

Supporting Information

Achieving Ultralong Life Sodium Storage in Amorphous Cobalt-tin Binary Sulfide Nanoboxes Sheathed in N-doped Carbon

Xu Liu,^a Yuwei Wang,^a Zhiyu Wang,^{a,} Tao Zhou,^b Mengzhou Yu,^a Luyang Xiu,^a Jieshan Qiu^{a,*}*

^a State Key Lab of Fine Chemicals, School of Chemical Engineering, Liaoning Key Lab for Energy Materials and Chemical Engineering, PSU-DUT Joint Center for Energy Research, Dalian University of Technology, Dalian 116024, China

^b State Key Lab of Polymer Materials Engineering, Polymer Research Institute, Sichuan University, Chengdu 610065, China

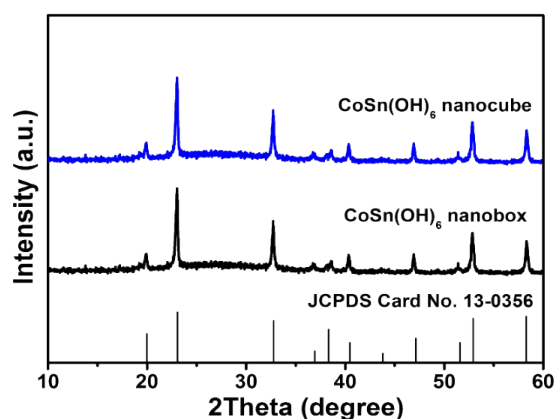


Fig. S1. XRD patterns of CoSn(OH)₆ nanocubes and nanoboxes.

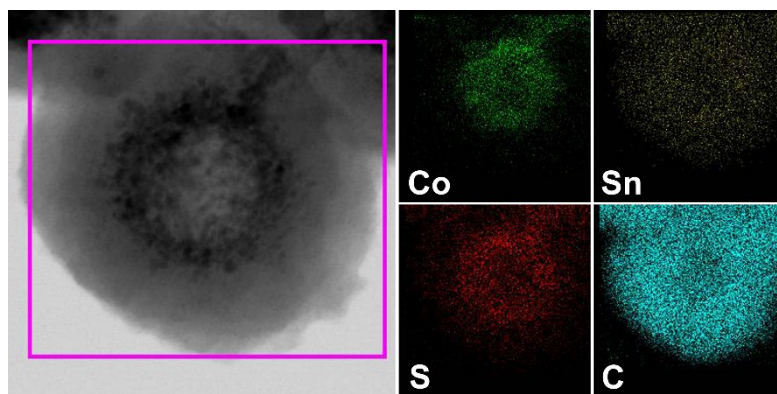


Fig. S2. Elemental mapping revealing the uniform distribution of Co, Sn, S and C elements in CoSnS_x@NC nanoboxes.

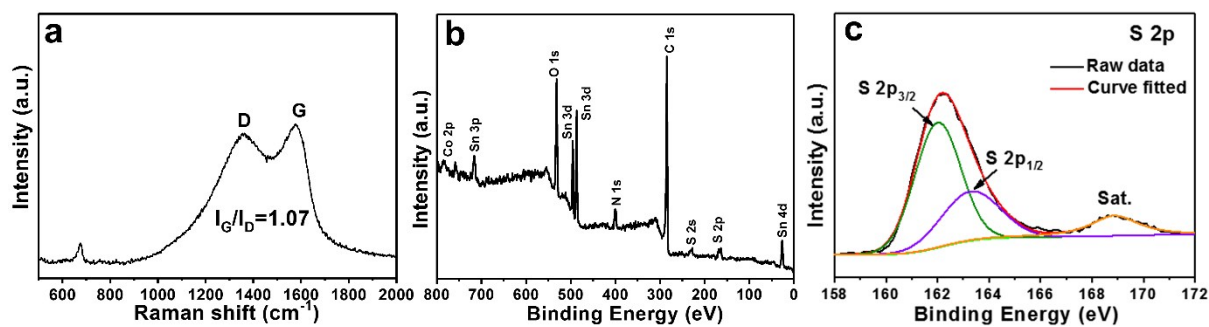


Fig. S3. (a) Raman spectrum of $\text{CoSnS}_x\text{@NC}$ nanoboxes; (b) XPS survey scan of $\text{CoSnS}_x\text{@NC}$ nanoboxes; (c) S 2p XPS spectrum of $\text{CoSnS}_x\text{@NC}$ nanoboxes.

