Supplementary Materials

Manipulating stable four-electron zinc-iodine batteries via the introduction of diamine ligand sites

Qijiayi Guo[1,#], Chao Qiu[1,#], Yang Zhang[2], Jing Li[1], Zhixiang Chen[1], Fulong Li[1], Weifeng Liu[1], Xinlong Tian[1], Xiaodong Shi[1]

[1]School of Mechanical and Electrical Engineering, School of Marine Science and Engineering, School of Chemistry and Chemical Engineering, Hainan University, Haikou 570228, Hainan, China.
[2]Precision Industry Revolution Equipment Technology (Henan) Co. Ltd., Zhengzhou Research Institute for Abrasives and Grinding Co. Ltd., Zhengzhou 450007, Henan, China.
[#]These authors contributed equally to this work.

Correspondence to: Assoc. Prof. Jing Li, Prof. Weifeng Liu and Prof. Xiaodong Shi, School of Chemistry and Chemical Engineering, Hainan University, 58 Renmin Avenue, Meilan District, Haikou 570228, Hainan, China. E-mails: jli@hainanu.edu.cn; lwf008@163.com; shixiaodong@hainanu.edu.cn

Section 1 Figures

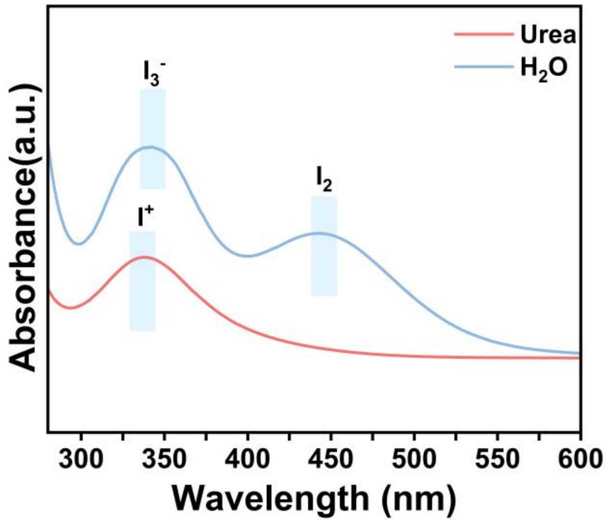

Figure S1 The corresponding UV-vis absorbance intensity of ICl in Urea and H_2O

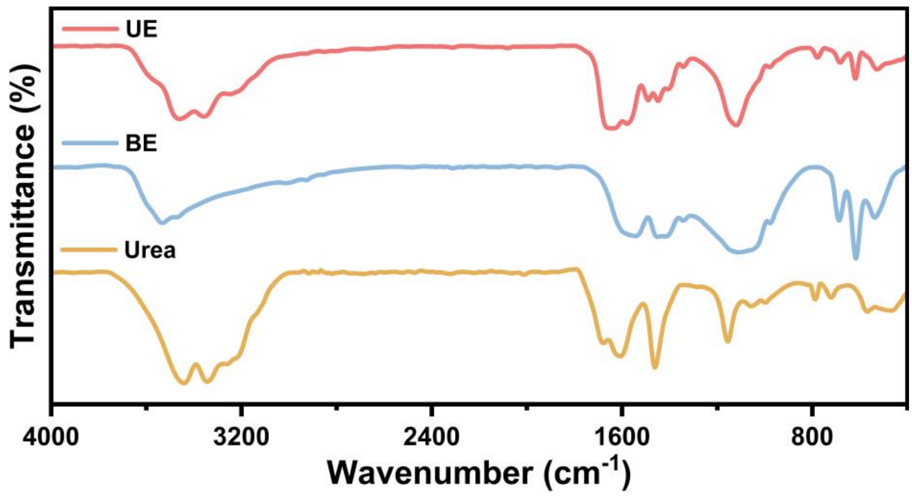

Figure S2 FT-IR spectra of various solvents, substances, and electrolytes.

