

Supplementary Information

Leveraging cation effect for low temperature aqueous Zn-based batteries

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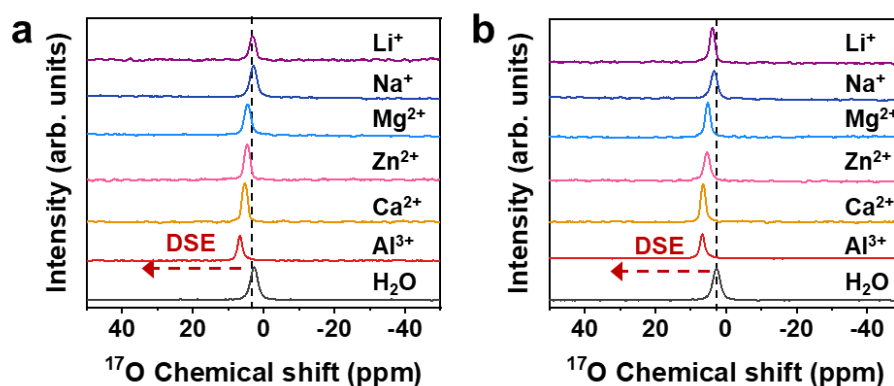
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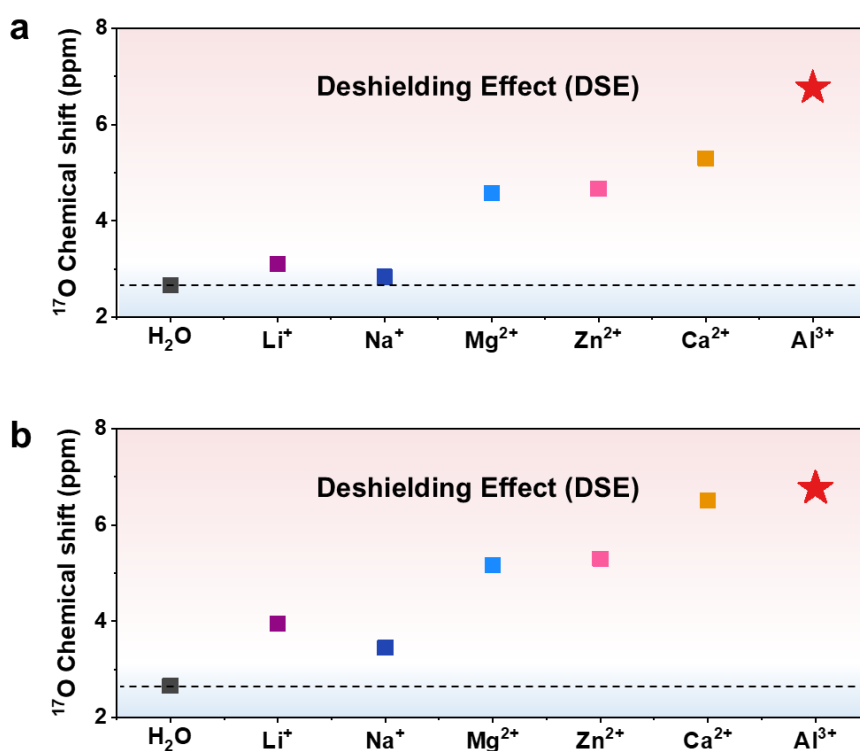
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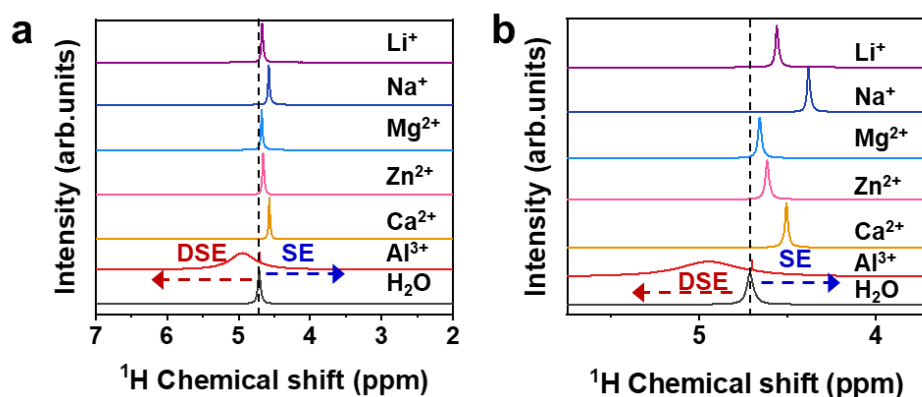
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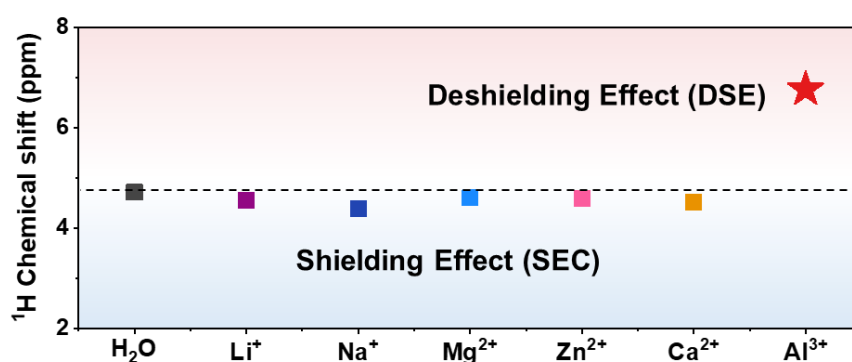
Supplementary Fig. 1 ^{17}O NMR spectra of different cation electrolytes with the constant anion of Cl^- . **a** The fixed cation concentration is 0.9 m and **b** the fixed Cl^- concentration is 2.7 m, respectively. DSE represents the deshielding effect.



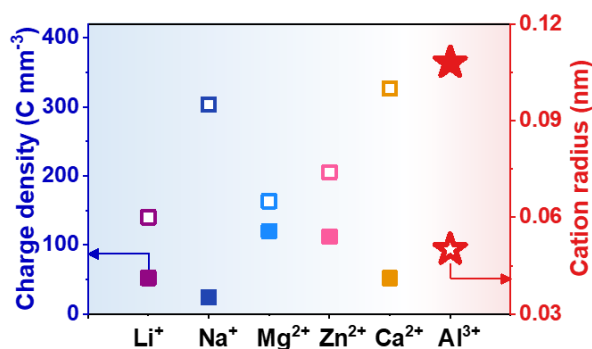
Supplementary Fig. 2 The cation effect diagram of different cations versus ^{17}O chemical shift. **a** The fixed cation concentration is 0.9 m and **b** the fixed Cl^- concentration is 2.7 m, respectively.



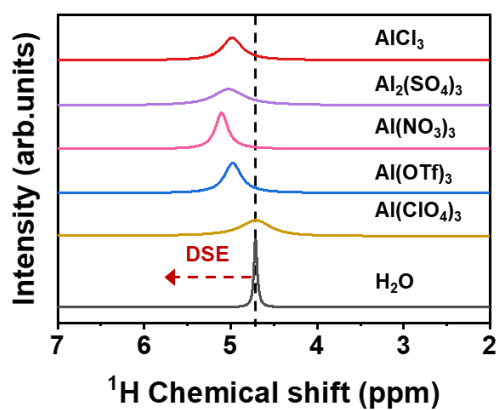
Supplementary Fig. 3 ^1H NMR spectra of different cation electrolytes with the constant anion of Cl^- . **a** The fixed cation concentration is 0.9 m and **b** the fixed Cl^- concentration is 2.7 m, respectively. DSE represents the deshielding effect, SE is the shielding effect.



