Electronic Supplementary Information

Mg-storage properties of hollow copper selenide nanocubes

Jingwei Shen,[a] Dong Chen,[a] Shun-an Cao,[a] Ting Li,*[b] Wei Luo,[c] Fei Xu*[a]

[a] Key Laboratory of Hydraulic Machinery Transients, Ministry of Education, School of Power and Mechanical Engineering, Wuhan University, Wuhan 430072, China.

[b] Key Laboratory of Catalysis and Materials Science of the State Ethnic Affairs Commission & Ministry of Education, College of Chemistry and Materials Science, South-Central University for Nationalities, Wuhan 430074, China.

[c] College of Chemistry and Molecular Sciences, Wuhan University, Wuhan 430072, China.

* E-mail:

Fei Xu (xufei2058@whu.edu.cn)

Ting Li (liting@mail.scuec.edu.cn)

Supplementary data: Additional figures and tables as mentioned in the text

1. Full XPS spectra.

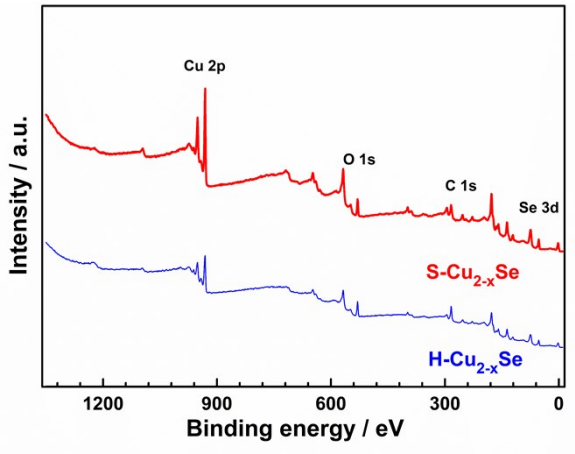

Fig. S1 Full XPS spectra of H-$Cu_{2-x}Se$ and S-$Cu_{2-x}Se$.

2. Rate capability of S-$Cu_{2-x}Se$.

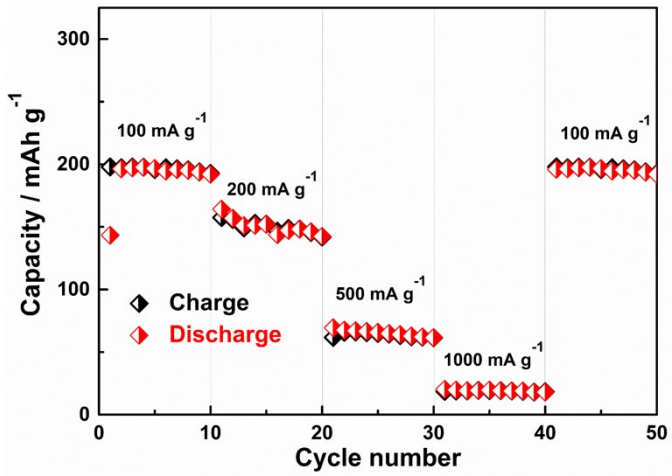

Fig. S2 Rate capability of S-$Cu_{2-x}Se$ at different current densities from 100 to 1000 mA g^{-1}. The test started from an activated S-$Cu_{2-x}Se$.