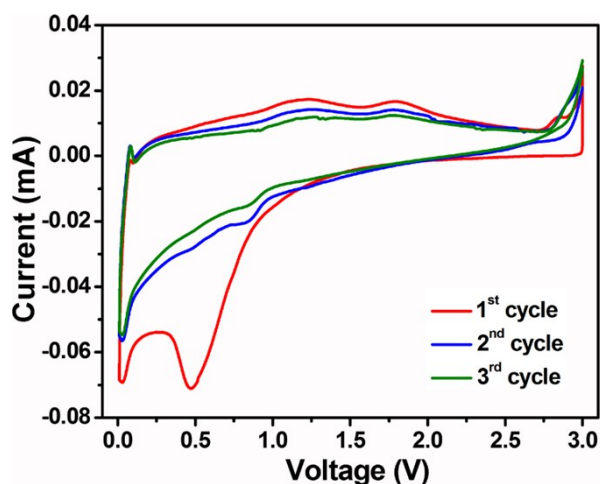


Fig. S4. CV curves of $\text{CoSnS}_x\text{@NC}$ nanoboxes at a scan rate of 0.1 mV s^{-1} between 0.0-3.0 V.

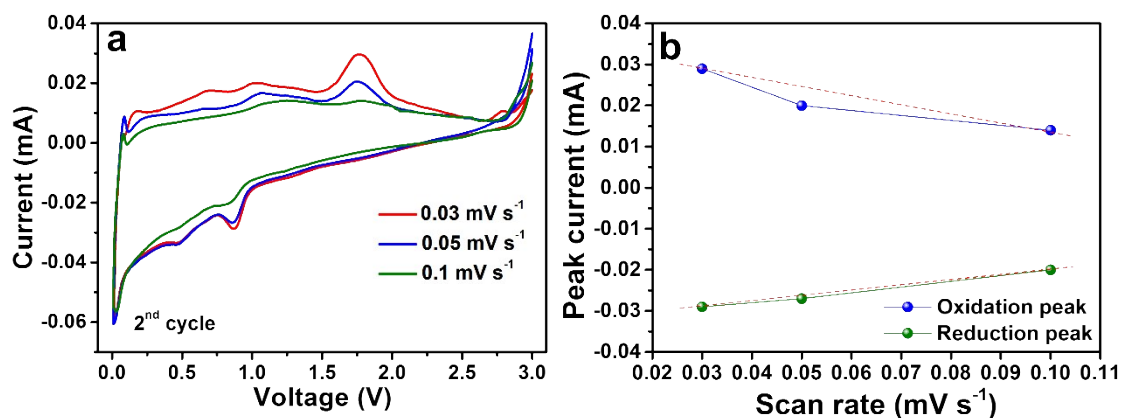


Fig. S5. (a) CV curves of $\text{CoSnS}_x\text{@NC}$ nanoboxes at various scan rate of 0.03-0.1 mV s^{-1} between 0.0-3.0 V; (b) the plot of oxidation/reduction peak current vs. the scan rate.

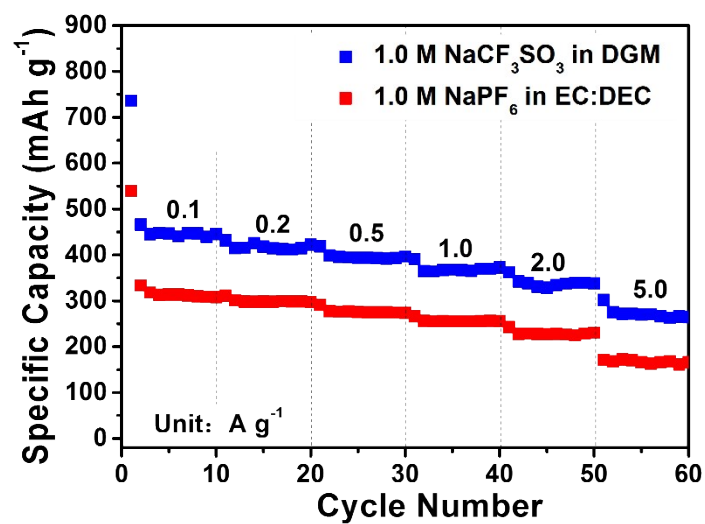


Fig. S6. Rate capability of CoSnS_x@NC nanoboxes in 1 M NaCF₃SO₃/DGM and 1 M NaPF₆/EC:DEC electrolyte at varied current densities of 0.1-5.0 A g⁻¹.

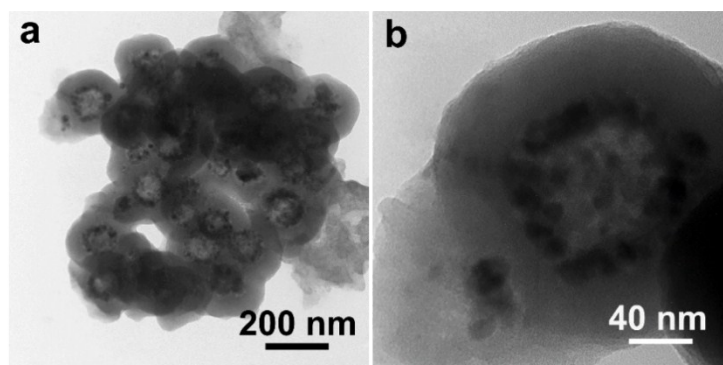


Fig. S7. (a) TEM images of CoSnS_x@NC nanoboxes after deep cycling for 4000 cycles.