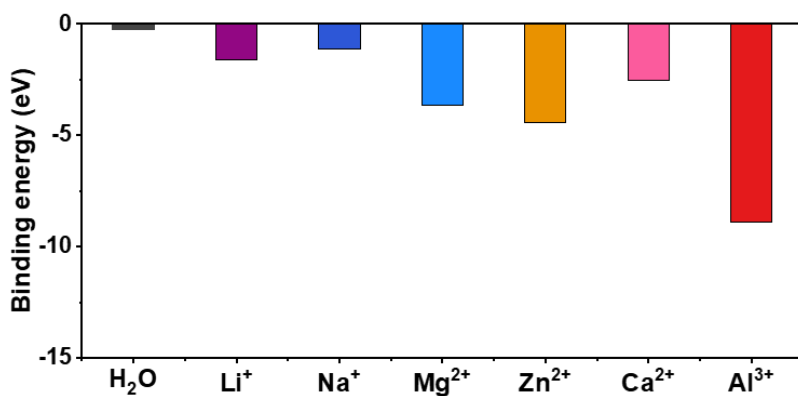
Supplementary Fig. 4 The cation effect diagram of different cations versus ^1H chemical shift. The fixed Cl^- concentration is 2.7 m.



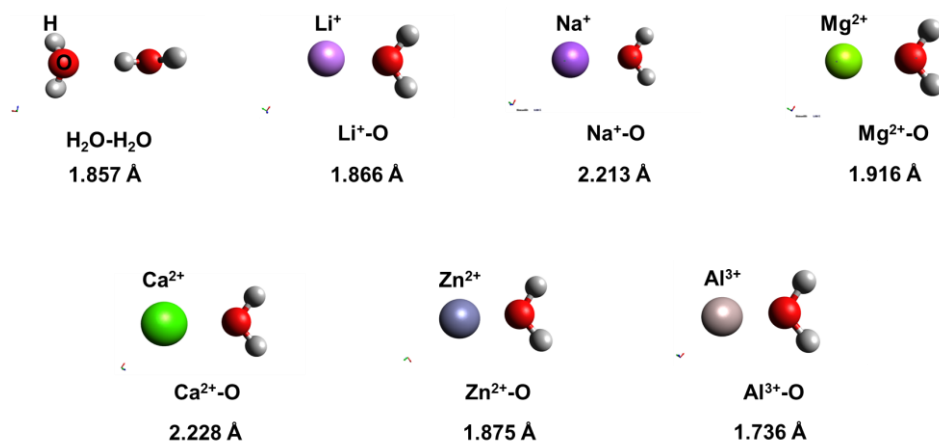
Supplementary Fig. 5 The charge density and cation radius of different cations.



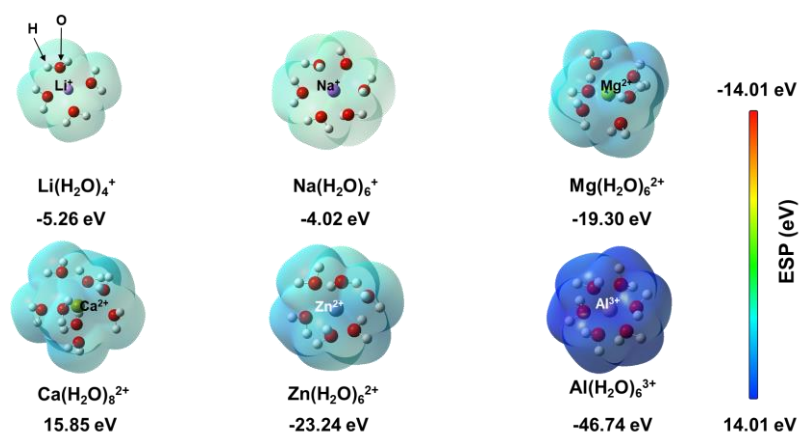
Supplementary Fig. 6 ^1H NMR spectra of different Al^{3+} -based electrolytes.



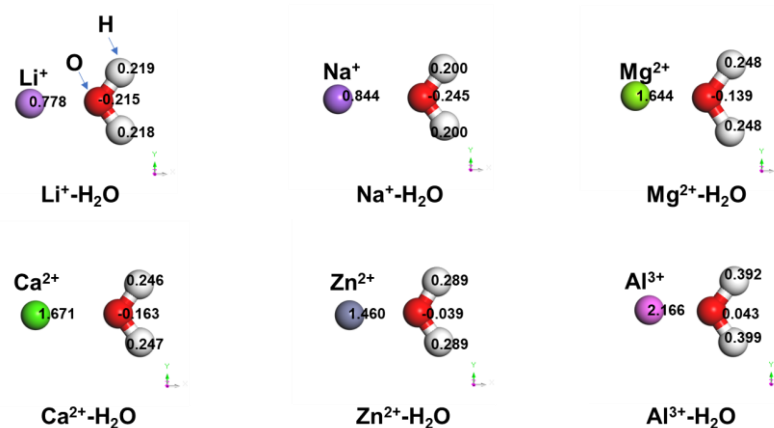
Supplementary Fig. 7 Binding energies for water with water and water with different cations calculated by DFT.



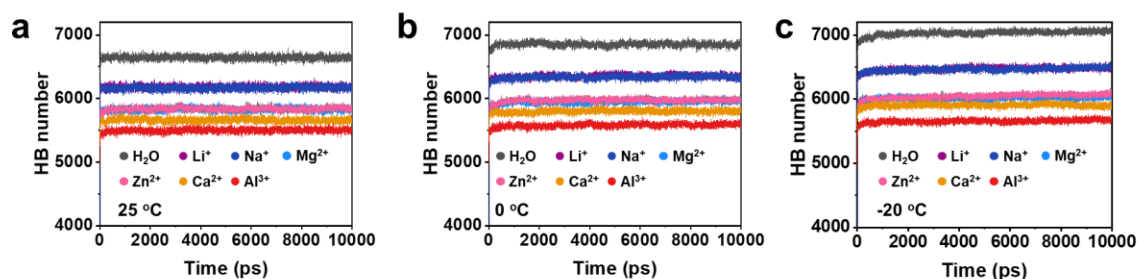
Supplementary Fig. 8 Distance for water with water and different cations calculated by DFT.



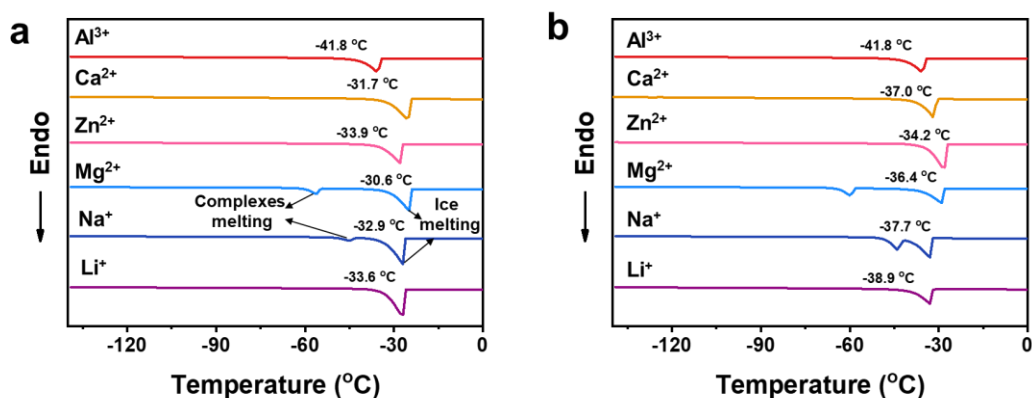
Supplementary Fig. 9 ESP distributions and binding energies for solvation structures with different cations. The binding energy for solvation structures with Al^{3+} is higher than that of the other cations, and the calculated ESP distributions of the solvation structures with Al^{3+} exhibit higher impact with water molecule, confirming the strong interactions between Al^{3+} and water molecule.



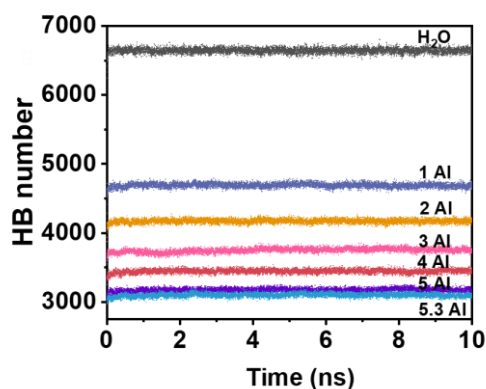
Supplementary Fig. 10 Hirshfeld charge distributions calculated by DFT.



