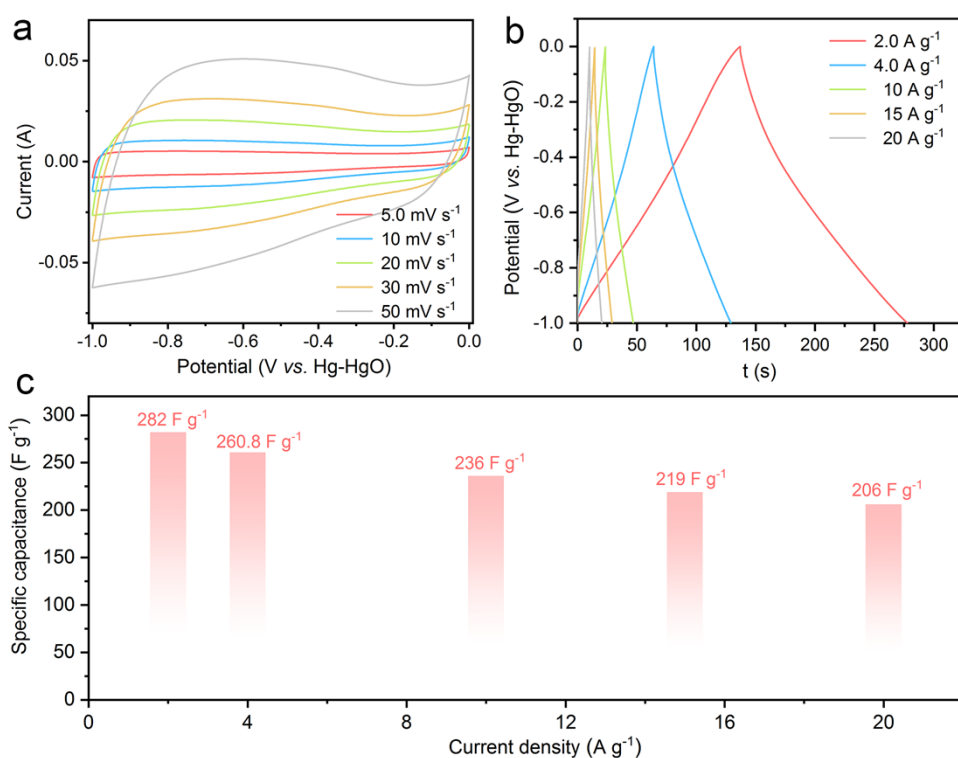
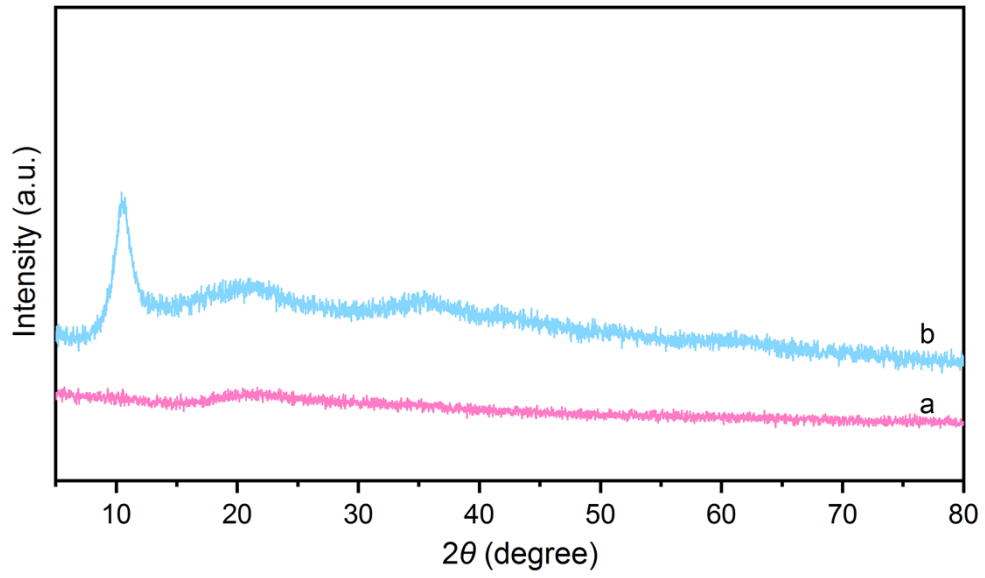