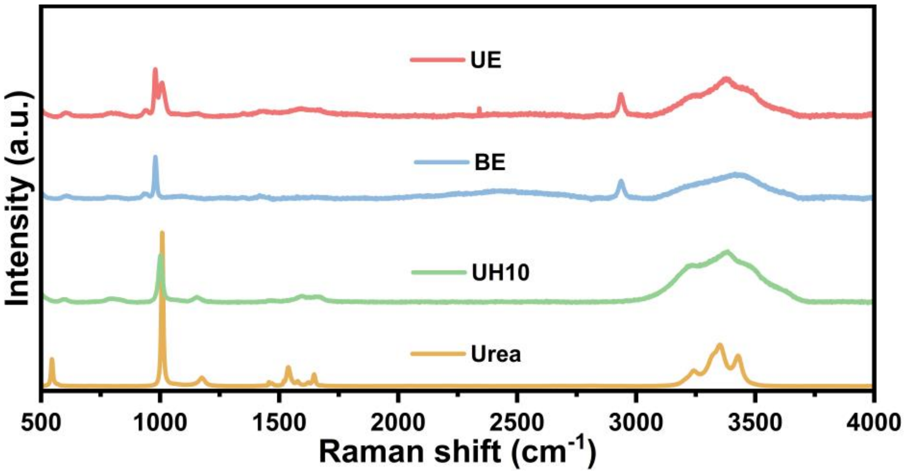

Figure S3 Raman spectra of various solvents, substances, and electrolytes.

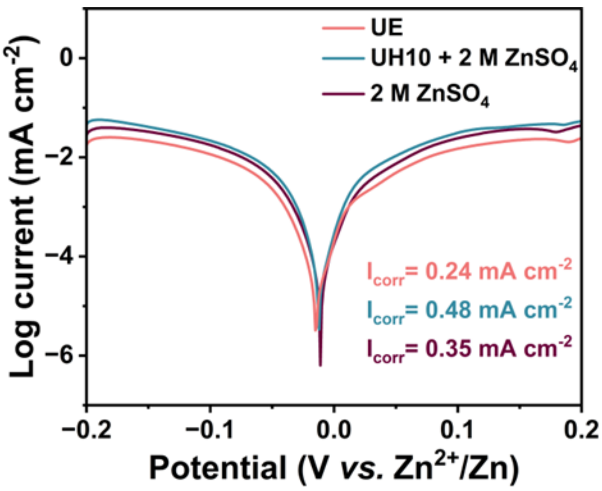

Figure S4 Tafel curves of different electrolytes.