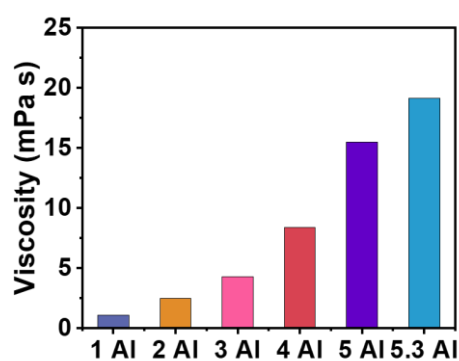
Supplementary Fig. 11 The calculated HB number between water molecules in different cationic systems at **a** 25 °C, **b** 0 °C and **c** -20 °C.



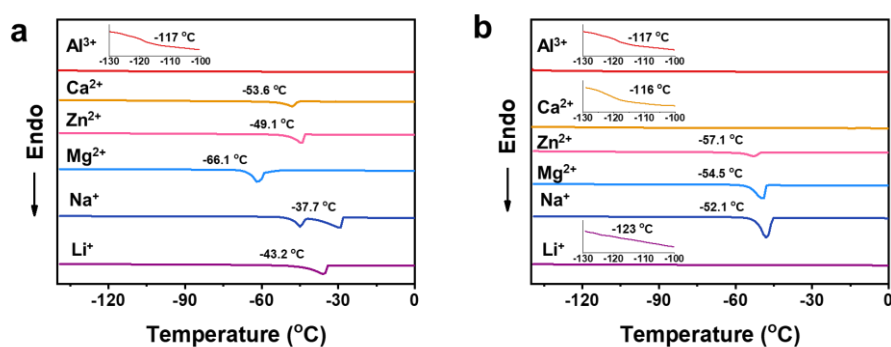
Supplementary Fig. 12 Differential scanning calorimetry (DSC) curves of different cation electrolytes with the anion of Cl⁻. **a** The fixed cation concentration is 0.9 m and **b** the fixed Cl⁻ concentration is 2.7 m, respectively. DSC measurements were conducted to compare the T_f of different cation systems. When the concentrations of both cations and Cl⁻ in the electrolyte were fixed respectively, the Al³⁺ system exhibits the lowest freezing point compared to other cation systems, confirming the good antifreeze capability of the Al³⁺ system.



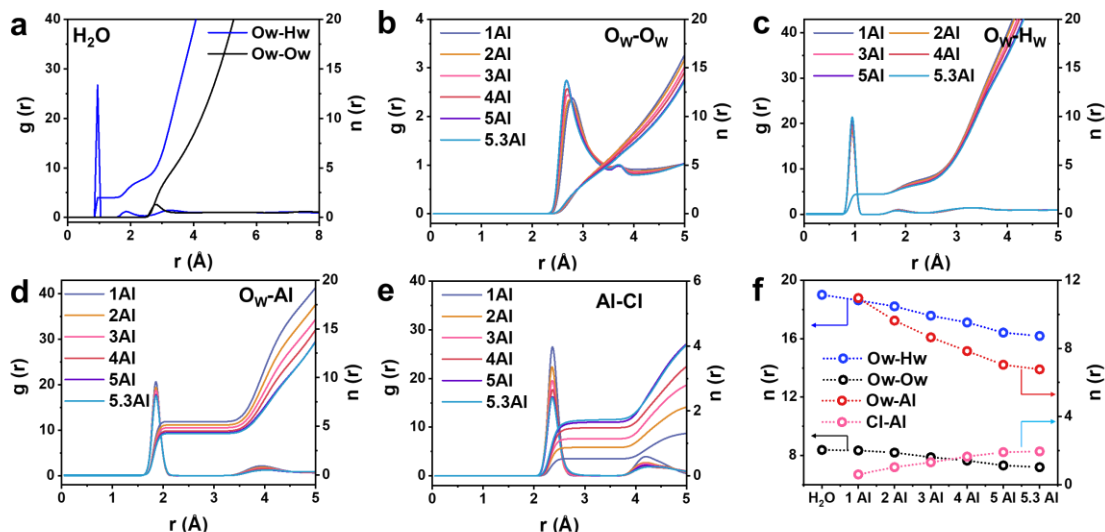
Supplementary Fig. 13 The calculated HB number between water molecules in different AlCl₃ concentration electrolytes.



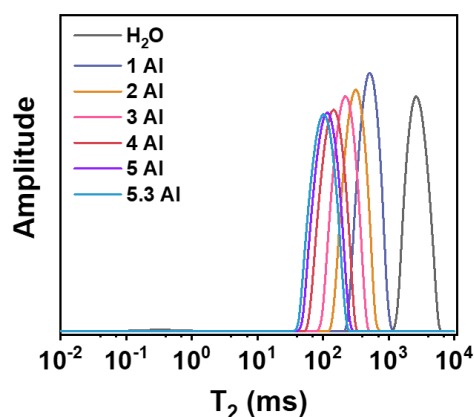
Supplementary Fig. 14 Viscosities of different AlCl₃ concentration electrolytes.



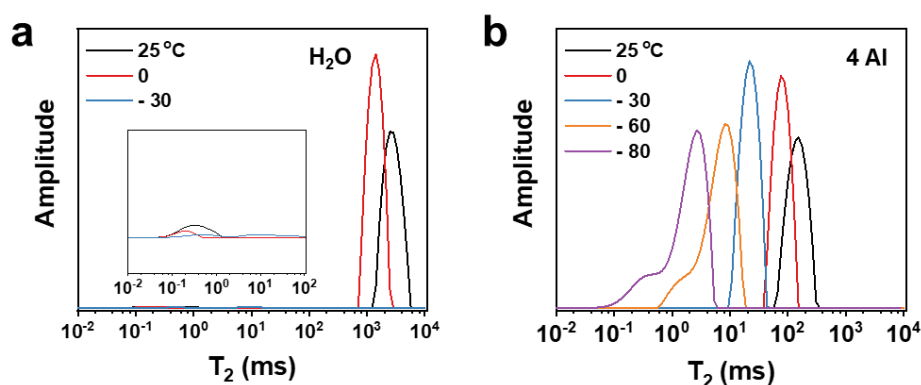
Supplementary Fig. 15 DSC curves of different cation electrolytes with the constant anion of Cl⁻. **a** The fixed cation concentration is 2.8 m and **b** the fixed Cl⁻ concentration is 8.4 m, respectively. Note: due to the solubility limit of NaCl being lower than 8.4 m, the DSC curve for the Na⁺ system in **b** represents the saturated concentration.



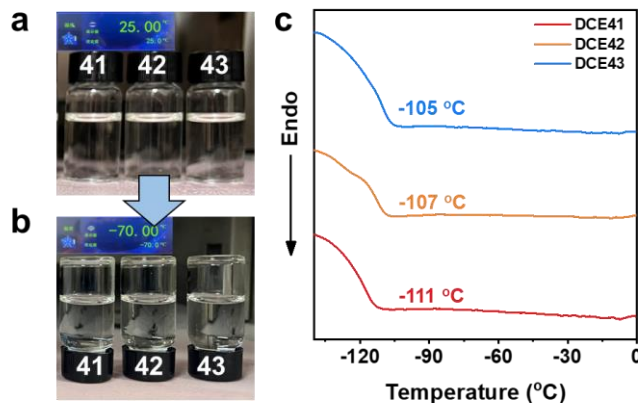
Supplementary Fig. 16 MD stimulation results of aqueous solution and AlCl_3 electrolytes with varying concentrations, which were performed with a 4 Å cutoff radius for coordination analysis. **a** The corresponding RDF plots of $\text{O}_w\text{-H}_w$ and $\text{O}_w\text{-O}_w$ for aqueous solutions. The corresponding RDF plots of **b** $\text{O}_w\text{-H}_w$, **c** $\text{O}_w\text{-O}_w$, **d** $\text{O}_w\text{-Al}$ and **e** Al-Cl for AlCl_3 electrolytes with different concentrations. **f** The coordination numbers of $\text{O}_w\text{-H}_w$, $\text{O}_w\text{-O}_w$, $\text{O}_w\text{-Al}$ and Al-Cl in aqueous solution and AlCl_3 electrolytes with different concentrations. The degree of disorder in an electrolyte can be reflected by the coordination species and coordination numbers of O atoms in water. Compared to pure water, where O atoms are primarily coordinated by H ($\text{O}_w\text{-H}_w$) and other O ($\text{O}_w\text{-O}_w$), the coordination environment in AlCl_3 solutions becomes more complex, with the appearance of additional $\text{O}_w\text{-Al}$ interactions and a progressive decrease in the coordination numbers of $\text{O}_w\text{-H}_w$ and $\text{O}_w\text{-O}_w$.



