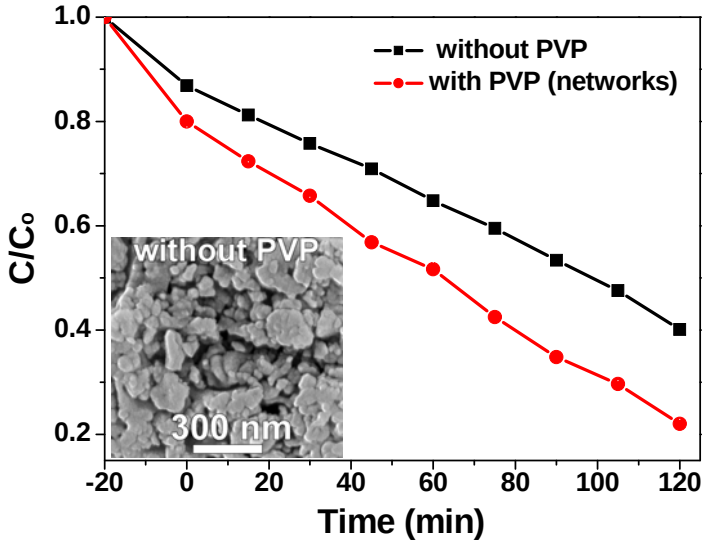

Fig. S7 Photocatalytic performance using the as-obtained hematite network (with PVP) and other hematite sample (without PVP, the inset shows its SEM image with aggregated structures) as catalysts.

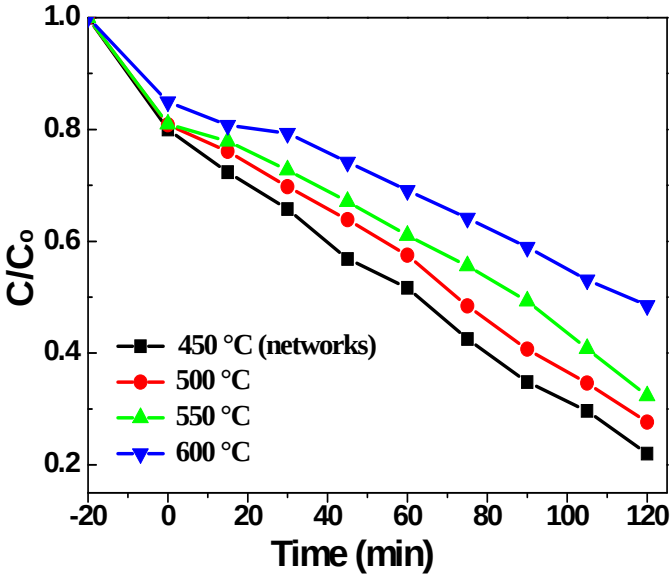

Fig. S8 Photocatalytic results with four different catalysts. The four catalysts were burned at the temperatures of 450 ºC, 500 ºC, 550 ºC, and 600 ºC, showing degradation rates of 78 %, 72 %, 67 %, and 51 %, respectively.

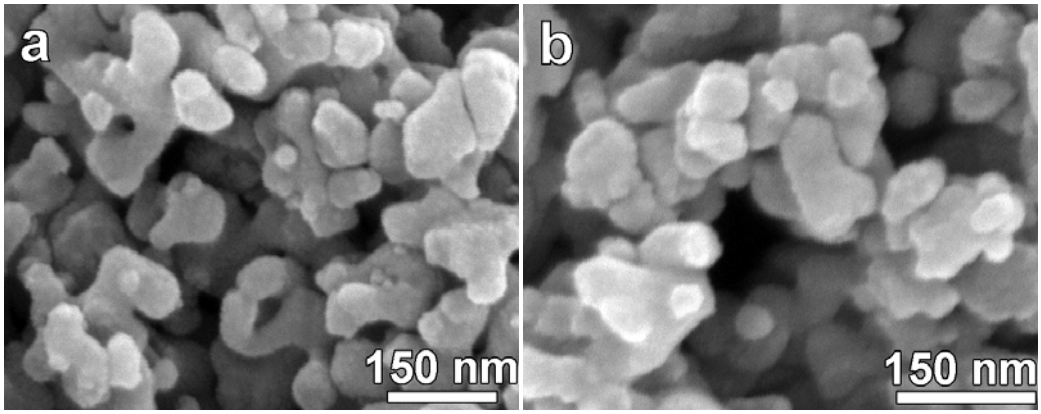

Fig. S9 SEM images of the hematite samples at burning temperature of 550 ºC (a) and 600 ºC (b). The hematite networks were obtained at 450 ºC. Obviously, the aggregated particles were obtained instead of networks with increased temperature.

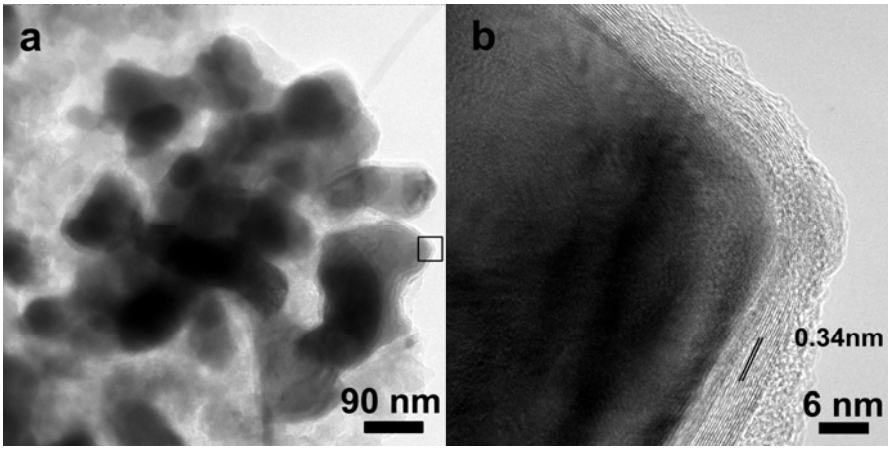

Fig. S10 (a) TEM image of the Fe_3O_4/C-8 sample as Li-ion battery electrode materials after 90 cycles. (b) HRTEM image corresponding to the marked frame in Fig. S10a, showing onion-like carbon layers capped the Fe_3O_4 particle. The spacing of 0.34 nm could be ascribed to the graphite's layering of (002).