Electronic Supporting Information

**Fig. S1** SEM images of (a) the parent ZIF-8 nanocrystals and (b) the etched ZIF-8 nanobubbles.
**Fig. S2** Wide-angle PXRD profiles of the parent ZIF-8 nanocrystals, the ZIF-8 nanobubbles, and the simulated ZIF-8 pattern from single-crystal data.
Fig. S3 TEM images of (a) the parent ZIF-7 nanocrystals and (b) the etched ZIF-7 nanobubbles.
Fig. S4 pH change of the suspension of ZIF-8 nanoparticles in tannic acid versus time.
**Fig. S5** FTIR spectrum of the ZIF-8 nanobubbles treated with tannic acid molecules. The arrows indicate the typical bands that are assignable to the adsorbed tannic acid molecules.
Fig. S6 TEM images of ZIF-8 etched by polymaleic acid.
**Fig. S7** TEM images of ZIF-8 etched by hyaluronic acid.
Fig. S8 TEM images of UIO-66 etched by tannic acid.
Fig. S9 TEM images of MIL-101 etched by tannic acid.
**Fig. S10** (a) CV curves of the non-hollow carbon nanoparticles between 1 and 3 V (vs Na⁺/Na) at various rate in the range of 5-40 mV·s⁻¹. (b) The dependence of anodic and cathodic current (at 2.0 V) on scanning rate.
Fig. S11 Galvanostatic charge/discharge curves for the hollow carbon nanobubbles between 0.001 and 3.000 V (vs Na+/Na) at a current density of 50 mA·g⁻¹.
Fig. S12 Coulombic efficiency of the electrodes prepared with non-hollow carbon nanoparticles and hollow carbon nanobubbles cycled at a current density of 10,000 mA·g⁻¹.
Fig. S13 TEM images of (a) the non-hollow carbon nanoparticles and (b) the hollow carbon nanobubbles after 1,000 charge/discharge cycles at a current density of 10,000 mA g$^{-1}$. 
Fig. S14 (a) CV curves for the first 2 cycles of the hollow carbon nanobubbles and non-hollow carbon nanoparticles between 0.001 and 3.000 V (vs. K⁺/K) at a potential sweep rate of 0.1 mV s⁻¹. (b) Galvanostatic charge/discharge curves for the first 2 cycles between 0.001 and 3.000 V (vs. K⁺/K) at a current density of 50 mA g⁻¹. (c) Rate performance and (d) cycling performance of the hollow carbon nanobubbles and non-hollow carbon nanoparticles. The electrodes were first activated by discharge/charge at a current density of 50 mA·g⁻¹ in the initial cycle before testing at the current density of 1 A·g⁻¹.
Fig. S15 (a, b) Galvanostatic charge/discharge curves of the non-hollow carbon nanoparticles and the hollow carbon nanobubbles between 0.001 and 3.000 V (vs. K+/K) at various current densities ranging from 50 to 2,000 mA·g⁻¹. (c) Comparison of rate capacity of our carbon materials with other published materials such as hard carbon microspheres¹, soft carbon², reduced graphene oxide (RGO), and graphite³.


**Figure S16.** Cycling performance of non-hollow carbon and hollow carbon as cathodes for Li-S battery at a current density of 100 mA·g⁻¹.