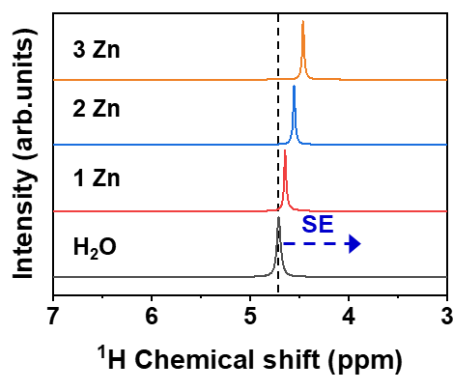
Supplementary Fig. 17 ^1H LF-NMR curves of H_2O and different AlCl_3 concentration electrolyte. The peaks for the T_2 distribution curves belong to the H in the water molecule.



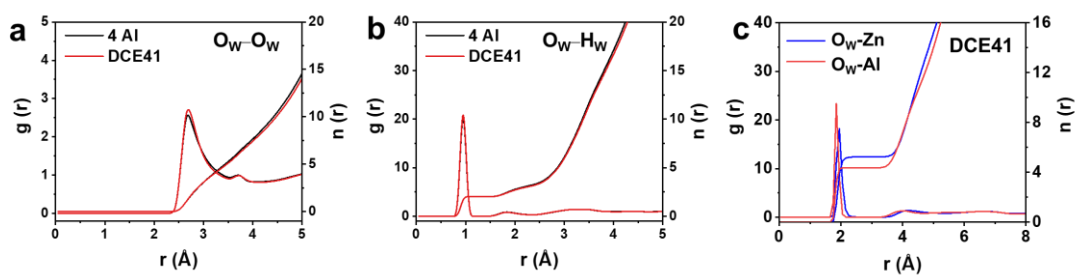
Supplementary Fig. 18 Temperature-dependent ^1H LF-NMR curves of **a** H_2O and **b** 4Al. The 4Al was selected as an exemplary simulation object due to its highest anti-freezing property (Fig. 1g). When the temperature drops to $-30\text{ }^\circ\text{C}$ for pure water, the T_2 peak shifts significantly to low relaxation times and disappears due to water freezing (Supplementary Fig. 18a). In contrast, the peaks shift gradually but still remain in the range of 0.1-10 ms with the high intensity in 4Al (Supplementary Fig. 18b), confirming the strong anti-freezing performance of AlCl_3 .



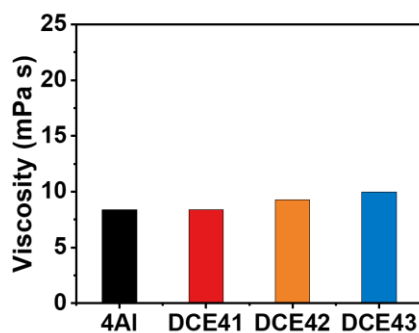
Supplementary Fig. 19 The anti-freezing performance of DCEs. The optical photographs of DCEs at **a** 25 °C and **b** -70 °C. **c** DSC curves of DCEs.



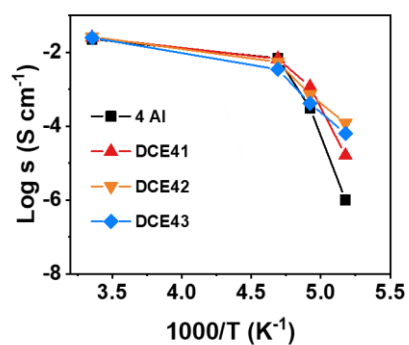
Supplementary Fig. 20 ¹H NMR spectra of H₂O and different ZnCl₂ concentration electrolyte.



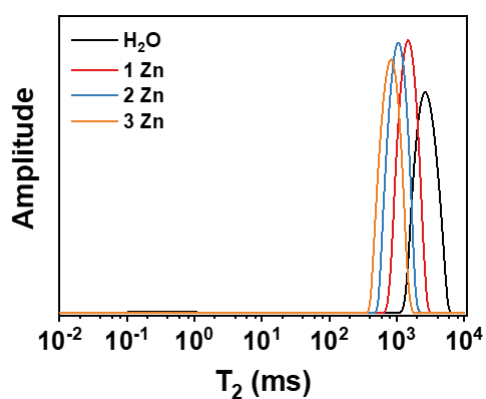
Supplementary Fig. 21 MD stimulation results of 4Al and DCE41. **a** The corresponding RDF plots of O_W-O_W. **b** The corresponding RDF plots of O_W-H_W. **c** The corresponding RDF plots of O_W-Zn and O_W-Al in DCE41.



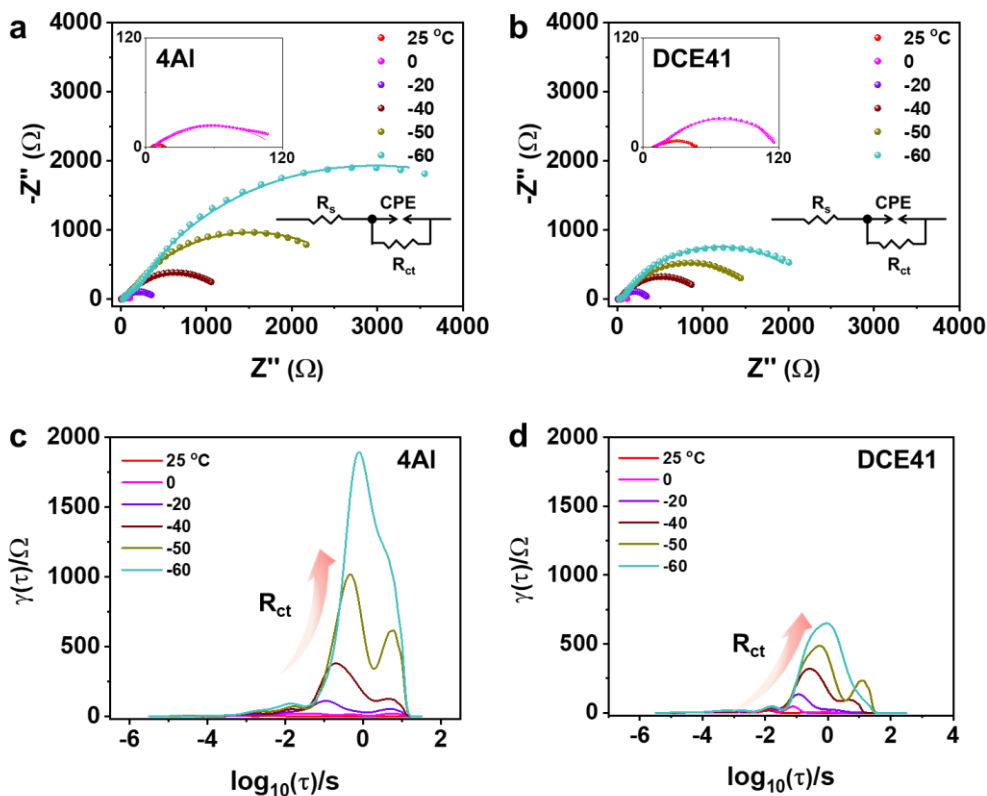
Supplementary Fig. 22 Viscosities of DCEs.



Supplementary Fig. 23 Temperature dependence of the ionic conductivities for 4Al and DCEs.