3. Charge/discharge curves for the rate performance

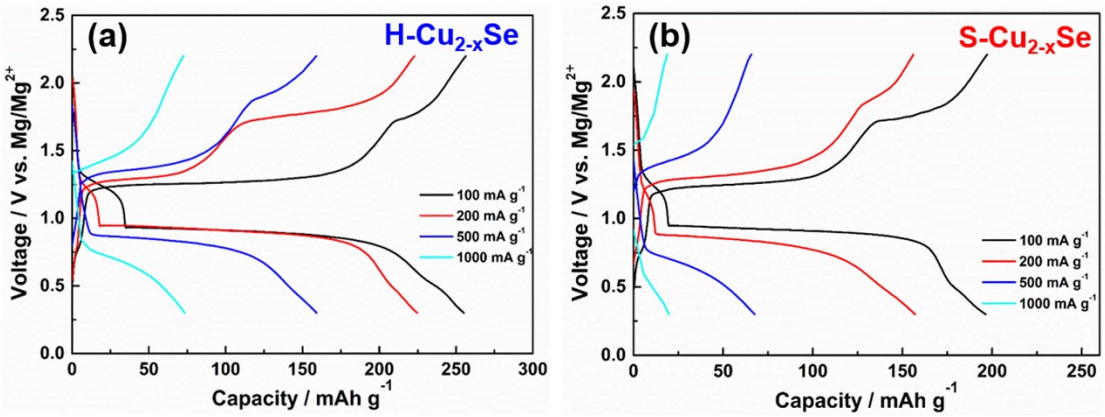

Fig. S3 Charge/discharge curves for rate performance of (a) H-$Cu_{2-x}Se$ and (b) S-$Cu_{2-x}Se$.

4. Determination of Mg^{2+} diffusion coefficients for H-$Cu_{2-x}Se$ and S-$Cu_{2-x}Se$.

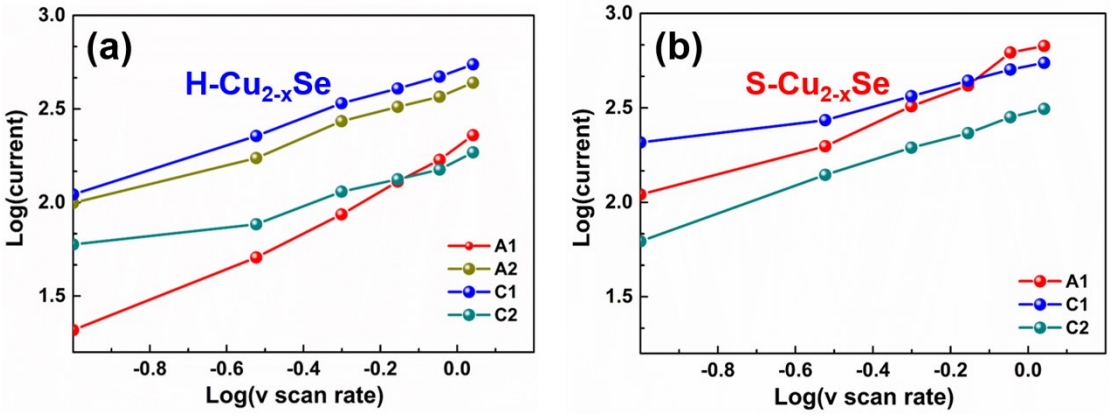

Fig. S4 Log(*i*) vs. log(*v*) plots for different redox peaks of H-$Cu_{2-x}Se$ and S-$Cu_{2-x}Se$ electrodes.

Table S1 Calculation of Mg^{2+} diffusion coefficients

	H-$Cu_{2-x}Se$		**S-$Cu_{2-x}Se$**	
peak	$i_p/v^{1/2}$	***D*** **(×10^{-9} cm^2 s^{-1})**	$i_p/v^{1/2}$	***D*** **(×10^{-10} cm^2 s^{-1})**
A1	0.2764	4.3124	0.8086	16.4032
A2	0.4609	11.9911	/	/
C2	–0.1693	1.6179	–0.3429	2.9498
C1	–0.5940	19.9167	–0.4871	5.9525

The diffusion coefficient of Mg^{2+} is calculated by the following equation:

$$i_p = 2.69 \times 10^5 n^{3/2} A D^{1/2} v^{1/2} C_0$$

where i_p is the peak current (A), n is the number of electrons per molecule during the reaction, A (cm^2) is the contact area between the electrode and electrolyte, D is the diffusion coefficient of Mg^{2+} (cm^2 s^{-1}), C_0 (mol cm^{-3}) is the concentration of Mg^{2+} ion in the electrode material, and v is the scan rate (V s^{-1}).