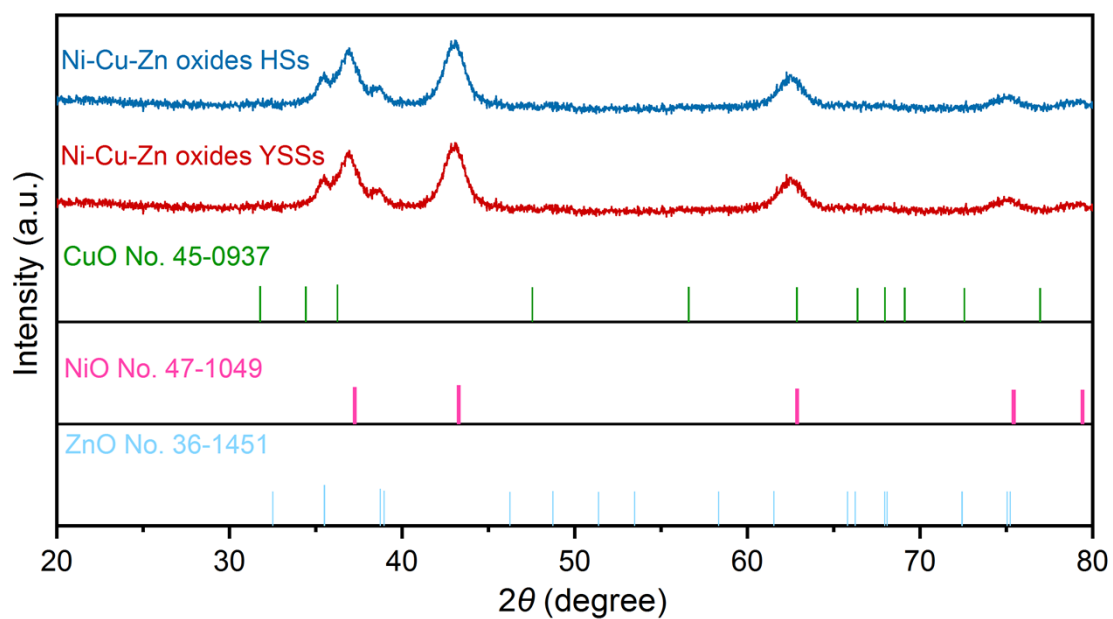
## Supporting information



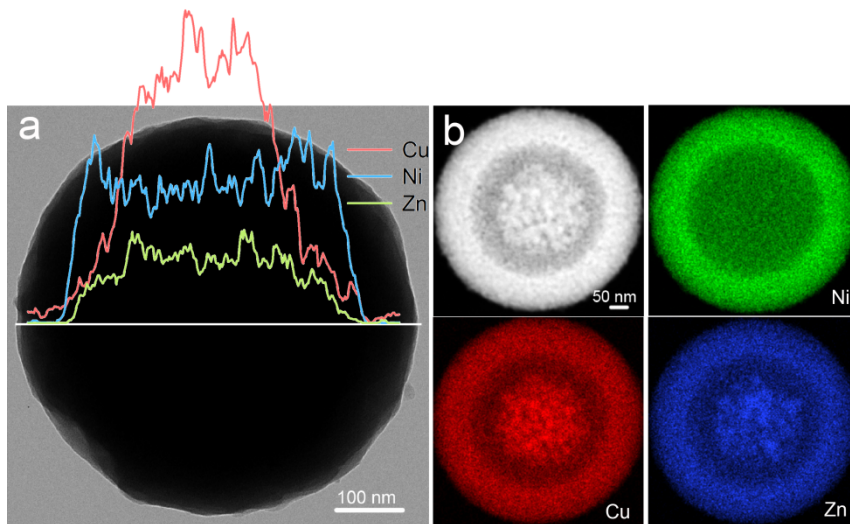
**Fig. S1.** Electrochemical performances of AC: (a) CV curves collected at 5.0-50 mV s<sup>-1</sup>, (b) GCD curves collected at 2.0-20 A g<sup>-1</sup> and (c) Specific capacitance of AC at 2.0-20 A g<sup>-1</sup>.



