

Supplementary Material

**High-temperature performance investigation of  
Adiponitrile-based electrolytes for sodium-ion batteries**

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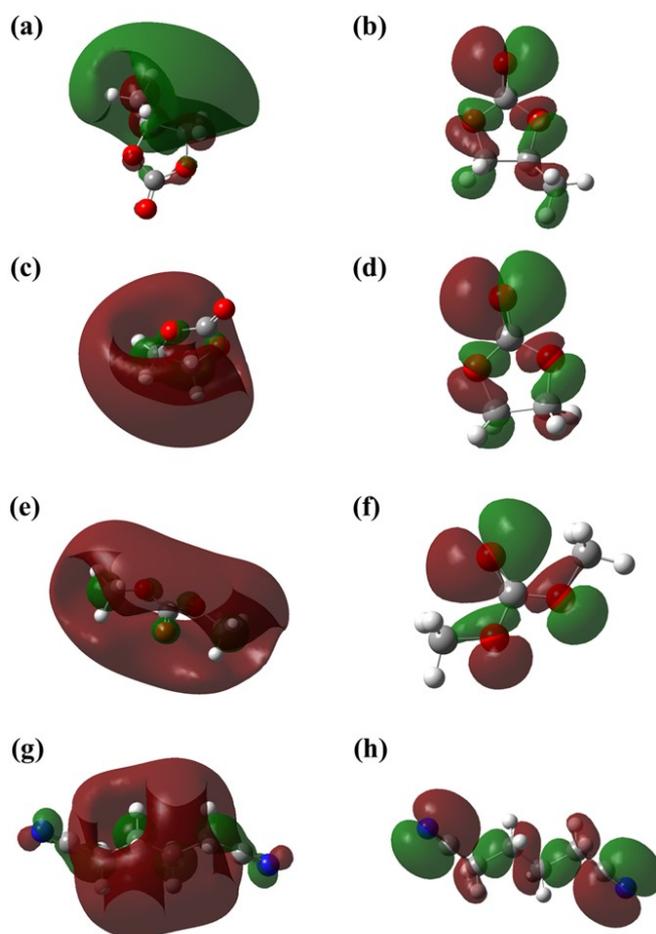
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**Fig. S1. HOMO and LUMO energy level diagrams of PC (a, b), EC (c, d), DMC (e, f), and ADN (g, h)**

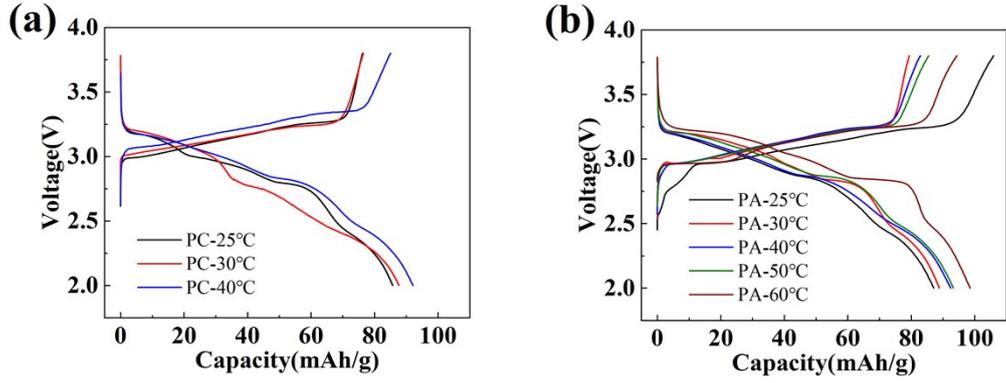


Fig. S2. First-cycle charge-discharge curves of the PC-based system at different temperatures: (a) PC system, (b) PA system

