Electronic Supplementary Information

Phase-segregation induced growth of core-shell α-Fe_2O_3/SnO_2 heterostructures for lithium-ion battery

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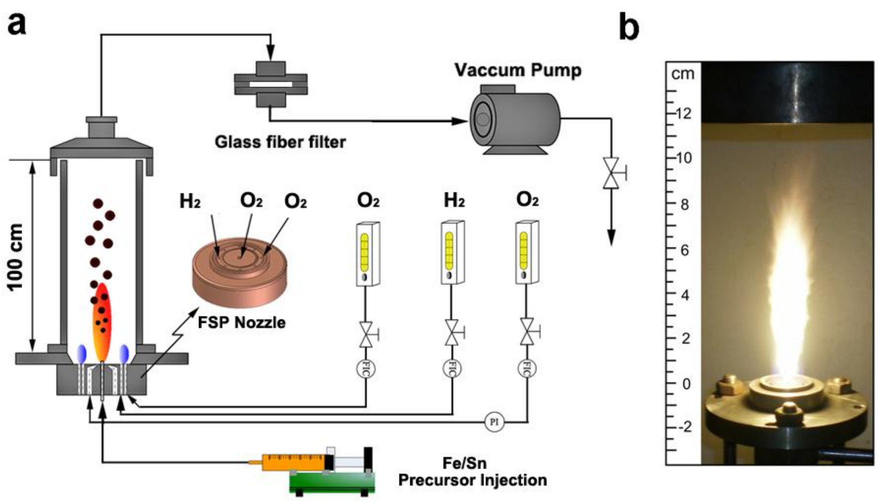


Figure S1 (a) Schematic experimental set-up for flame spray preparation of core-shell α-Fe_2O_3/SnO_2 heterostructures, (b) a digital photo of typical spray flame in an open environment.

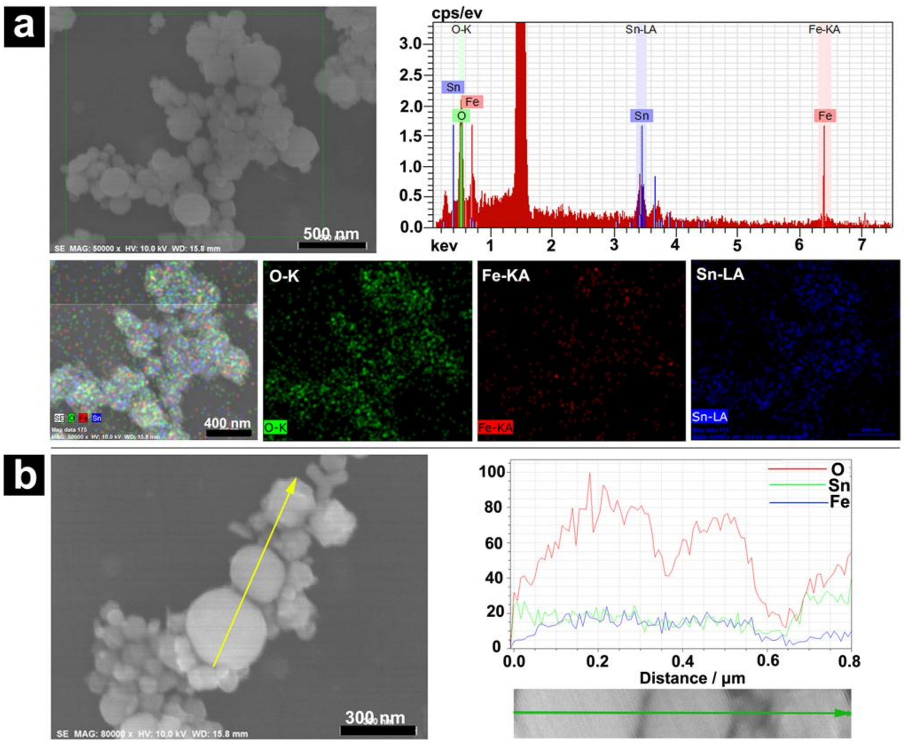
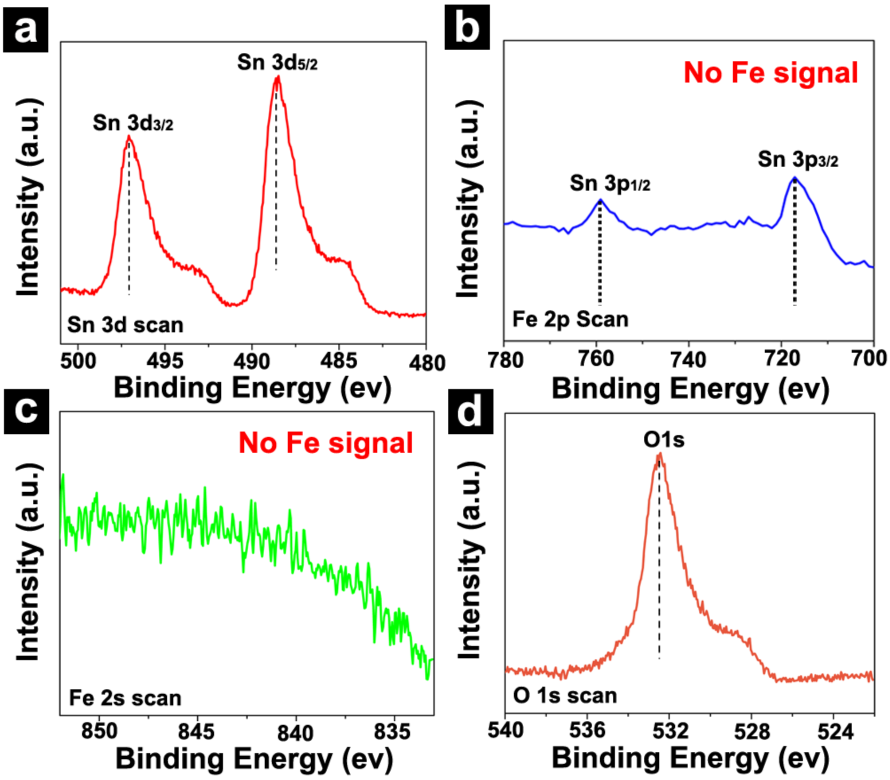