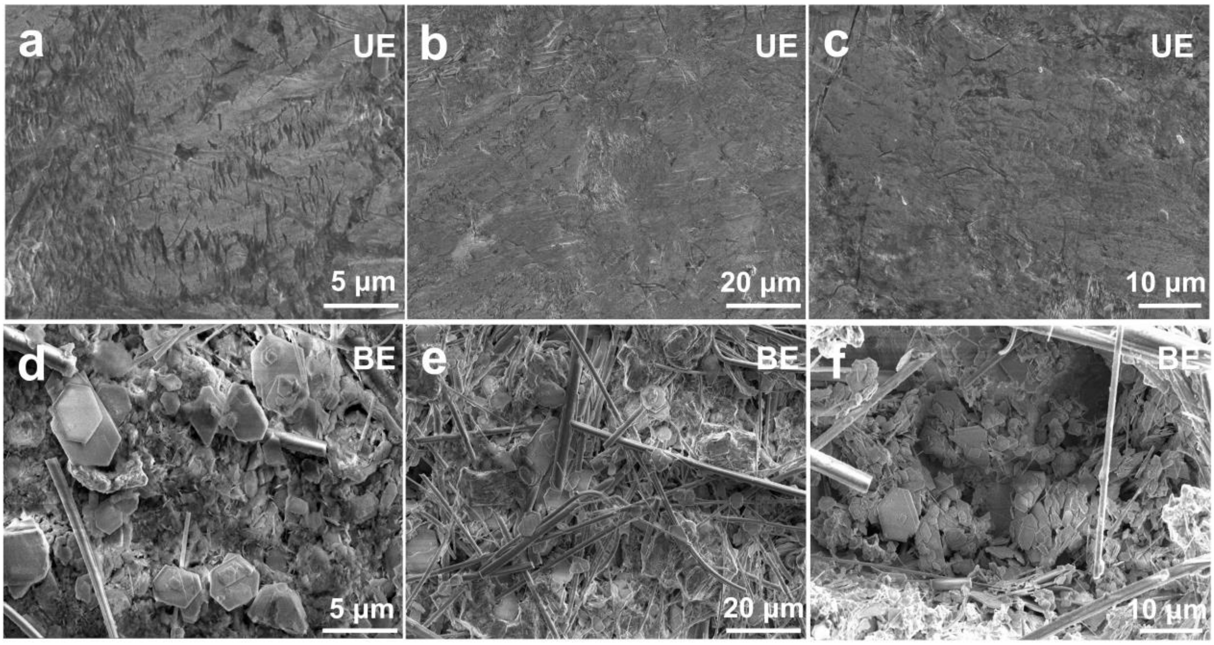

Figure S5 SEM of Zn anode after 50 cycles of various electrolytes.

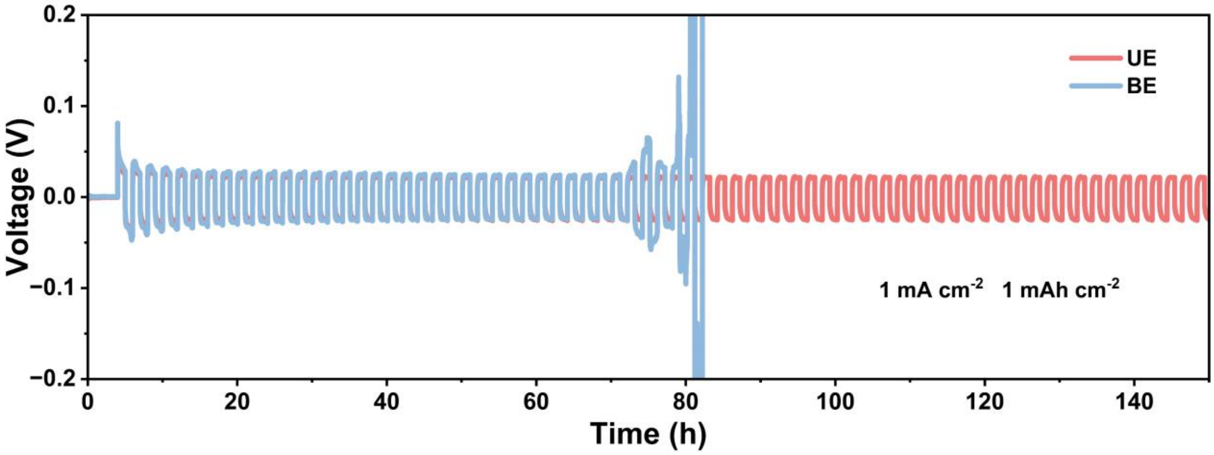

Figure S6 Voltage responses of Zn//Zn symmetric cells in UE and BE with the areal capacity of 1 mAh cm^{-2} (current density of 1 mA cm^{-2}) for 150 h.