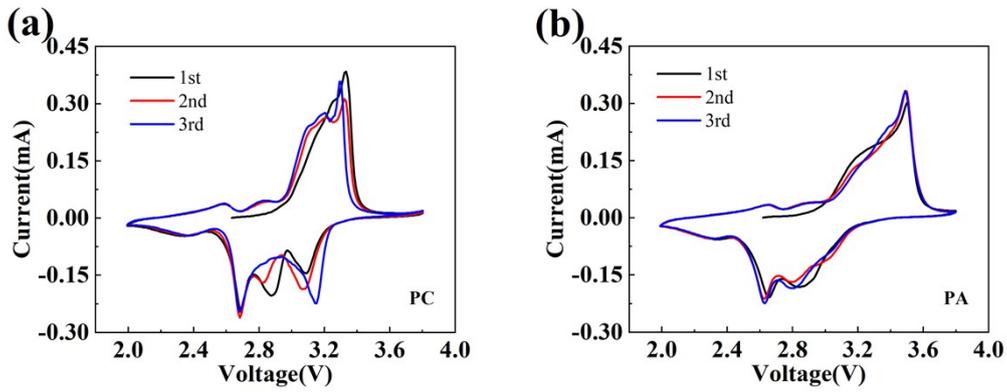


Fig. S3. Cyclic Voltammograms (CVs) of PC-Based Systems for the First Three Cycles at a Scan Rate of  $0.1 \text{ mV} \cdot \text{s}^{-1}$ : (a) PC System; (b) PA System

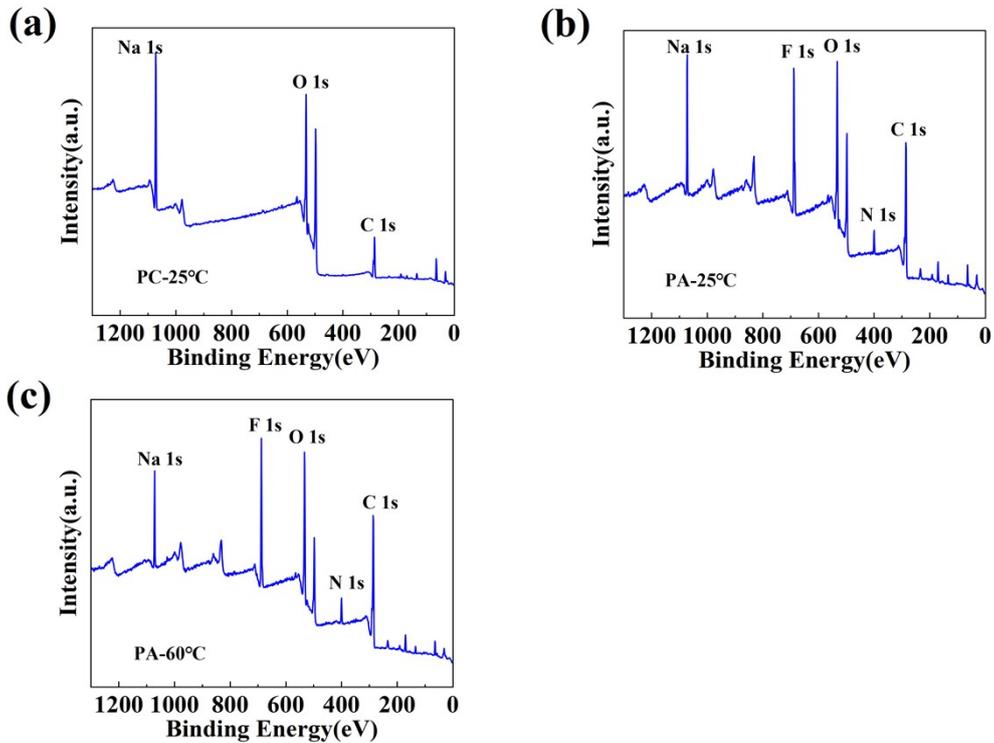


Fig. S4. Total XPS spectra of the PC-based system: (a) PC -  $25 \text{ }^\circ\text{C}$ , (b) PA -  $25 \text{ }^\circ\text{C}$ , (c) PA -  $60 \text{ }^\circ\text{C}$