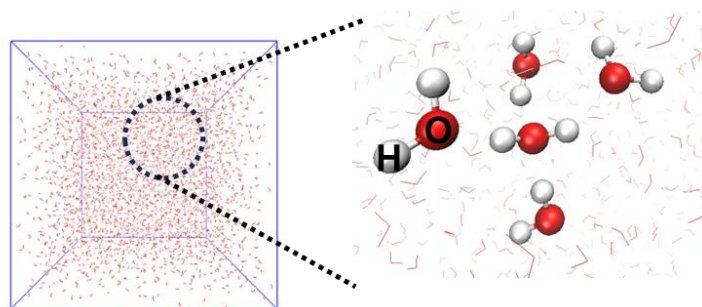


Supplementary Fig. 24 LF ¹H NMR curves of H₂O and different ZnCl₂ concentration electrolyte.

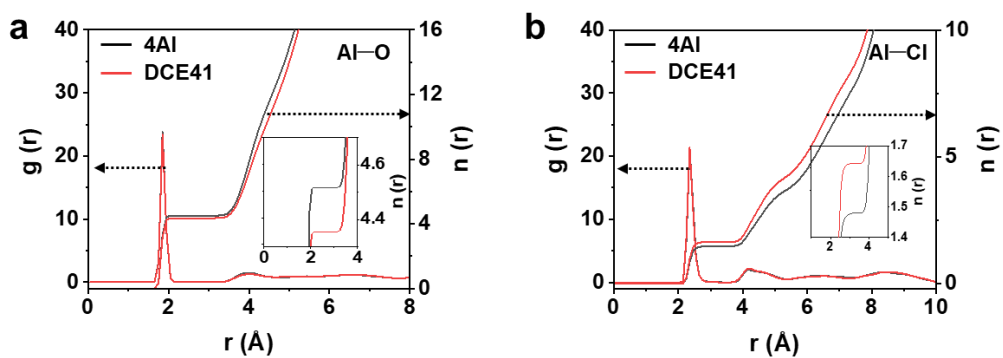


Supplementary Fig. 25 Electrochemical impedance spectroscopy (EIS) results for the symmetrical Zn batteries with **a** 4Al and **b** DCE41 from 25 °C to -60 °C (Note: The fitted results were shown in Supplementary Tables 1 and 2). The corresponding DRT curves for the symmetrical Zn batteries with **c** 4Al and **d** DCE41 from 25 °C to -60 °C. Both the 4Al and DCE41 electrolytes exhibit an increase in charge transfer resistance (R_{ct}) with decreasing temperature. However, at all tested temperatures, the DCE41 electrolyte consistently displays a lower R_{ct} compared to the 4Al system, indicating more efficient interfacial charge transfer kinetics. This result further confirms that the dual-cation electrolyte design effectively improves charge transfer processes at the electrode–electrolyte interface under low-temperature conditions, thereby promoting faster interfacial kinetics.

Aqueous solution

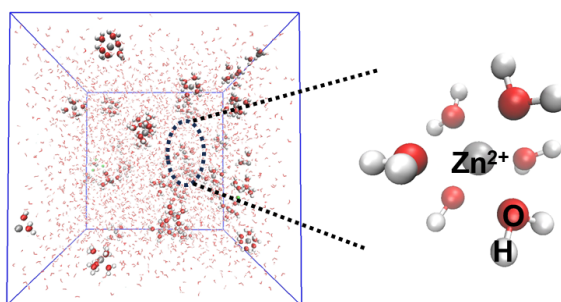


Supplementary Fig. 26 The snapshots of the MD simulation cell for aqueous solution.

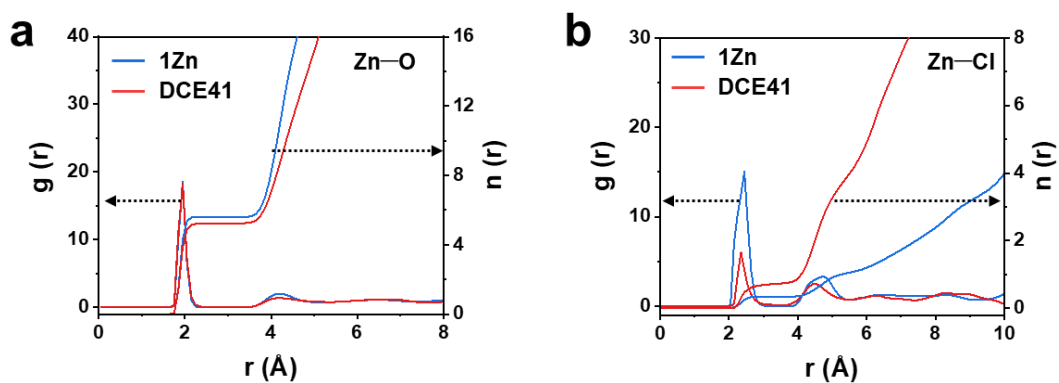


Supplementary Fig. 27 MD stimulation results of 4Al and DCE41. The corresponding RDF plots of **a** Al-O and **b** Al-Cl for 4Al and DCE41.

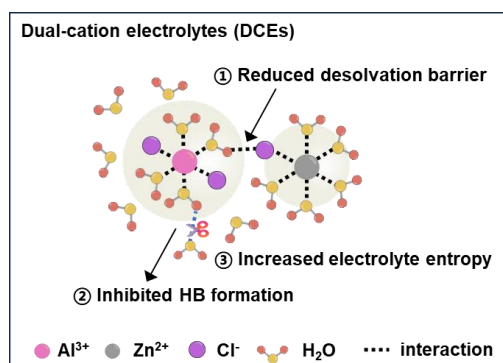
1Zn



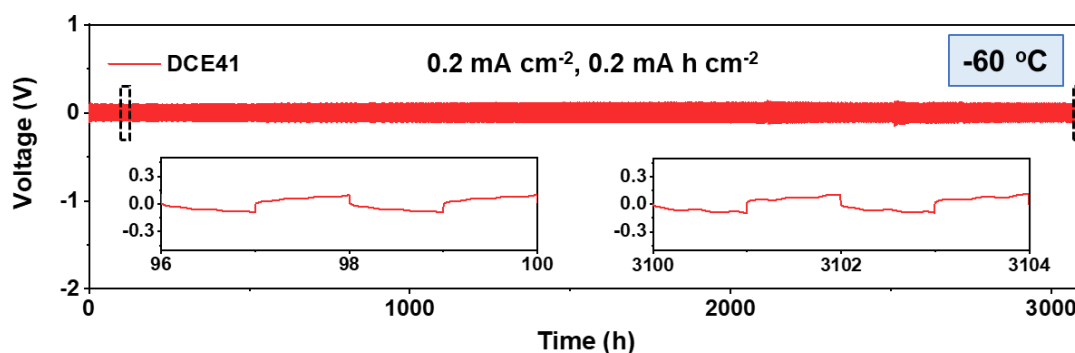
Supplementary Fig. 28 The snapshots of the MD simulation cell for 1Zn.



