

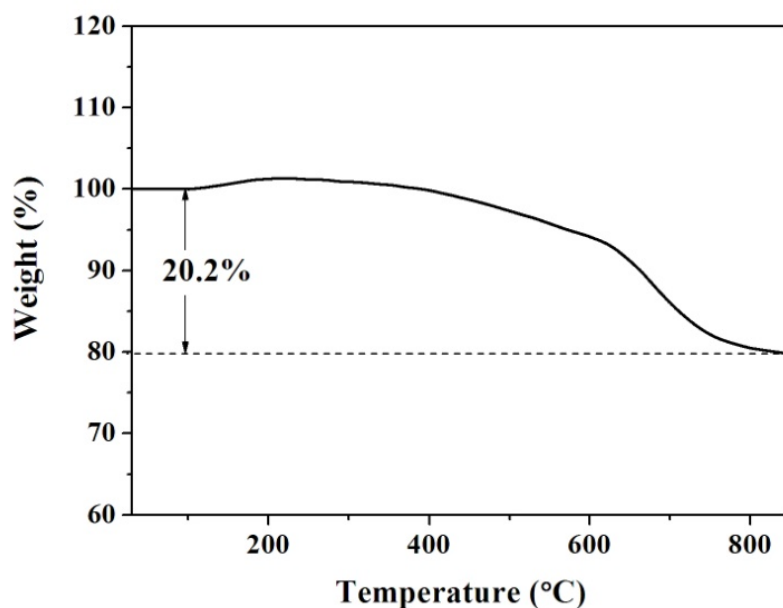
Supporting Information

Self-assembled echinus-like nanostructures of mesoporous CoO nanorod@CNT for lithium-ion batteries

Feng Dan Wu, Yong Wang*

Supporting Information 1

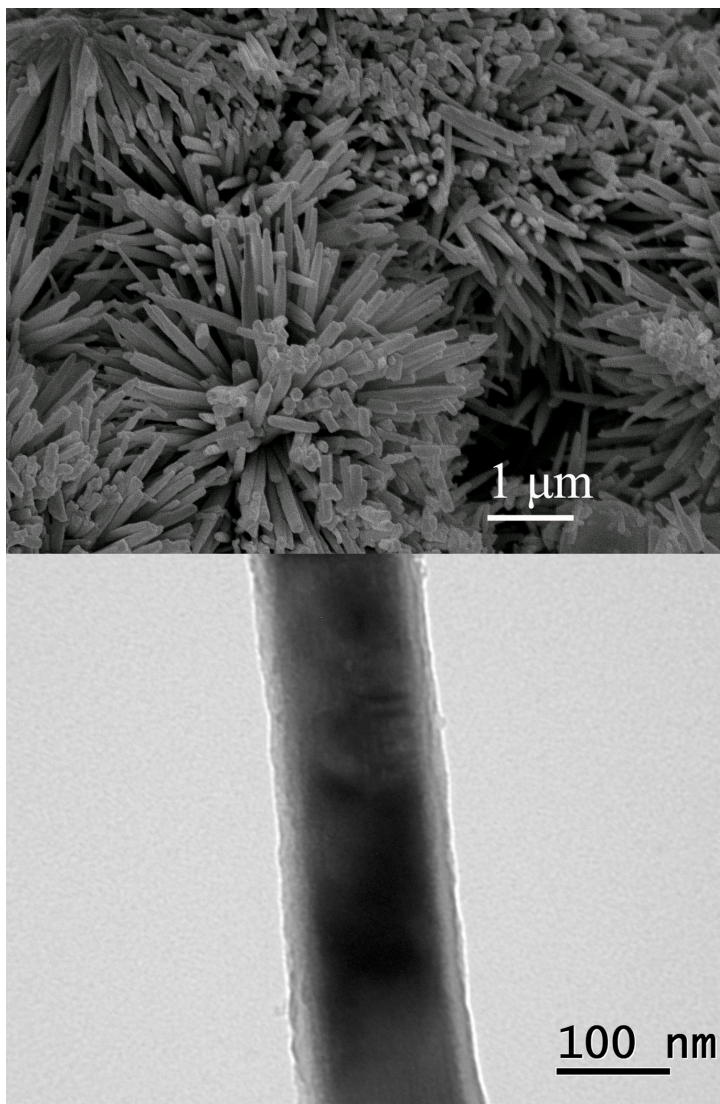
The following figure shows the TGA curve of CoO@CNT in air. There was a slight weight increase at 100-280°C, which should be attributed to the partial oxidation of CoO to Co₃O₄. A large weight loss occurred at 380-790°C, corresponding to the decomposition of carbon and partial reduction of CoO to Co.