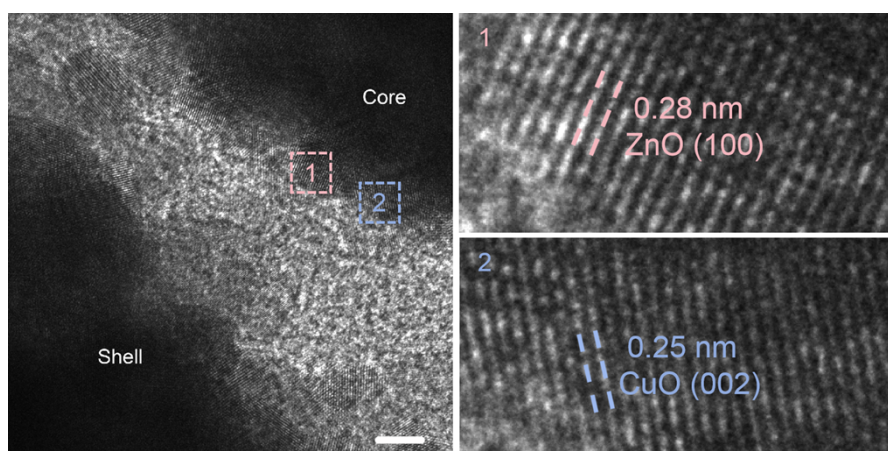
**Fig. S2.** XRD pattern of the prepared precursor under different synthesis time: (a) 1.0 h, (b) 6.0 h.



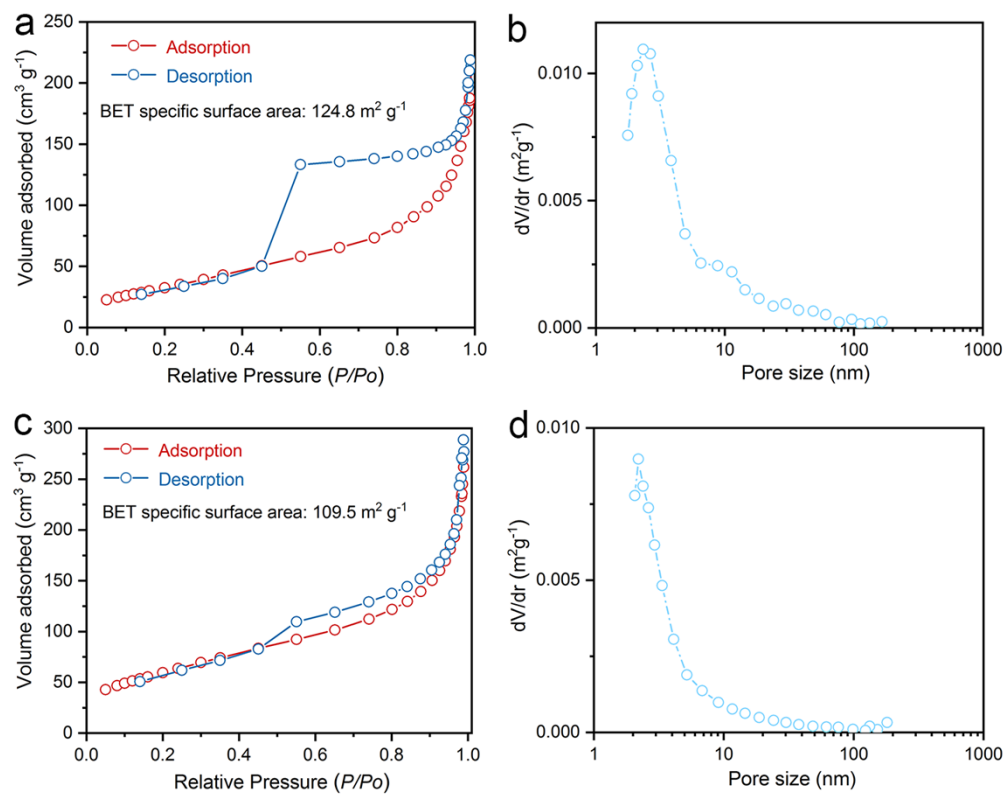
**Fig. S3.** XRD patterns of Ni-Cu-Zn oxides YSSs and Ni-Cu-Zn oxides HSs.