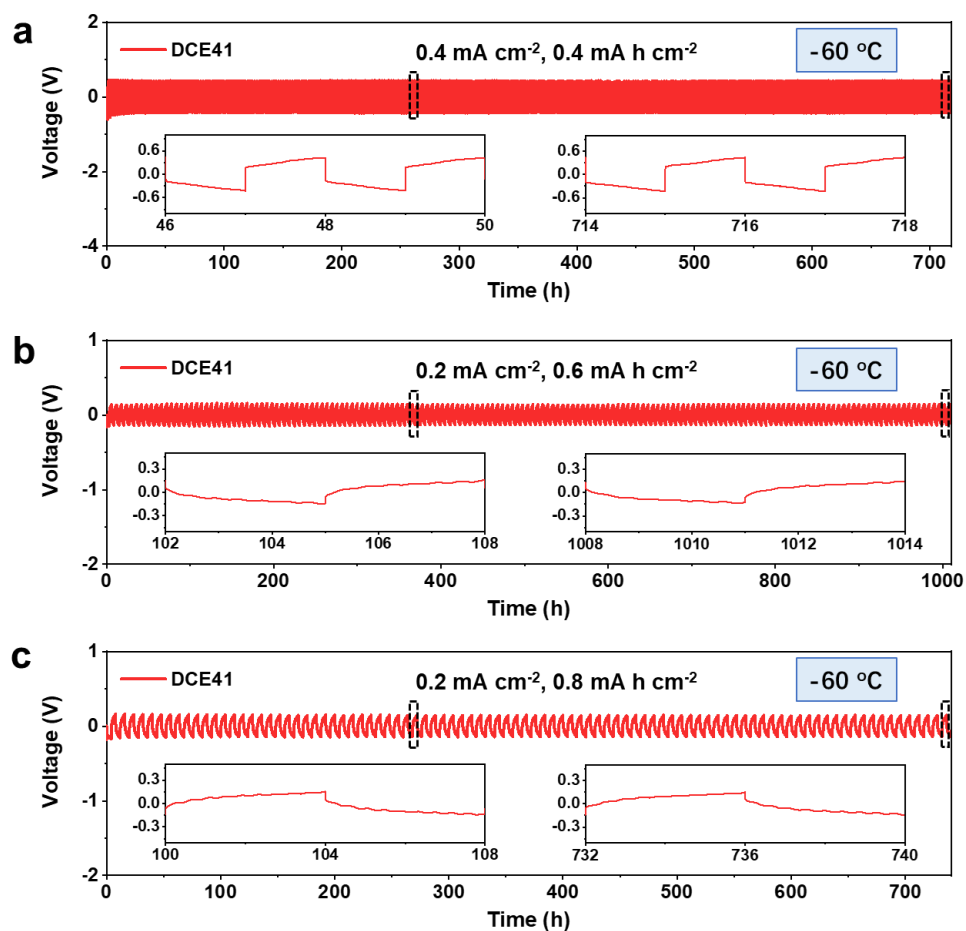
Supplementary Fig. 29 MD stimulation results of 1Zn and DCE41. The corresponding RDF plots of **a** Zn-O and **b** Zn-Cl for 1Zn and DCE41.



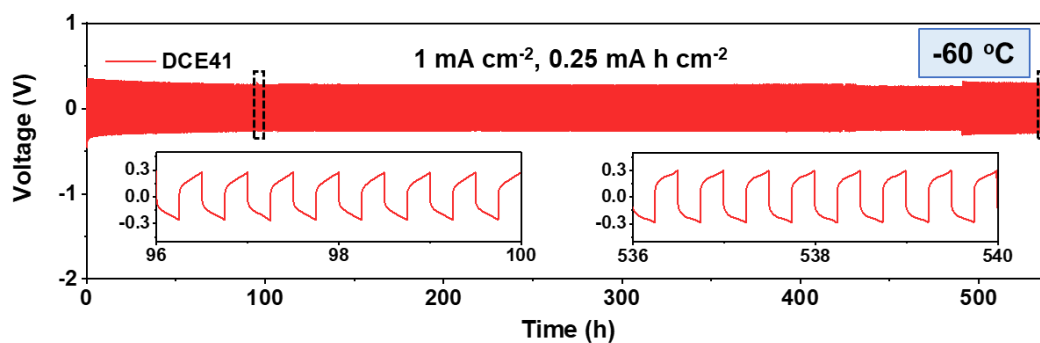
Supplementary Fig. 30 The schematic illustrations for the interaction regulation in DCEs.



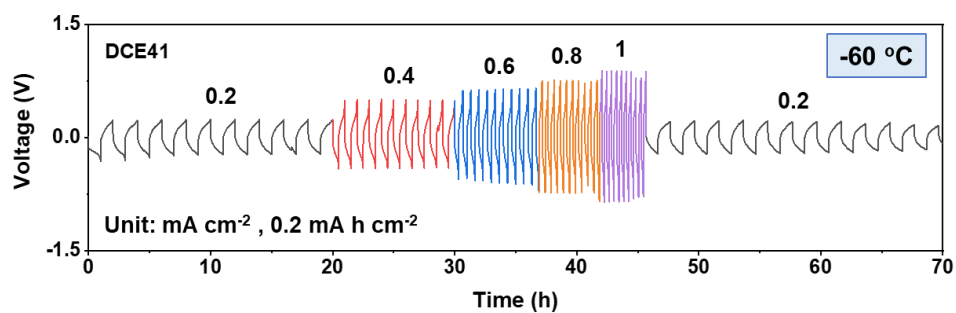
Supplementary Fig. 31 Galvanostatic voltage profiles of the symmetrical Zn cell at 0.2 mA cm^{-2} and 0.2 mA h cm^{-2} under -60°C .



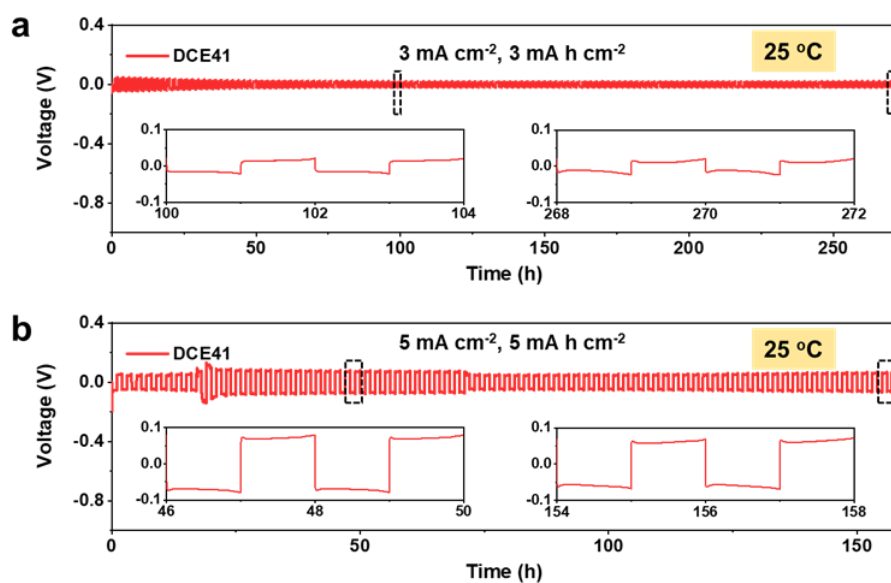
Supplementary Fig. 32 Galvanostatic voltage profiles of the symmetrical Zn cells at **a** 0.4 mA cm⁻², 0.4 mA h cm⁻², **b** 0.2 mA cm⁻², 0.6 mA h cm⁻² and **c** 0.2 mA cm⁻², 0.8 mA h cm⁻² at -60 °C.



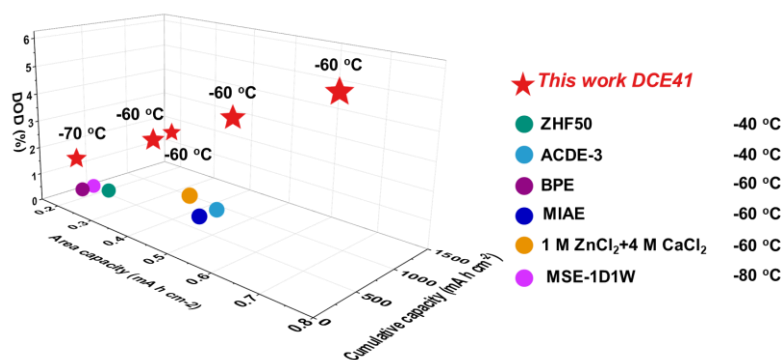
Supplementary Fig. 33 Galvanostatic voltage profiles of the symmetrical Zn cell at 1 mA cm⁻² and 0.25 mA h cm⁻² under -60 °C.



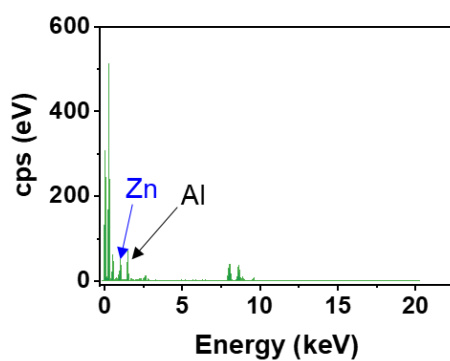
Supplementary Fig. 34 Galvanostatic voltage profiles of the symmetrical Zn cell at various current densities under -60 °C.