* Corresponding author. Tel:+86-21-66137723, Fax:+86-21-66137725
E-mail: yongwang@shu.edu.cn (Prof. Y. Wang)

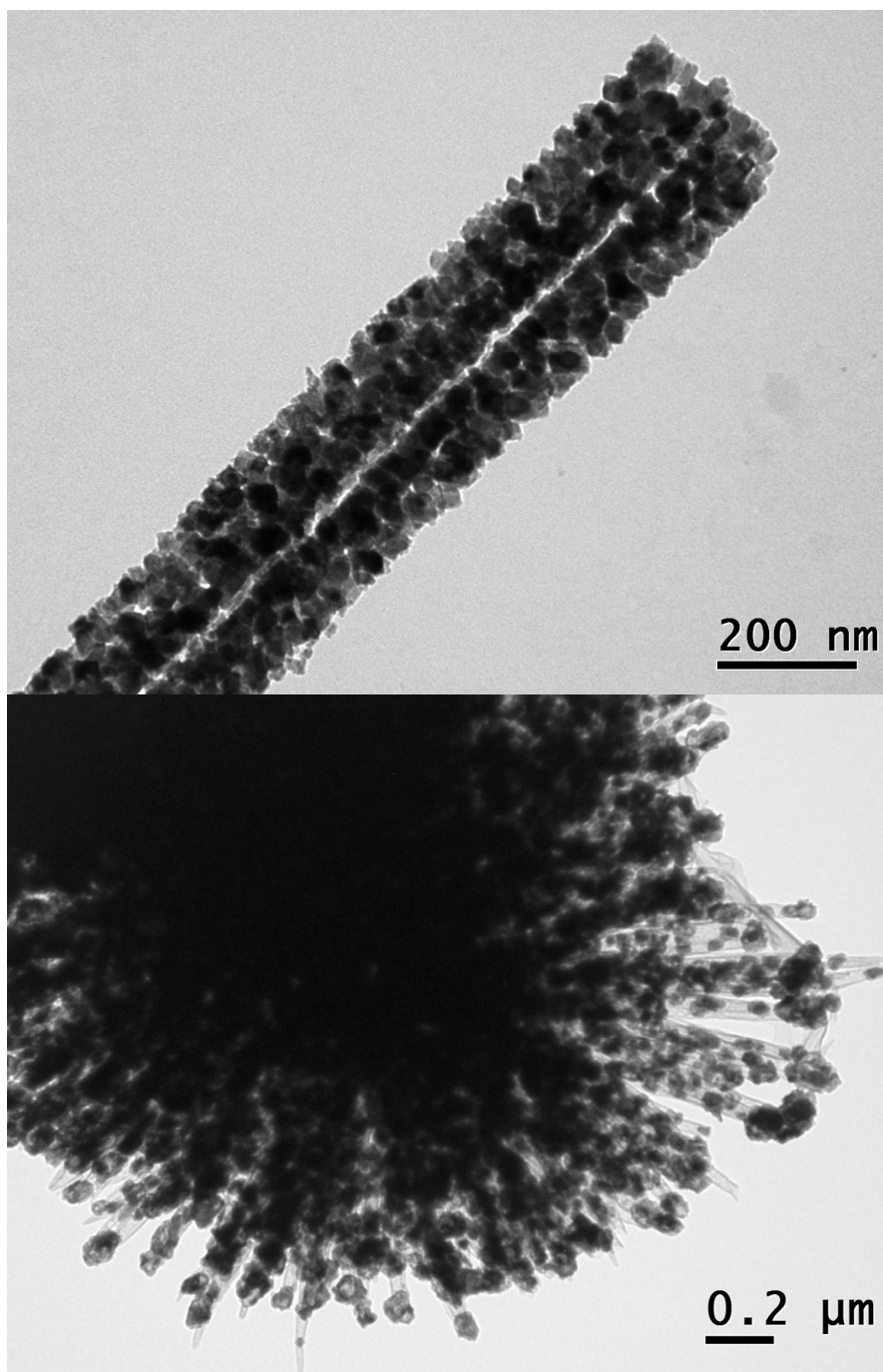
Supporting Information 2

The following FE-SEM image (top) and TEM image (bottom) show the echinus-like intermediate product of cobalt chloride carbonate hydroxide with carbon-rich polysaccharide overlayer (CCCH@CP nanorods). A thin polysaccharide layer could be clearly observed around CCCH nanorods core.



