ADVANCED MATERIALS

Supporting Information

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Hierarchical Hollow Spheres of Fe_2O_3 @Polyaniline for Lithium Ion Battery Anodes

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Hierarchical Hollow Spheres of Fe_2O_3@Polyaniline for Lithium Ion Battery Anode

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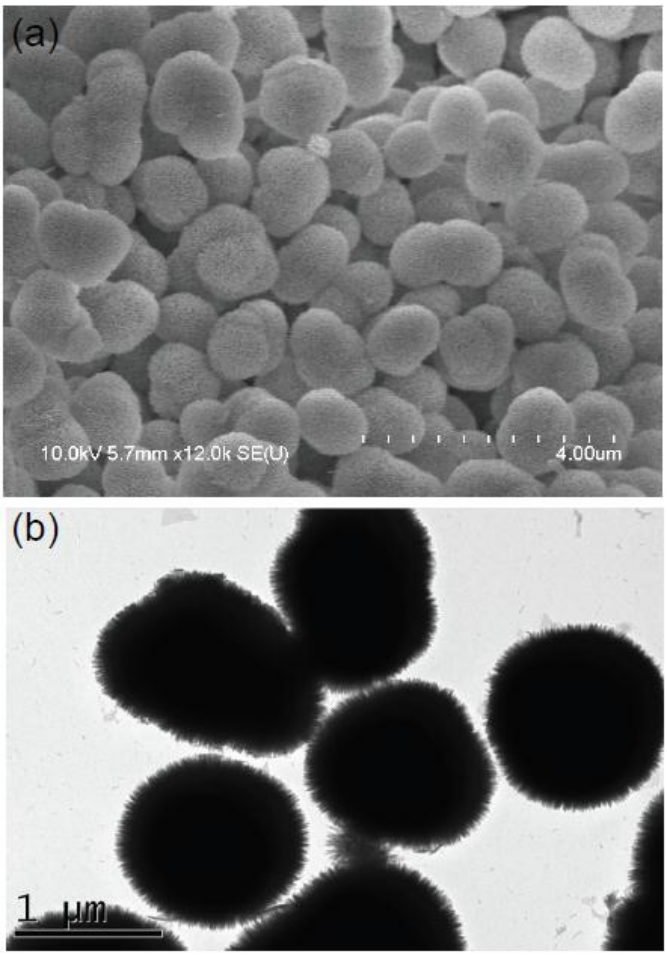

Figure S1. (a) SEM and (b) TEM images of the as-synthesized FeO_X samples.

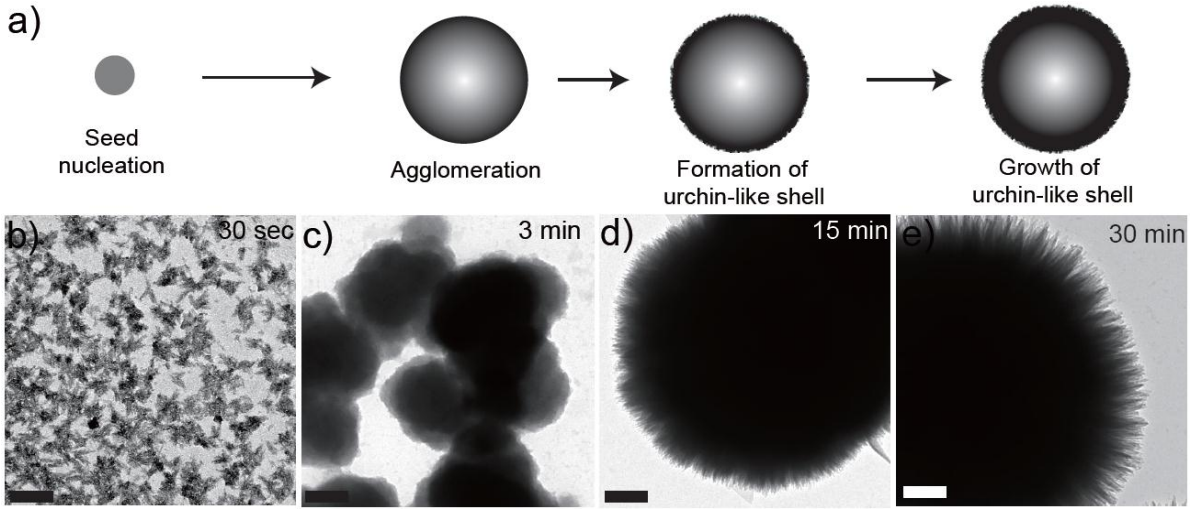

Figure S2. (a) Formation mechanism of urchin-like FeO_X sphere. (b–e) TEM images of iron oxides through ultrasonic irradiation at different reaction time intervals of 30 sec, 3 min, 15min, and 30 min (Scale bar is 100 nm.).