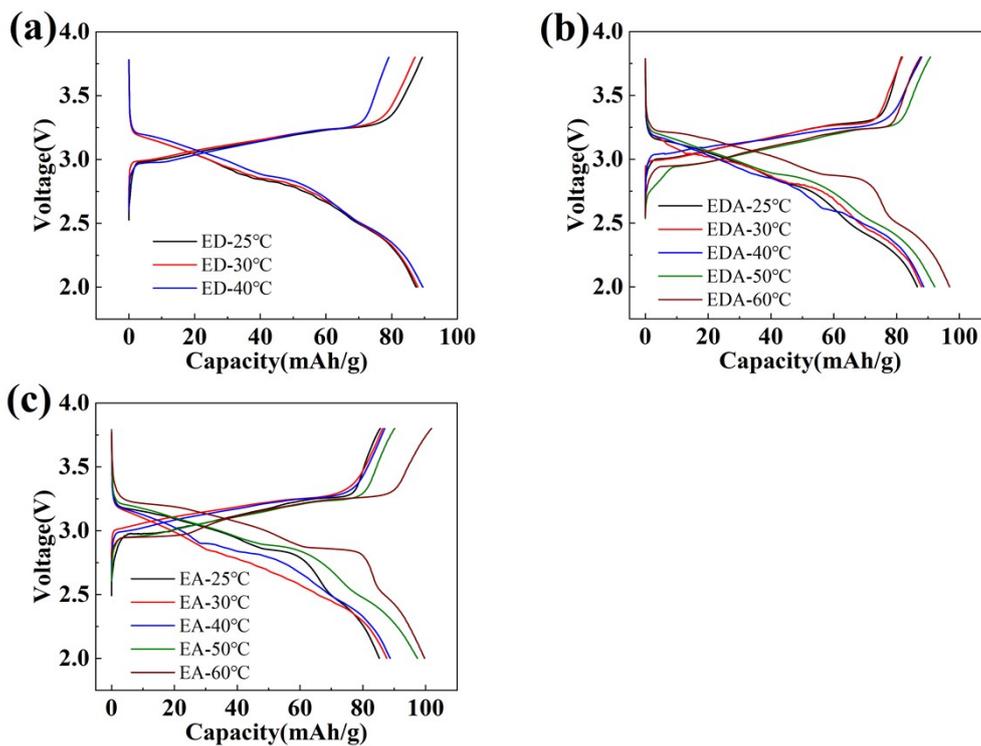


Fig. S5. First-cycle charge-discharge curves of the EC-based system at different temperatures: (a) ED system, (b) EDA system, (c) EA system

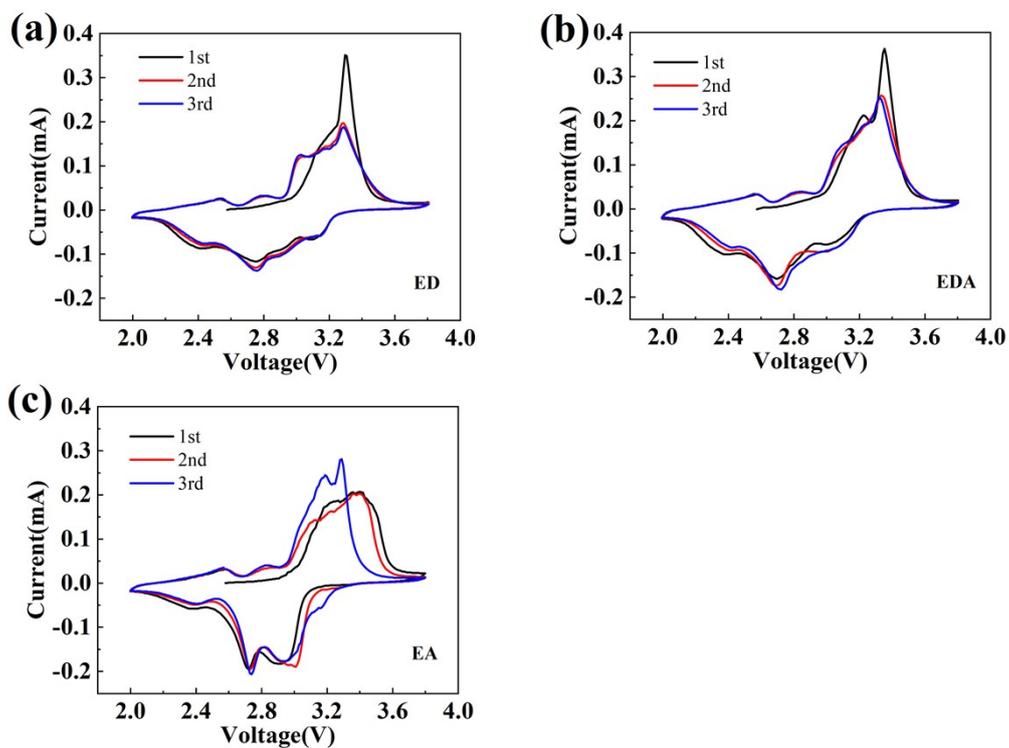


Fig. S6. Cyclic Voltammograms of EC-Based Systems for the First Three Cycles at a Scan Rate of 0.1 mV·s<sup>-1</sup>: (a) ED System; (b) EDA System; (c) EA System