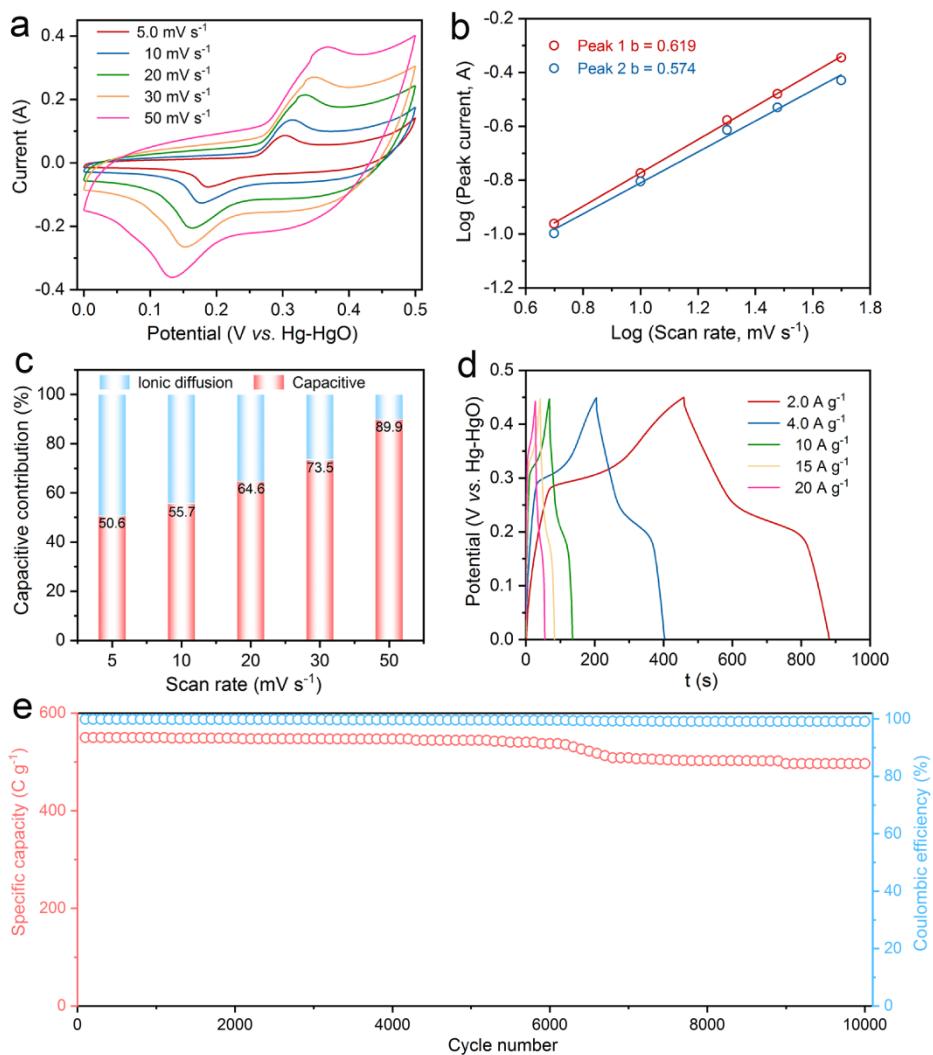
**Fig. S4.** (a) Line scanning for Ni, Cu and Zn of an individual precursor obtained at 30 min, (b) elemental mappings of an individual precursor obtained at 1.0 h.