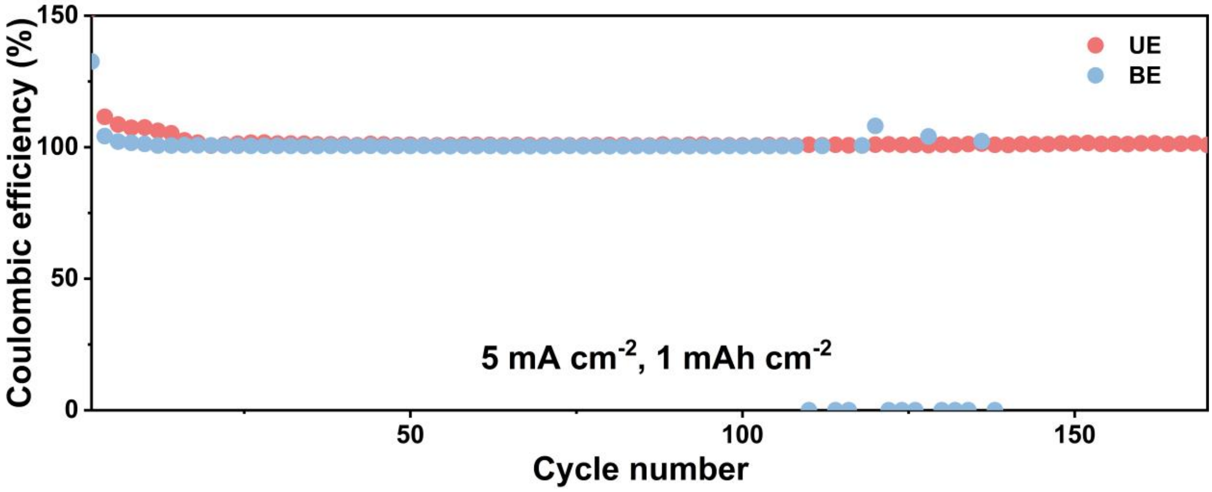

Figure S7 Coulombic efficiency of Zn//Cu cells in UE and BE.

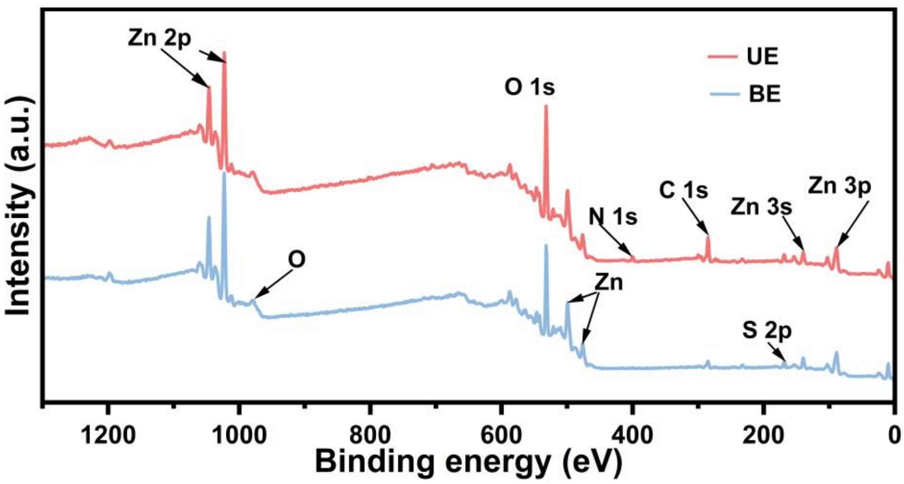

Figure S8 Survey XPS spectra of Zn anode in UE and BE after 10 cycles.

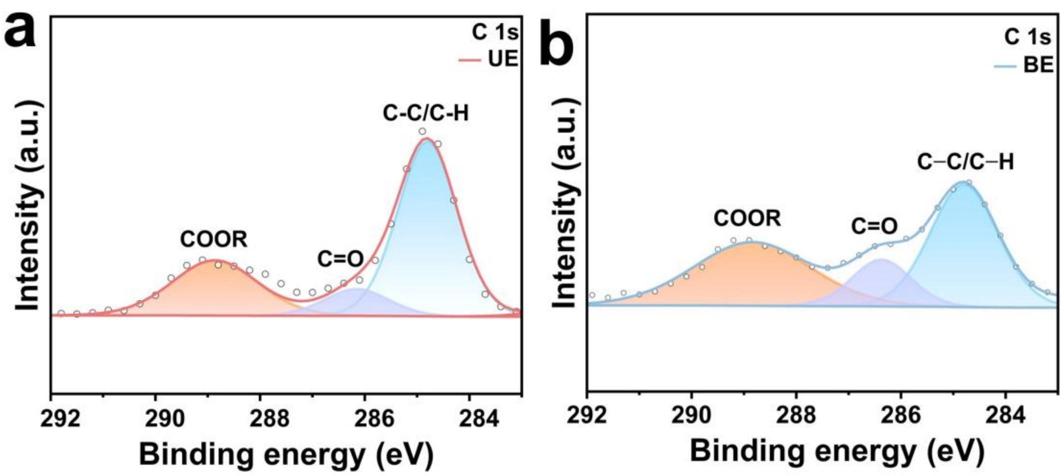

Figure S9 High-resolution C 1s spectra of Zn anode in (a) UE and (b) BE after 10 cycles.