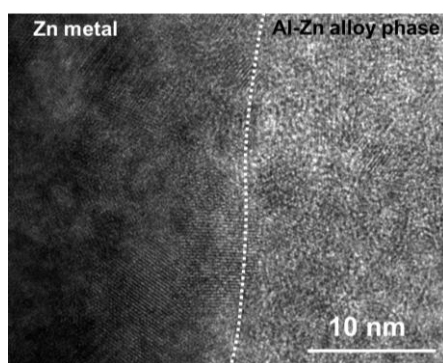
Supplementary Fig. 35 Galvanostatic voltage profiles of the symmetrical Zn cells at **a** 3 mA cm⁻², 3 mA h cm⁻² and **b** 5 mA cm⁻², 5 mA h cm⁻² at 25 °C.



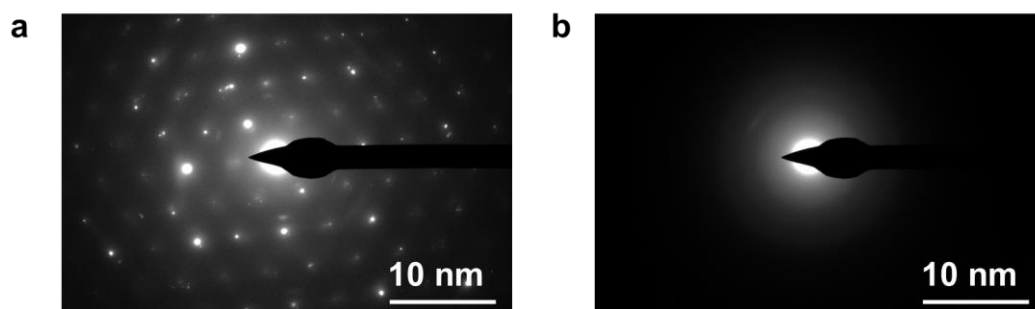
Supplementary Fig. 36 Comparisons of the areal capacity, cumulative capacity, DOD and operating temperatures (≤ -40 °C) of this work with reported Zn-based systems.^{1, 2, 3, 4, 5, 6}



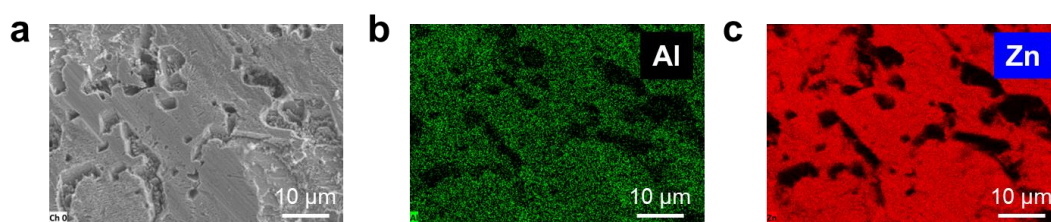
Supplementary Fig. 37 EDS mapping results for the Zn metal after 100 plating/stripping cycles at 0.2 mA cm^{-2} and 0.2 mA h cm^{-2} with the deposited capacity of 20 mA h cm^{-2} at -60°C in DCE41. The atomic mass ratio of the Al and Zn is 1.05:1.



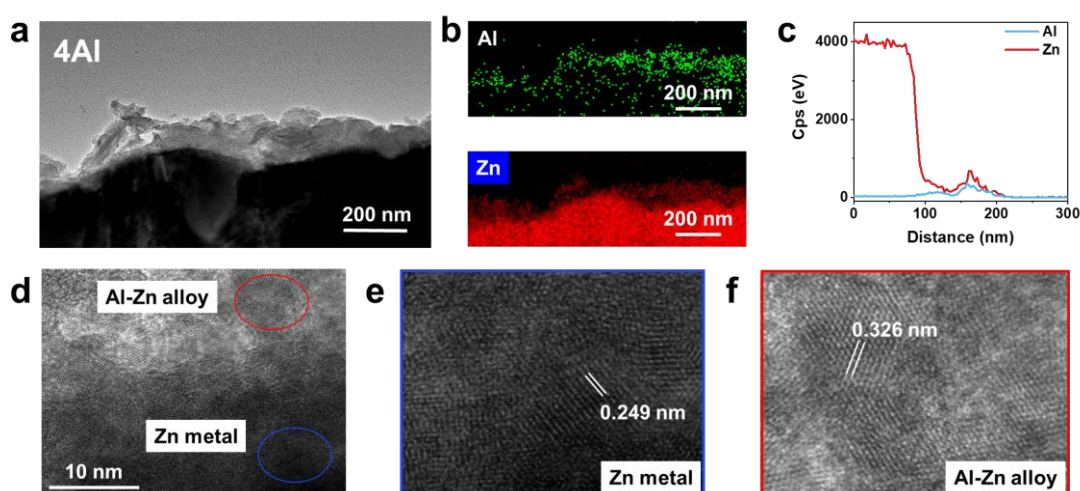
Supplementary Fig. 38 HRTEM image of the Zn metal after 100 plating/stripping cycles at 0.2 mA cm^{-2} and 0.2 mA h cm^{-2} with the deposited capacity of 20 mA h cm^{-2} at -60°C in DCE41.



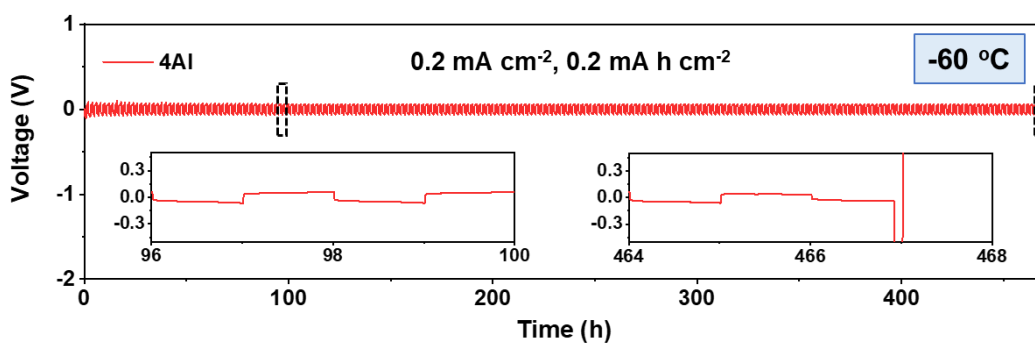
Supplementary Fig. 39 SAED patterns for **a** Zn phase and **b** Al-Zn alloy phase after 100 plating/stripping cycles at 0.2 mA cm^{-2} and 0.2 mA h cm^{-2} with the deposited capacity of 20 mA h cm^{-2} at -60°C in DCE41.



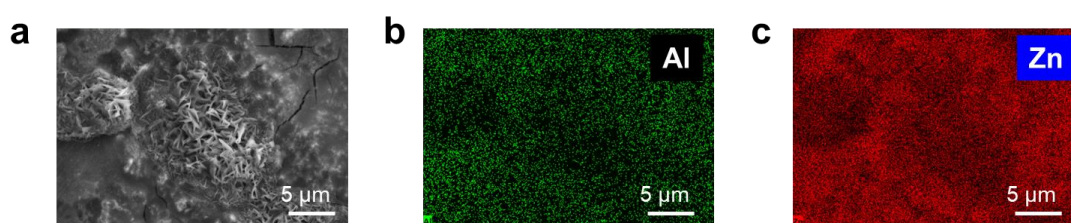
Supplementary Fig. 40 **a** FESEM image of the Zn metal after 100 plating/stripping cycles at 0.2 mA cm^{-2} and 0.2 mA h cm^{-2} with the deposited capacity of 20 mA h cm^{-2} at -60°C in DCE41. Corresponding EDS results of **b** Al and **c** Zn.