The formation mechanism of urchin-like FeO_X sphere was studied by observing reaction time-dependent morphological evolution, as shown in Figure S2. First of all, nano-sized seeds were synthesized by fast oxidation reaction of iron precursors under the ultrasonic irradiation using alcoholic solvent (reaction time of 30 sec).[1,2] The agglomerated microspheres appeared after reaction time of 3 min. When reaction time reached 15 min, the formation of large number of needles on the surface of microspheres was observed. As the reaction proceeded further (30 min), the needles on the surface grew to be larger and shaper to form urchin-like microspheres.

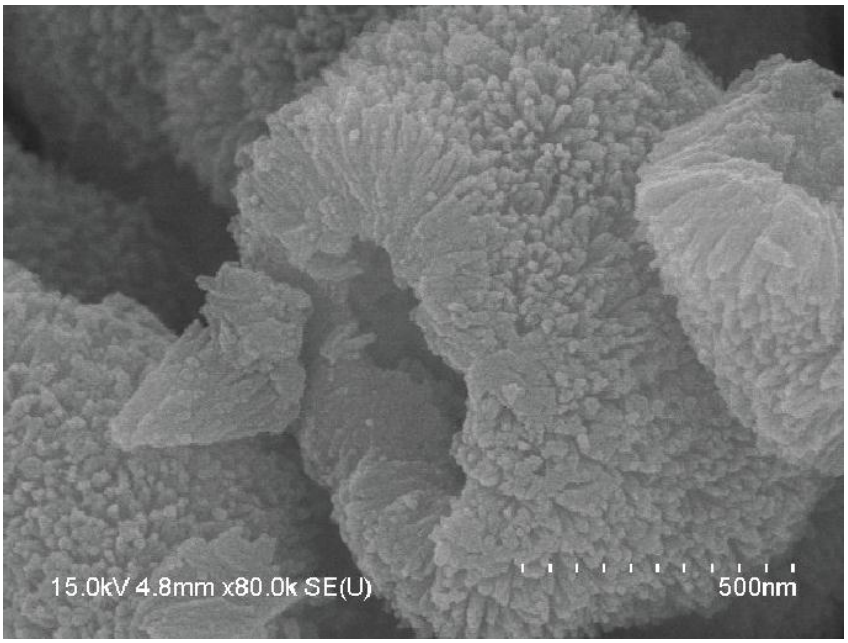

Figure S3. SEM image of FeO_X@PANI samples.

