Supplementary Material

Bifunctional nitrogen-doping carbon encapsulated $ZnSe/CoSe_2$ hollow nanospheres anodes for advanced alkali-ion batteries

Qiang Liu[a], Jiagang Hou[b], Qin Hao[a], Peng Huang[a], Caixia Xu[a*], Qiuxia Zhou[a], Ji Zhou[a], and Hong Liu[a,c*]

a Institute for Advanced Interdisciplinary Research (iAIR), Collaborative Innovation Center of Technology and Equipment for Biological Diagnosis and Therapy in Universities of Shandong, School of Chemistry and Chemical Engineering, University of Jinan, Jinan 250022, Shandong Province, China

b Qilu University of Technology (Shandong Academy of Sciences), Jinan 250353, Shandong Province, China

c State Key Laboratory of Crystal Materials, Shandong University Jinan 250100, Shandong Province, China

Fax: +86-531-82767046; Tel: +86-531-82767046

E-mail: chm_xucx@ujn.edu.cn; ifc_liuh@ujn.edu.cn

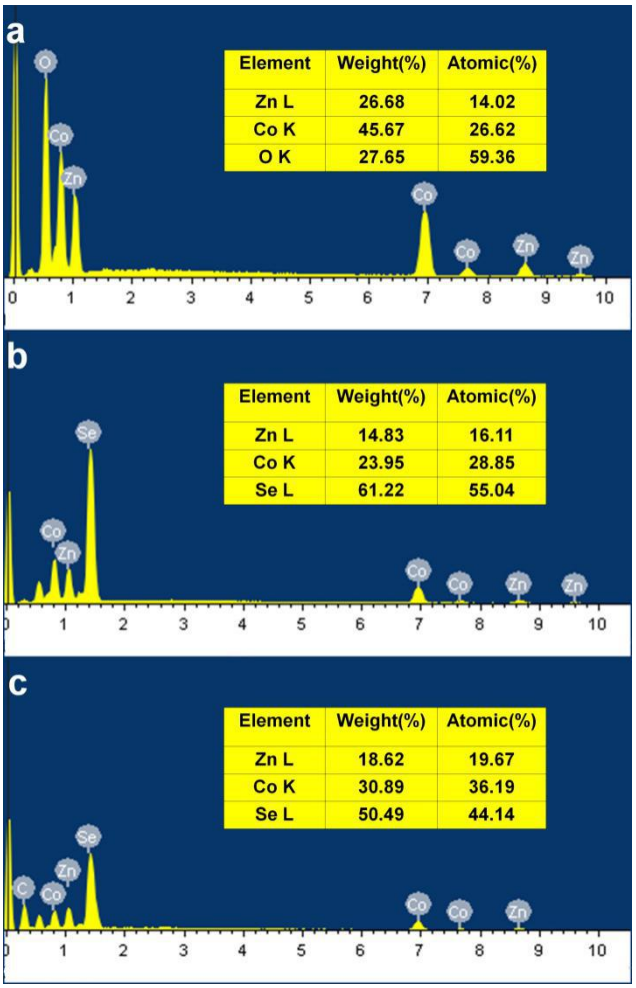

Fig. S1. EDS data of (a) ZnO/Co_3O_4, (b) $ZnSe/CoSe_2$, and $ZnSe/CoSe_2$@N-C samples.