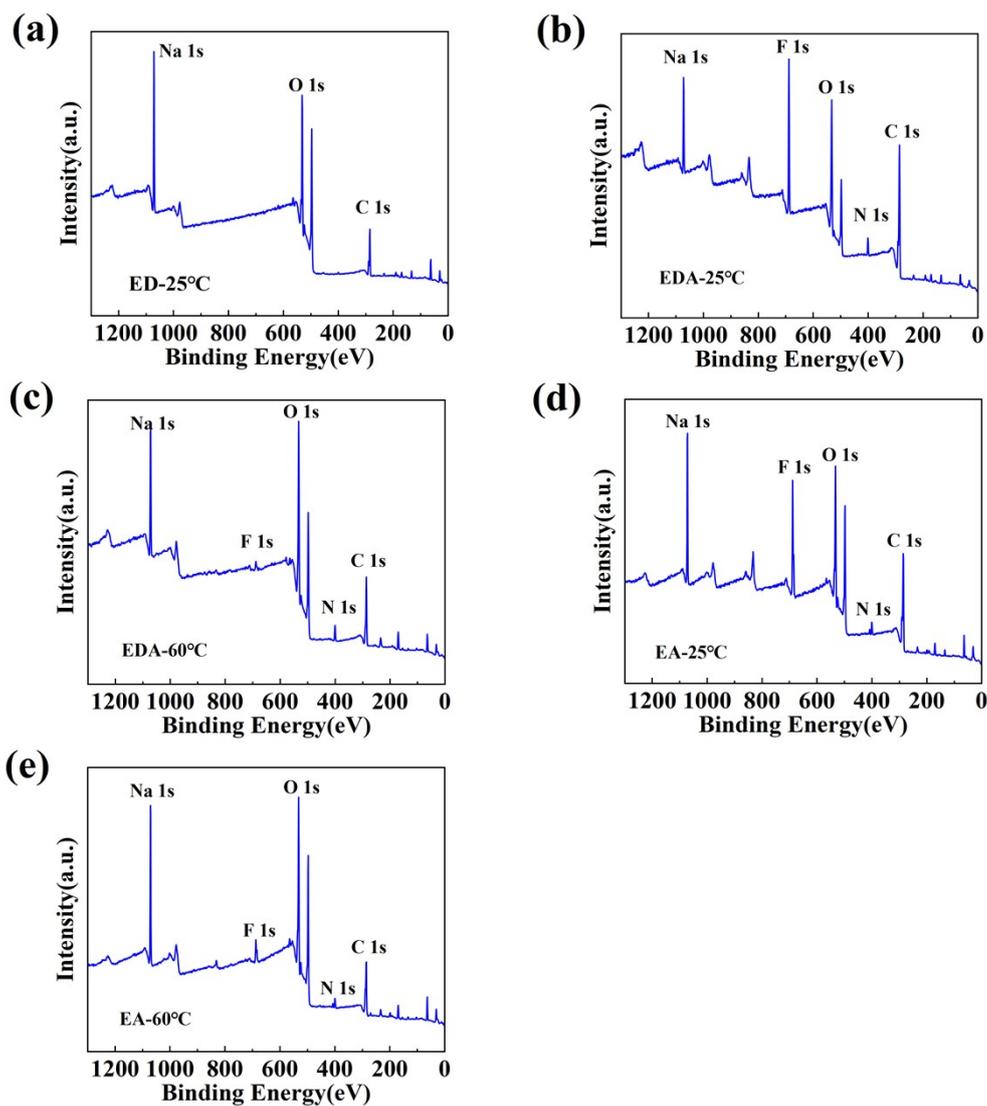


Fig. S7. Total XPS spectra of the EC-based system: (a) ED - 25 °C, (b) EDA - 25 °C, (c) EDA - 60 °C, (d) EA - 25 °C, (e) EA - 60 °C