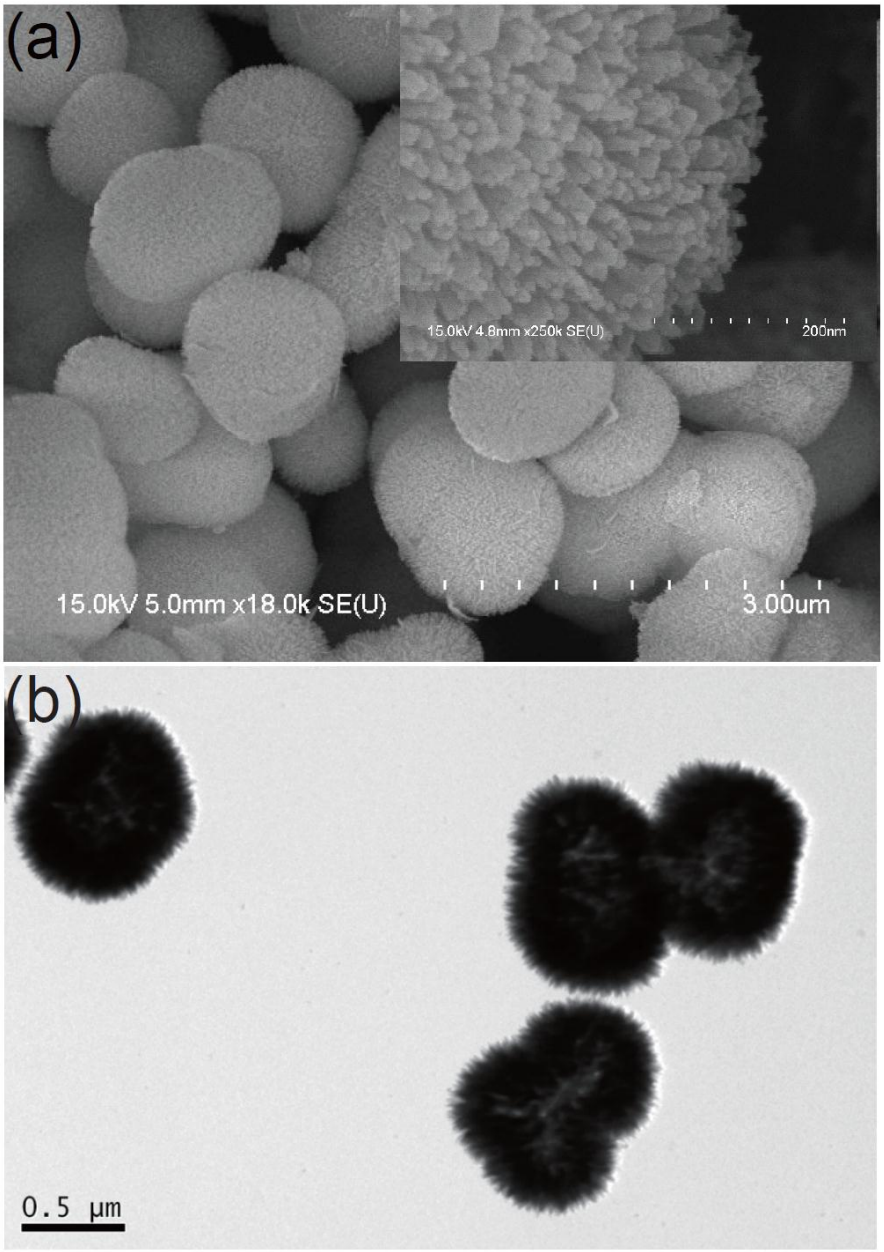

Figure S4. (a) SEM and (b) TEM images of Fe_2O_3@PANI samples.

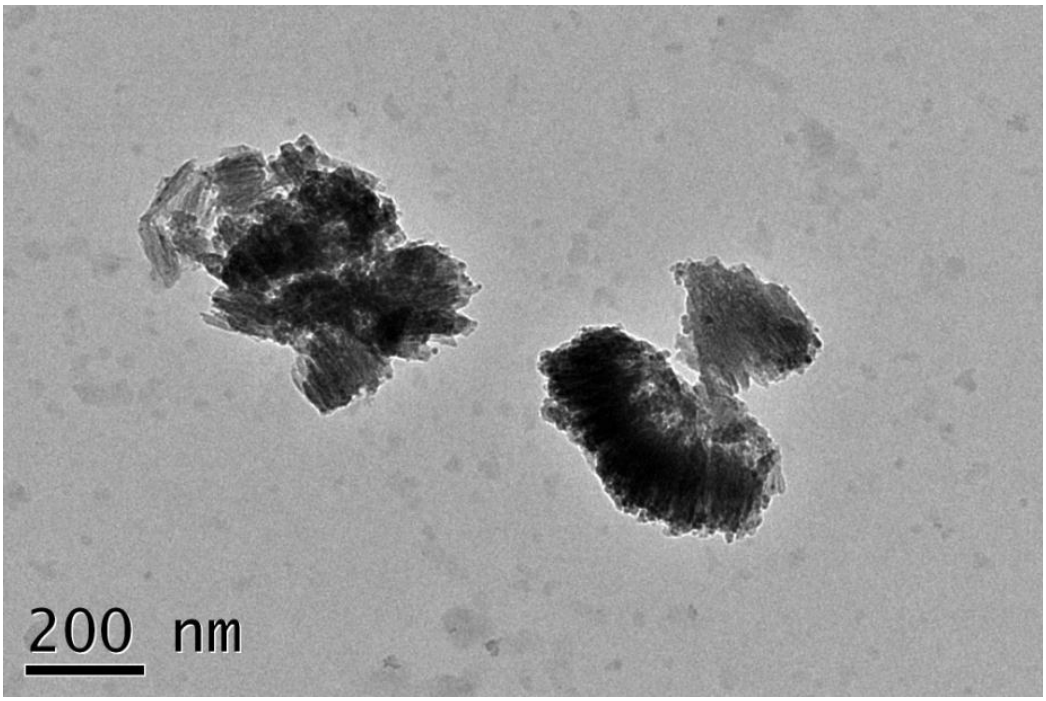

Figure S5. TEM images of Fe_2O_3 samples after the etching reaction time of 30 min.