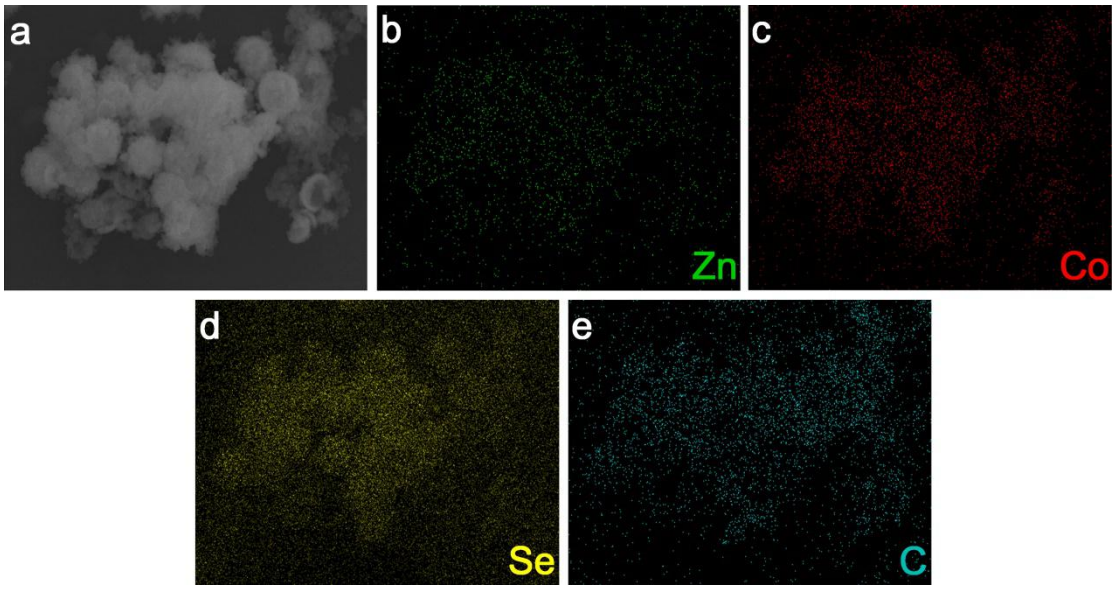

Fig. S2. Elemental mappings of Zn (b), Co (c), Se (d), and C (e) in the ZnSe/$CoSe_2$@N-C sample corresponding to Fig. S2a.

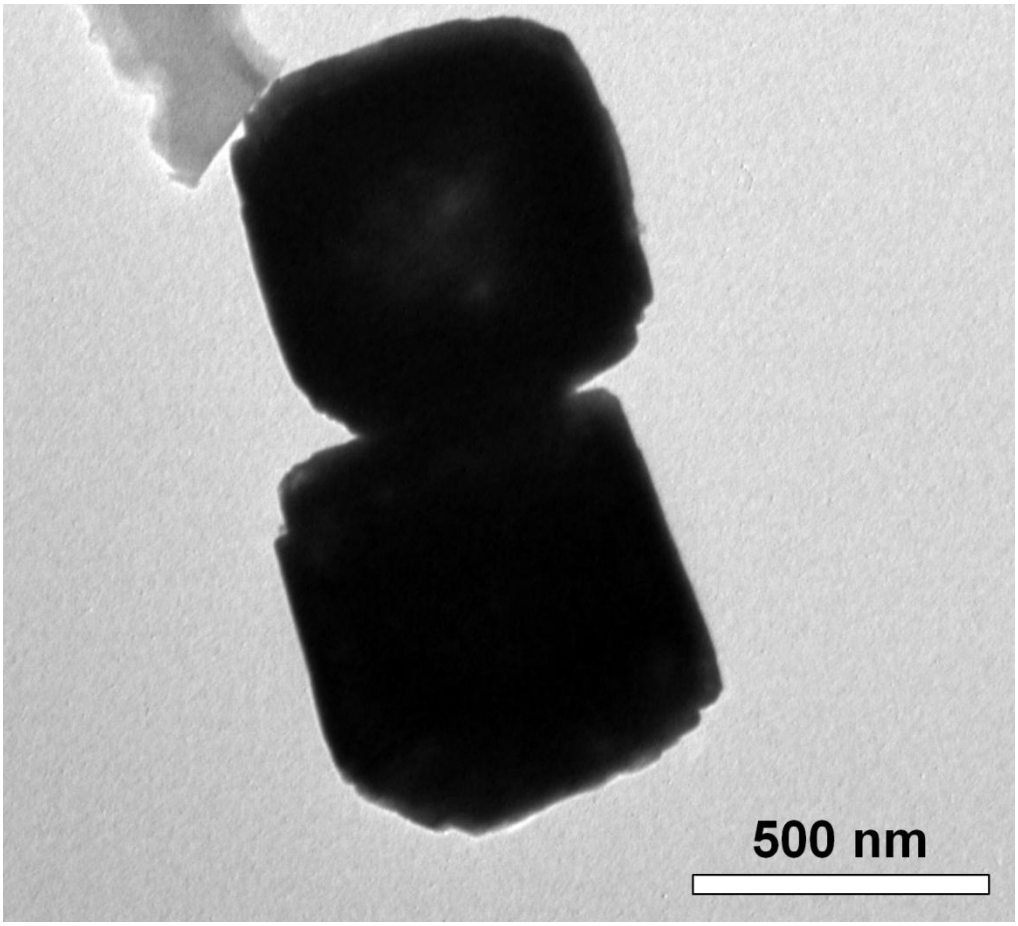

Fig. S3. TEM image of ZnO/Co_3O_4 precursor sample.

Table. S1

Impedance parameters of $ZnSe/CoSe_2$ and $ZnSe/CoSe_2$@N-C anodes calculated from equivalent circuits.

Electrode	R_e (Ω)	R_{ct} (Ω)
$ZnSe/CoSe_2$	4.88	104.5
$ZnSe/CoSe_2$@N-C	5.03	63.2