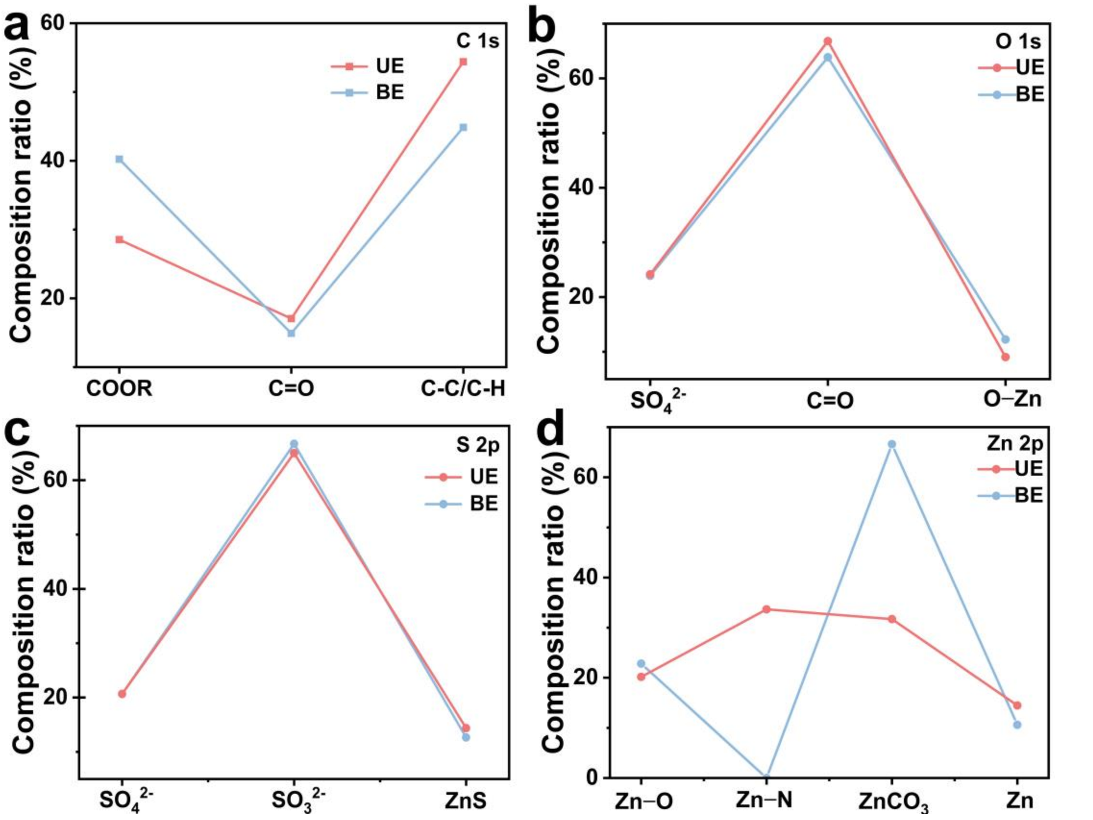

Figure S10 The XPS peak composition ratio comes from (a) C 1s, (b) O 1s, (c) S 2p, and (d) Zn 2p.

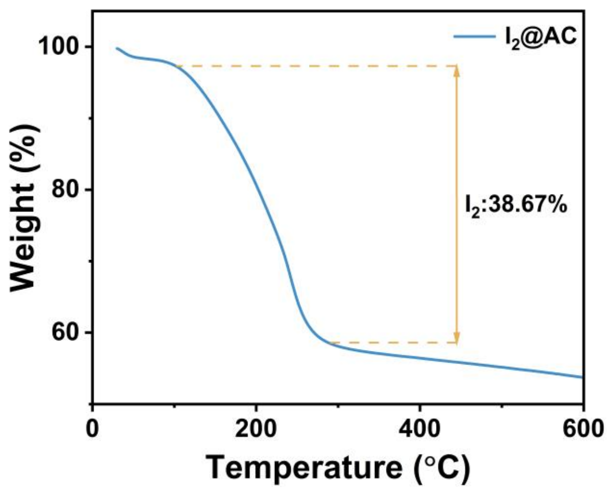

Figure S11 Thermogravimetric curve of I_2@AC composite tested at N_2 atmosphere from room temperature to 600 ℃.