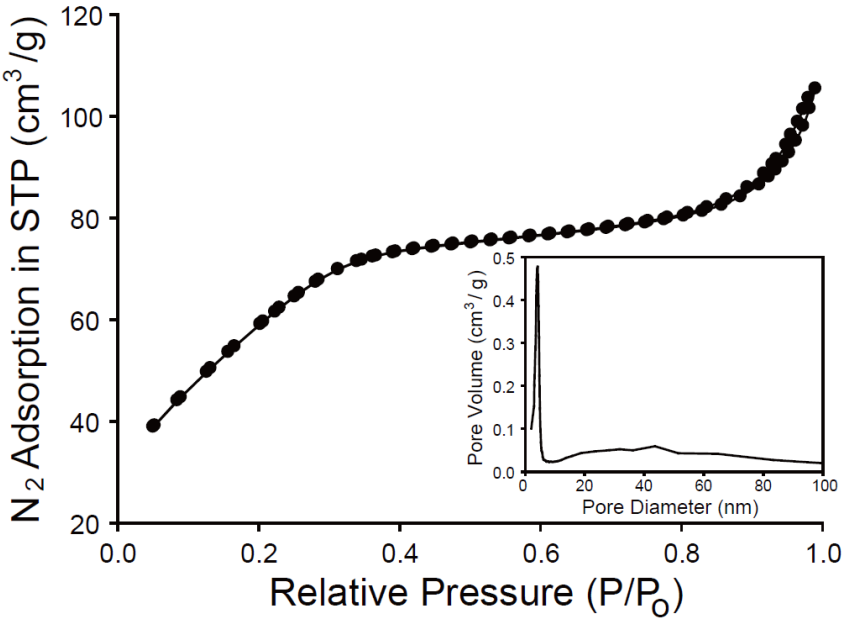

Figure S6. N_2 adsorption/desorption isotherms and pore size distribution of Fe_2O_3@PANI.

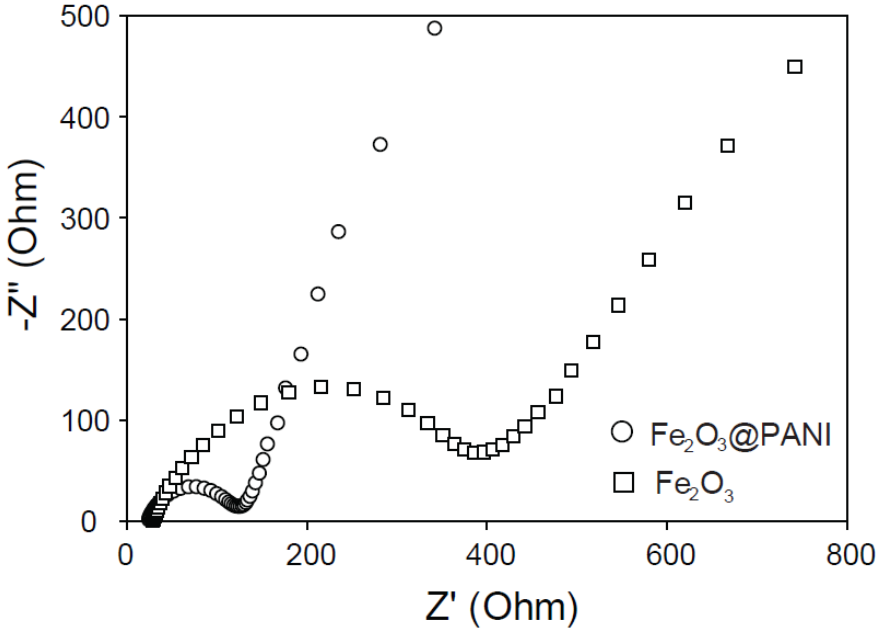

Figure S7. Nyquist plots (100 kHz – 10 mHz) of Fe_2O_3 and Fe_2O_3@PANI electrodes.

Table S1. Textural properties of FeO_X and Fe_2O_3@PANI samples following with different reaction times.

Etching time (hr)	0 h	1 h	2 h	3 h	4 h
Surface area $[m^2\ g^{-1}]^{a,b}$	112.2	135.3	236.9	169.2	158.2

[a] Properties determined using a gas sorption analyzer.
[b] Calculated using the Brunauer-Emmett-Teller (BET) equation.

Ref.

[1] J. Ho, K. S. Suslick, *Adv. Mater.* **2010**, *22*, 1039.
[2] F. Dang, N. Enomoto, J. Hojo, K. Enpuku, *Ultrason. Sonochem.* **2009**, *16*, 649.