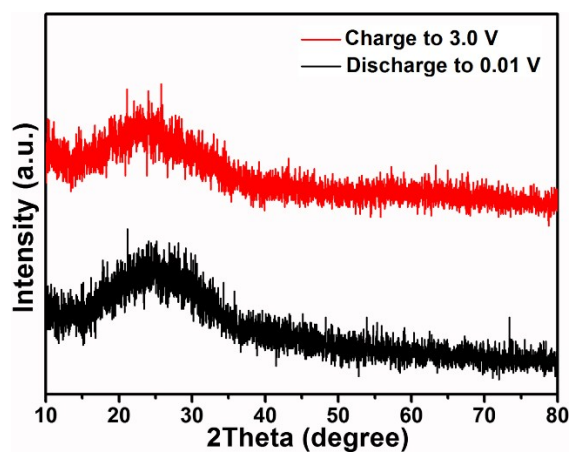


Fig. S8. XRD pattern of CoSnS_x@NC nanoboxes after discharging to 0.01 V and charging to 3.0 V.

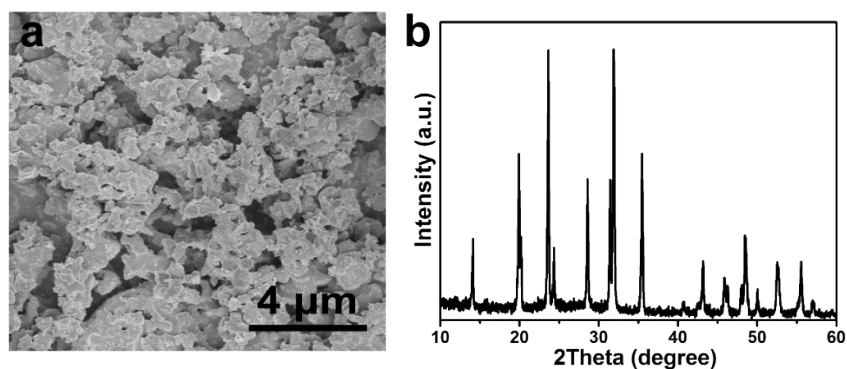


Fig. S9. (a) SEM image and (b) XRD pattern of $\text{Na}_3\text{V}_2(\text{PO}_4)_3/\text{C}$ composite.

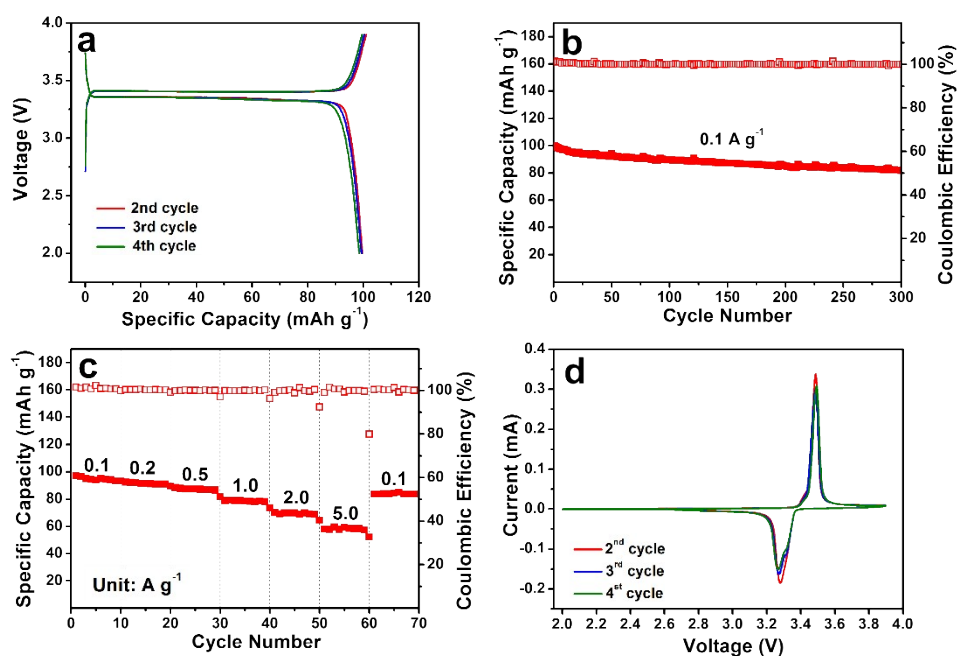


Fig. S10. (a) Discharge-charge voltage curves of $\text{Na}_3\text{V}_2(\text{PO}_4)_3/\text{C}$ cathode; (b) cycling stability of $\text{Na}_3\text{V}_2(\text{PO}_4)_3/\text{C}$ cathode at a current density of $0.1\ \text{A g}^{-1}$; (c) rate capability of $\text{Na}_3\text{V}_2(\text{PO}_4)_3/\text{C}$ composite at various current densities of 0.1 - $5.0\ \text{A g}^{-1}$; (d) CV curve of $\text{Na}_3\text{V}_2(\text{PO}_4)_3/\text{C}$ cathode between 2.0 - $3.9\ \text{V}$.