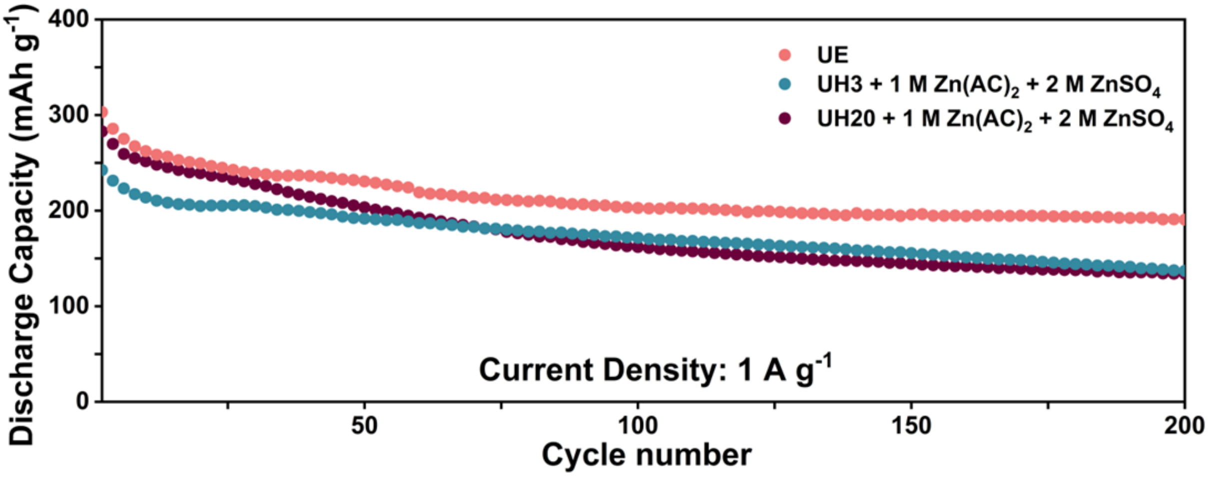

Figure S12 The cycling performance of Zn//I$_2$@ AC batteries with different urea ratios at a current density of 1 A g^{-1}.

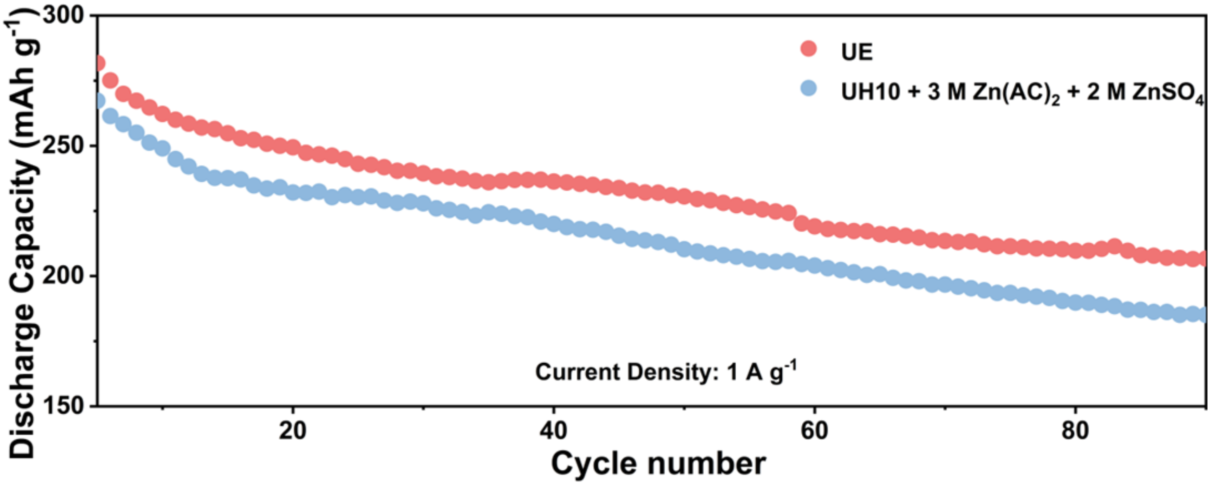

Figure S13 Cycling performance of Zn//I$_2$@ AC batteries in different concentrated electrolytes at 1 A g^{-1}.