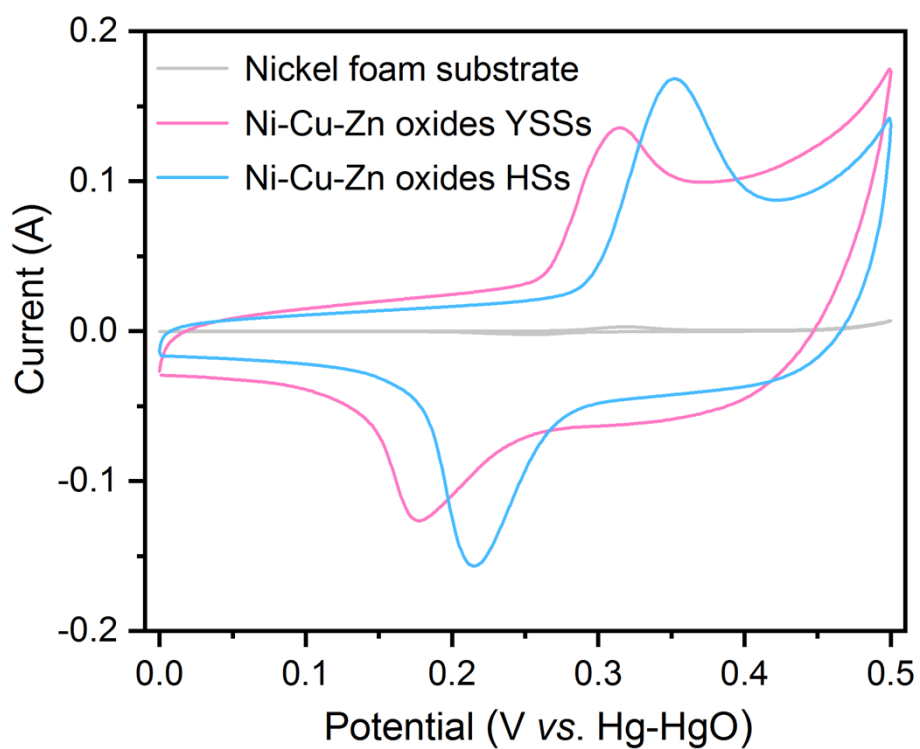
**Fig. S5.** HRTEM image of the core for Ni-Cu-Zn oxides YSS.



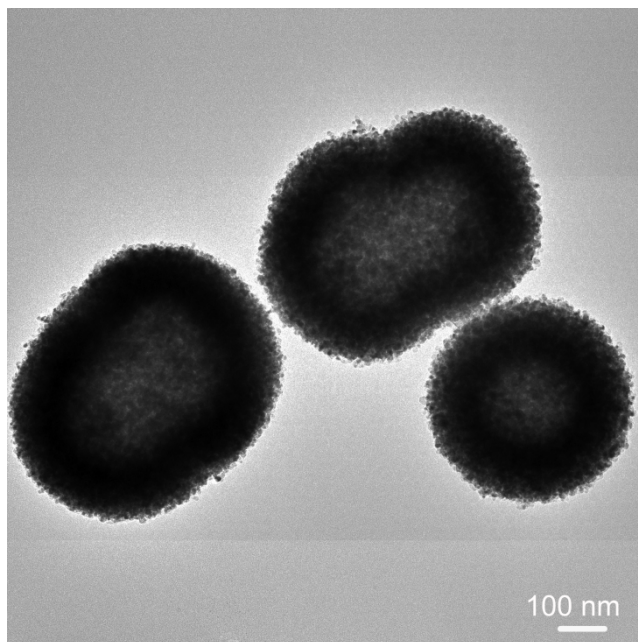
**Fig. S6.**  $\text{N}_2$  adsorption-desorption and pore size distribution curves of the (a,b) Ni-Cu-Zn oxides YSSs and (c,d) Ni-Cu-Zn oxides HSs structures.