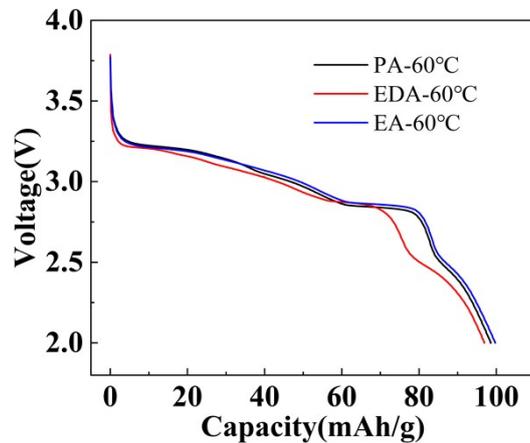


Fig. S8. First-cycle discharge curves of each ADN-containing system

**Table. S1 Recent Reports on High-Temperature Electrolytes and Their Performances**

No.	Electrolyte	Performance	Source
1	1M NaPF <sub>6</sub> in G2(diethylene glycol dimethyl ether)	the NVP cathode exhibited superior long-cycling stability at 60 °C, achieving an initial capacity of 70 mAh·g <sup>-1</sup> and retaining 80% of this capacity after 150 cycles at 60 °C	[1]
2	1M NaPF <sub>6</sub> in DOL+G1+G2+G3+G4+FEC	at 60 °C, the 131-HS cell maintained stable cycling for 80 cycles	[2]
3	1M NaPF <sub>6</sub> in EC:DEC:FEMC=3.5:3.5:3	the HC anode maintains 90.86 % capacity retention while delivering 265.78 mAh g <sup>-1</sup> specific capacity over 300 cycles at 0.1 A g <sup>-1</sup> under 60 °C	[3]
4	NaPF <sub>6</sub> and NaODFB in 4.5TEP-3.5PhCF <sub>3</sub> -1.5 PC	cycling performance in Ah-level pouch cells operating at 55 °C, demonstrating an exceptional capacity retention of 86.9 % after 1000 cycles	[4]
5	NaClO <sub>4</sub> in EC:DMC with TCM and FEC	cells maintain 87.8% capacity retention after 440 cycles at 55 °C	[5]
6	PC as solvent and FEMC as additive	the NMYO-FEMC cathode achieves 113.9 mAh g <sup>-1</sup> at 5C with 82.8% capacity retention after 300 cycles, and 75.2% retention at 1C after 100 cycles at 55 °C	[6]
7	0.3M NaPF <sub>6</sub> in PC:FEC:TTE=3:3:4	at 55 °C, the Na  FePO <sub>4</sub> system exhibits an initial Coulombic efficiency of 72%, with an approximate specific capacity of 100 mAh g <sup>-1</sup> and a capacity retention of 99.63% after 200 cycles at 0.5C charge/1.0C discharge	[7]

- 1 X. Ren, Y. Wu, X. Chen, L. Hu, Y. Zhao, T. Zhang, B. Ge, X. Sun and X. Yu, *Energy Material Advances*, 2025, **6**.
- 2 Z. Luo, L. Hu, C. Dai, G. Ma, Y. Ye, K. Xu and Z. Lin, *Angewandte Chemie International Edition*, 2025, **64**.
- 3 Y. Meng, Y. Wang, Q. Liu, X. Chen, E. Wang, W. Chen, H. Pan, J. Zhao, X. Li and J.-Y. Liang, *Chemical Engineering Journal*, 2025, **525**.
- 4 Y. Tu, Z. Ren, M. Ma, C. Zuo, S. Wang, Y.-c. Lu and H. Pan, *Energy Storage Materials*, 2025, **83**.
- 5 X. Zhang, L. Han, Y. Cao, L. Cheng, X. Ren, Y. Kan, J. Zhu and Y. Hu, *Energy Storage Materials*, 2025, **82**.
- 6 Y. Liu, Q. Ran, W. Sheng, H. Chang, R. Cao, J. Liu, M. Li, X. Liu and S. Komarneni, *Chemical Engineering Journal*, 2025, **521**.
- 7 Q. Zhang, X. Wang, H. Li and R. Qiao, *J. Electrochem. Soc.*, 2025, **172**, 010501.