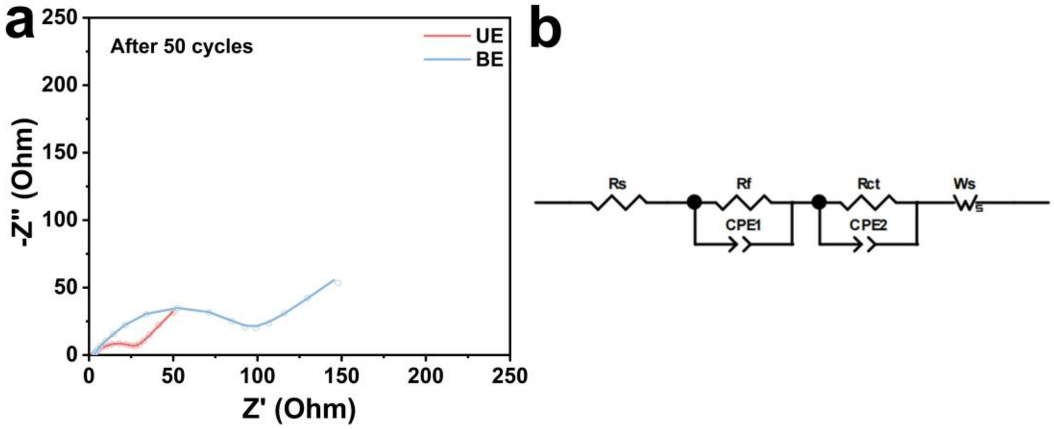

Figure S14 The (a) fitted impedance diagrams and (b) equivalent circuit diagrams of UE and BE.