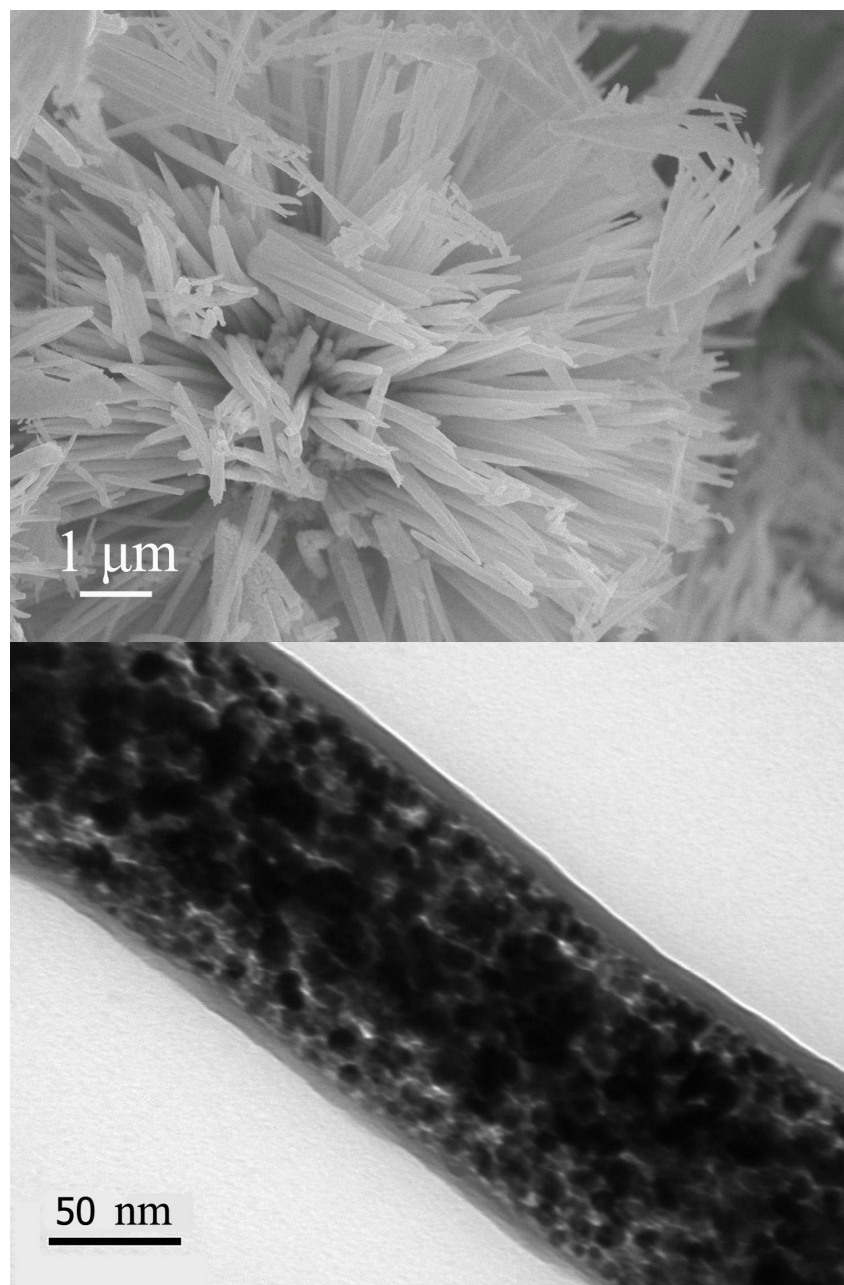
Supporting Information 3

The TEM image (top) shows two parallel pristine CoO nanorods, which were prepared in the absence of glucose. These nanorods were composed of many small nanoparticles. The TEM image (bottom) shows the carbon nanotube-encapsulated Co materials (Co@CNT) with echinus-like morphology, which was prepared by direct calcination in N₂ at 450°C without preheating in air at 250°C.



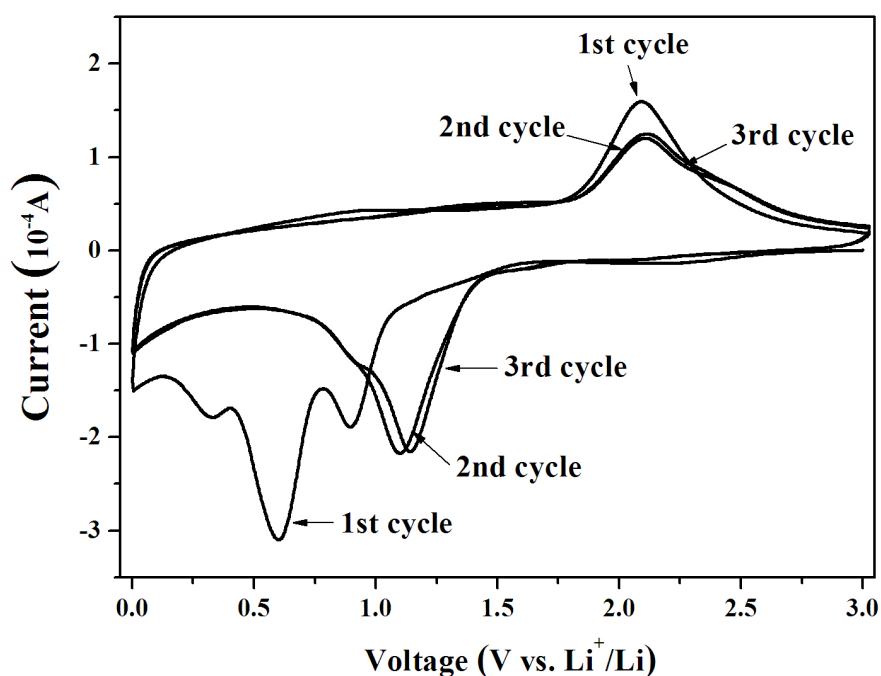
Supporting Information 4

The following FE-SEM image (top) and TEM image (bottom) show the echinus-like CoO@CNT composite. Porous CoO nanorods composed of small nanoparticles (10-20 nm in size) were encapsulated inside carbon nanotubes.



Supporting Information 5

The following figure shows the first 3 cycles cyclic voltammograms of CoO@CNT nanostructure. The scan range was swept at the scan rate of 0.1 mV/s. The cathodic peaks of the first cycle at ~0.91 and 0.59 V could be attributed to the solid electrolyte interface (SEI) film formation on the active materials and to the reduction reaction of cobalt oxide to cobalt. The anodic peaks were recorded at ~2.09 V, corresponding to the oxidation of cobalt to cobalt oxide. The lithium insertion and extraction reactions with CoO took place reversibly according to the following established reaction pathway:



Supporting Information 6

The following TEM image shows the pristine CoO nanorod electrode in the presence of carbon black and PVDF binder after 50 cycles of discharge and charge. There was no observation of nanorod-like structure.