Figure S2 (a) SEM image of core-shell α-Fe_2O_3/SnO_2 heterostructures and the corresponding EDS and elements mapping images. (b) SEM image and the corresponding EDS line scanning of several particles. (Elements mapping images of more particles in single SEM image shows the distribution of Sn, Fe, and O in detail. It is obviously noted that Fe are mainly in central of particles, compared to Sn atoms. Furthermore, the elements line scanning of serveral particles in single SEM image is shown in Figure S2(b). It is oberserved that Sn atom is more than Fe at the near surface of particles, suggesting the existence of SnO_2 shell. These results demonstrate that the obtained Fe_2O_3/SnO_2 heterostructures show typical core-shell structures.)



Figuere S3 (a) Sn 3d xps spectra collected for core-shell α-Fe_2O_3/SnO_2 heterostructures. (b, c) the corresponding Fe 2p and Fe 2s xps spectra (no trace of Fe 2p and Fe 2s signals is detected). (d) O 1s xps spectra of core-shell α-Fe_2O_3/SnO_2 heterostructures. The Sn 3p spectrum of core-shell α-Fe_2O_3/SnO_2 heterostructures was also shown in (b). (As known, X-ray photoelectron spectroscopy is used to indentify the surface composition by irradiating the sample surface. Useful e^- signal is obtained only form a depth of around 0.1 to 10 nm. No traces of Fe signals detected suggest that the Fe_2O_3 cores are encapsulated by SnO_2 shell perfectly, indicating a typical core-shell structures.)

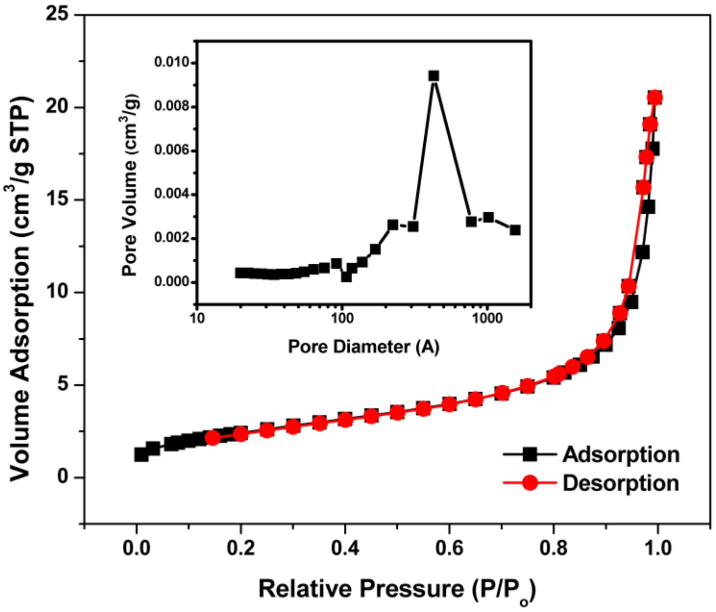


Figure S4 Adsorption-desorption isotherm and pore size distribution of core-shell α-Fe_2O_3/SnO_2 heterostructures (Fe/Sn = 1:1).