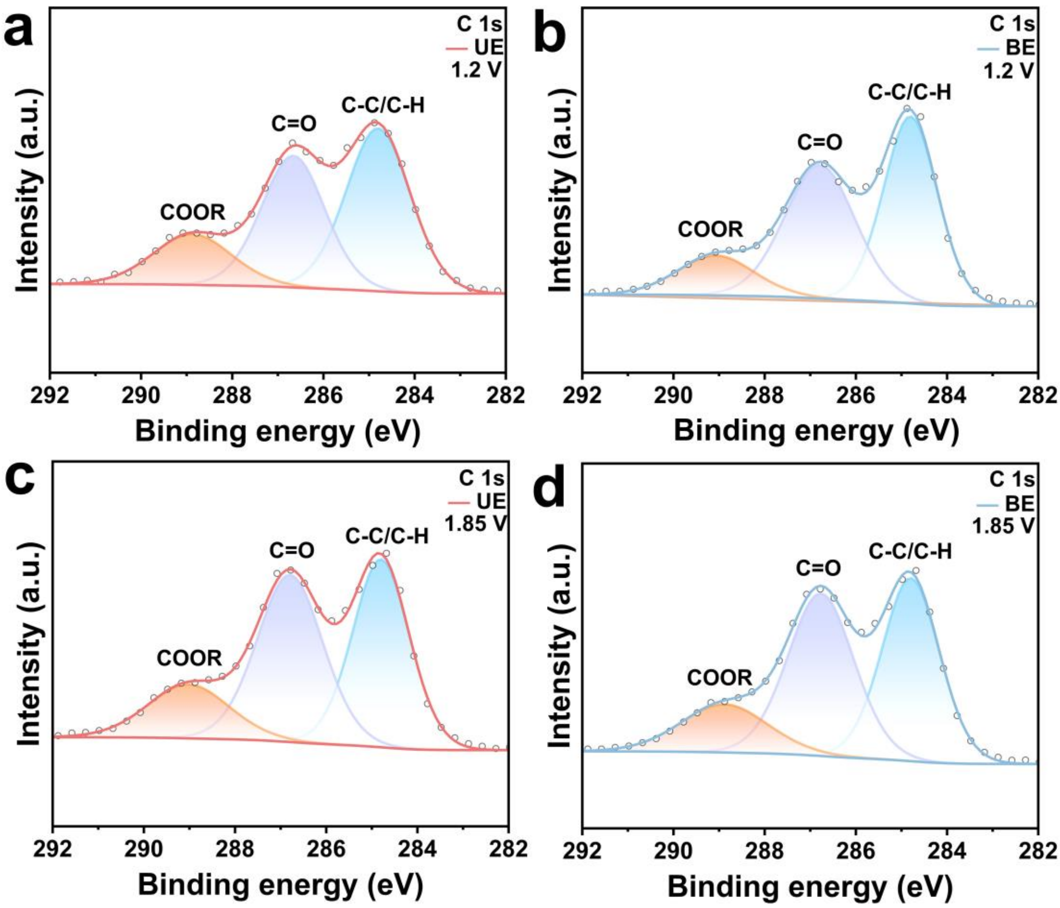

Figure S15 High-resolution C 1s spectra of I_2@AC cathode at different charged/discharged states in different electrolytes: (a) discharge to 1.2 V in UE, (b) discharge to 1.2 V in BE, (c) charge to 1.85 V in UE, and (d) charge to 1.85 V in BE.

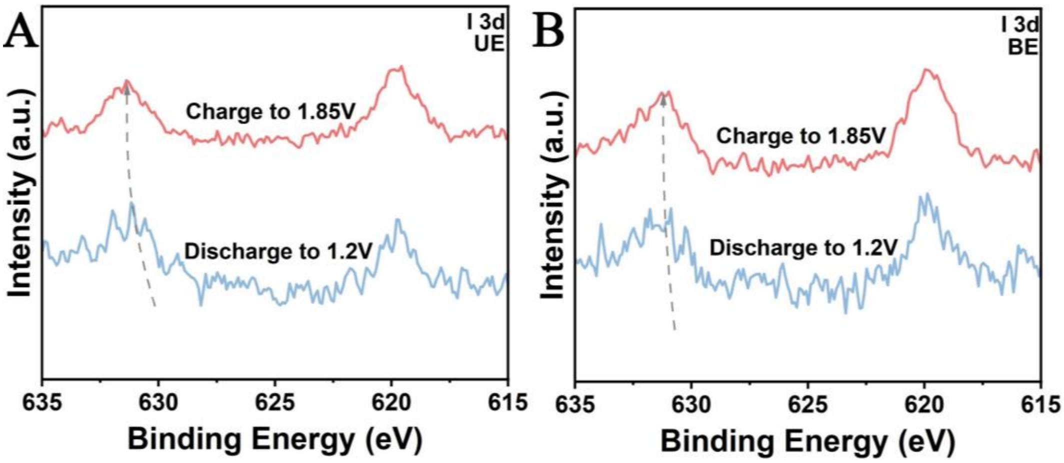

Figure S16 High-resolution I 3d spectra of I_2@AC cathode at different charged/discharged states in (A) UE and (B) BE.

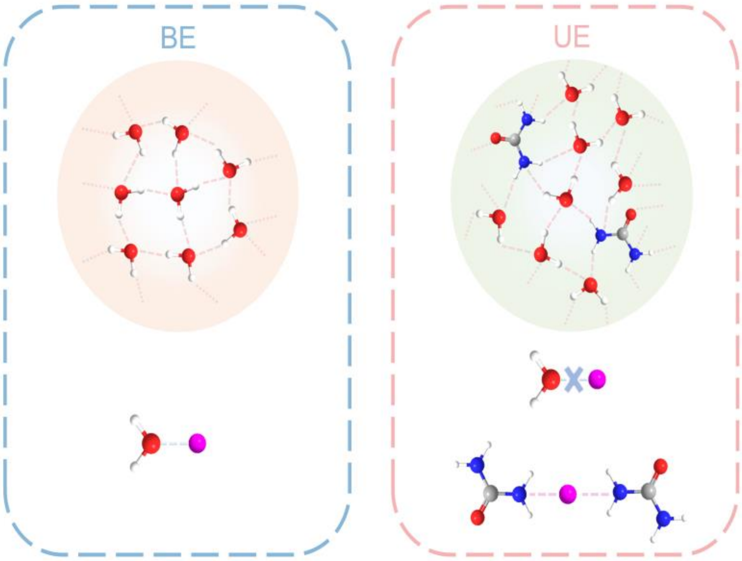

Figure S17 Schematic illustration of the intermolecular forces and mechanisms in the electrolytes of UE and BE (The gray, white, red, blue, and purple spheres represent the atoms of C, H, O, N, and I, respectively).