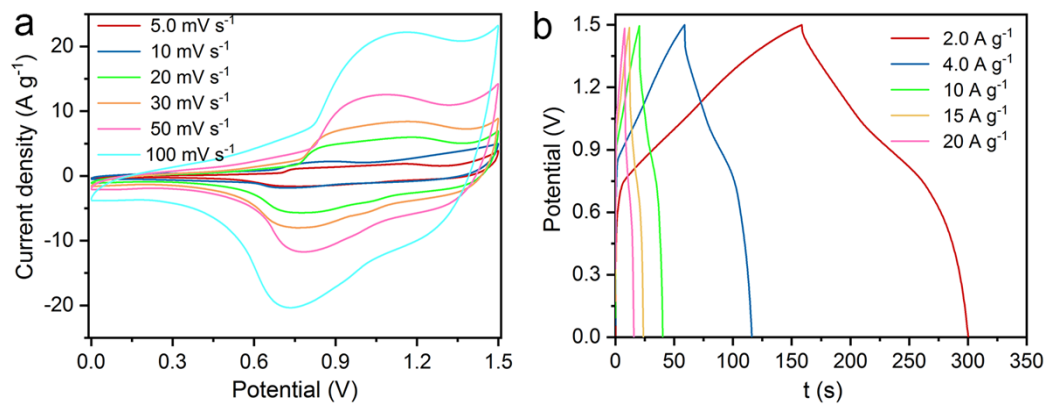
**Fig. S7.** Electrochemical performances of Ni-Cu-Zn oxides YSSs electrode: (a) CV curves collected at 5.0-50 mV s<sup>-1</sup>, (b) A correlation linear between log (redox peaks,  $i$ ) and log (scan rates,  $v$ ), (c) Percentages of capacitive and ionic diffusion contributions at 5.0-50 mV s<sup>-1</sup>, (d) GCD curves collected at 2.0-20 A g<sup>-1</sup> and (e) Long-term cycling measurement at 20 A g<sup>-1</sup>.



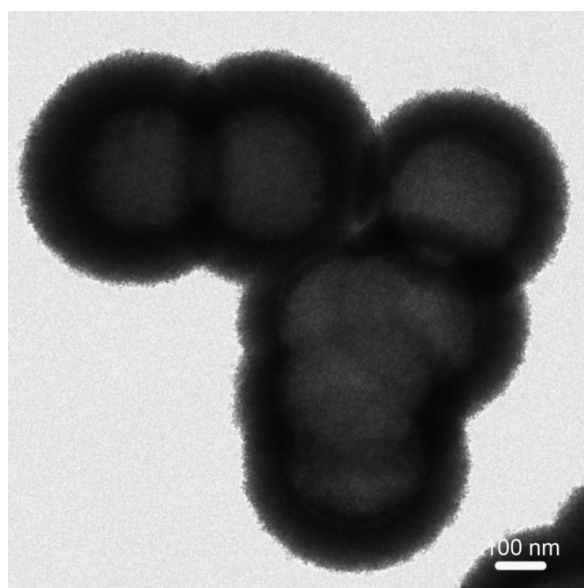
**Fig. S8.** CV curves of nickel foam substrate, Ni-Cu-Zn oxides YSSs and Ni-Cu-Zn oxides HSs at  $10 \text{ mV s}^{-1}$ .



**Fig. S9.** TEM image of the Ni-Cu-Zn oxides HSs after 10000 cycles in three-electrode system.



**Fig. S10.** (a) CV and GCD curves of the Ni-Cu-Zn oxides YSSs//AC.



**Fig. S11.** TEM image of the Ni-Cu-Zn oxides HSs after 10000 cycles in an asymmetrical two-electrode system.