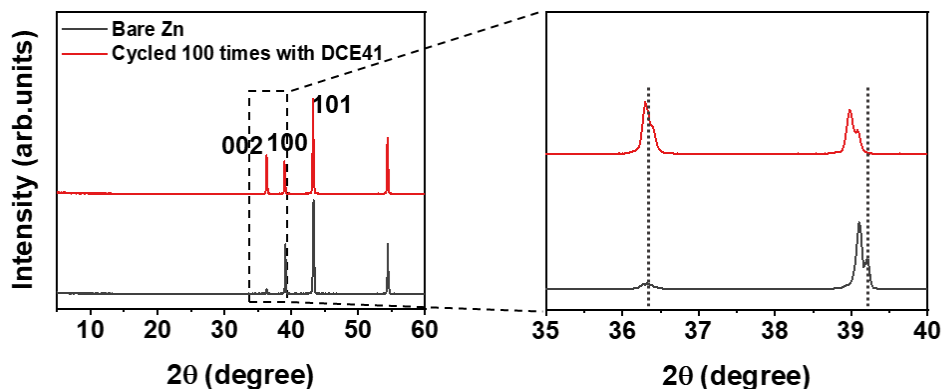
Supplementary Fig. 41 TEM test results of Zn metal after 100 plating/stripping cycles at 0.2 mA cm^{-2} and 0.2 mA h cm^{-2} with the deposited capacity of 20 mA h cm^{-2} at -60°C in 4Al. **a** Cross-sectional TEM image of the Zn metal. The associated **b** EDS mapping and **c** line-scan profiles of Al and Zn. **d** HRTEM images for the Al-Zn alloy and Zn metal. **e-f**) the zoom-in image of **d**. As shown, an Al-Zn alloy layer can be formed during Zn plating/stripping with 4Al on Zn metal. However, compared with the TEM image of the Zn metal in DCE41 (Supplementary Fig. 4d), the Al-Zn alloy layer formed in 4Al is thin and nonuniform, which is attributed to the slower ion deposition kinetics for uneven deposition distribution. This phenomenon has a detrimental effect on the long-term stability of Zn metal.



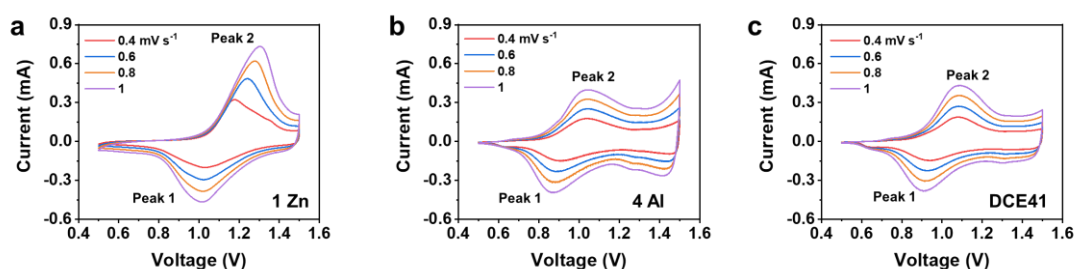
Supplementary Fig. 42 Galvanostatic voltage profiles of the symmetrical Zn cell with 4Al at 0.2 mA cm^{-2} and 0.2 mA h cm^{-2} under $-60 \text{ }^{\circ}\text{C}$. The cell is trapped with a limited cycle time of 464 h at $-60 \text{ }^{\circ}\text{C}$, which is far below the performance of DCE41 (Supplementary Fig. S23).



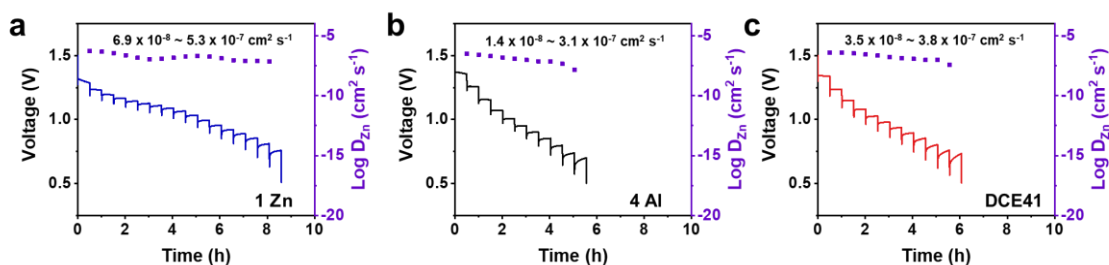
Supplementary Fig. 43 **a** FESEM image of the Zn metal after 100 plating/stripping cycles at 0.2 mA cm^{-2} and 0.2 mA h cm^{-2} with the deposited capacity of 20 mA h cm^{-2} at $-60 \text{ }^{\circ}\text{C}$ in 4Al. Corresponding EDS results of **b** Al and **c** Zn. SEM images revealed that irregular dendrite-like structures formed on the Zn metal surface. This also strongly contrasts with the uniform Zn surface with DCE41 (Supplementary Fig. S30).



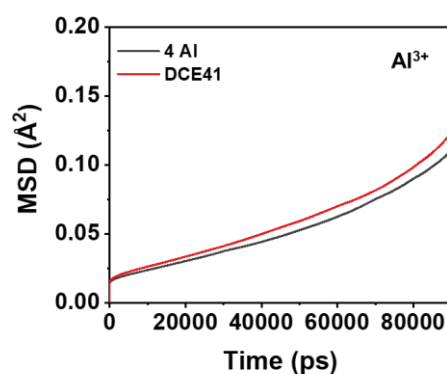
Supplementary Fig. 44 XRD patterns of bare Zn and Zn metal after 100 plating/stripping cycles at 0.2 mA cm^{-2} and 0.2 mA h cm^{-2} with the deposited capacity of 20 mA h cm^{-2} at -60°C in DCE41. Due to the alloy effect between deposited Al and Zn metal, the peaks at 36.3° and 39.1° on the cycled Zn negative electrode both shift to the smaller angles compared to the initial Zn metal. Meanwhile, $I_{(002)}/I_{(100)}$ presents a growing trend after 100 cycles, confirming the formation of Al-Zn alloy.



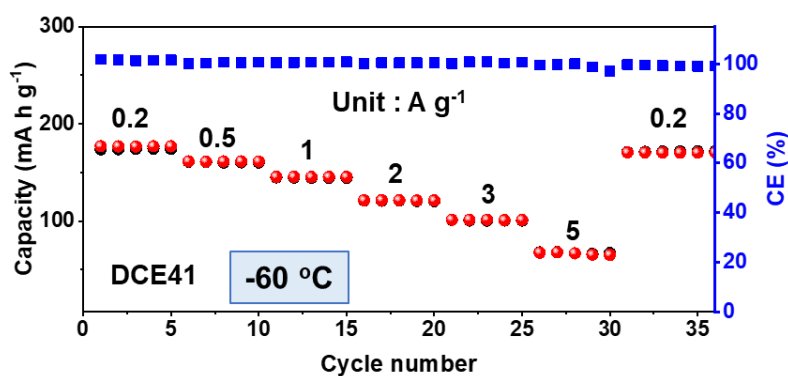
Supplementary Fig. 45 CV curves of the Zn||polyaniline (PANI) battery with **a** 1Zn, **b** 4Al and **c** DCE41 at different scan rates.



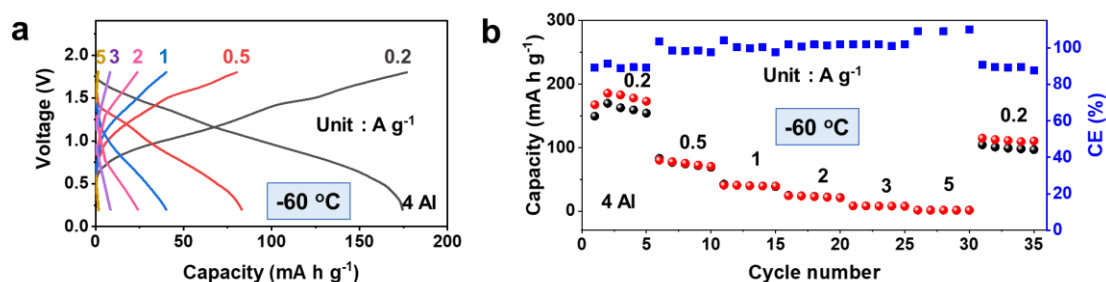
Supplementary Fig. 46 GITT tests of the Zn||PANI battery with **a** 1Zn, **b** 4Al and **c** DCE41.



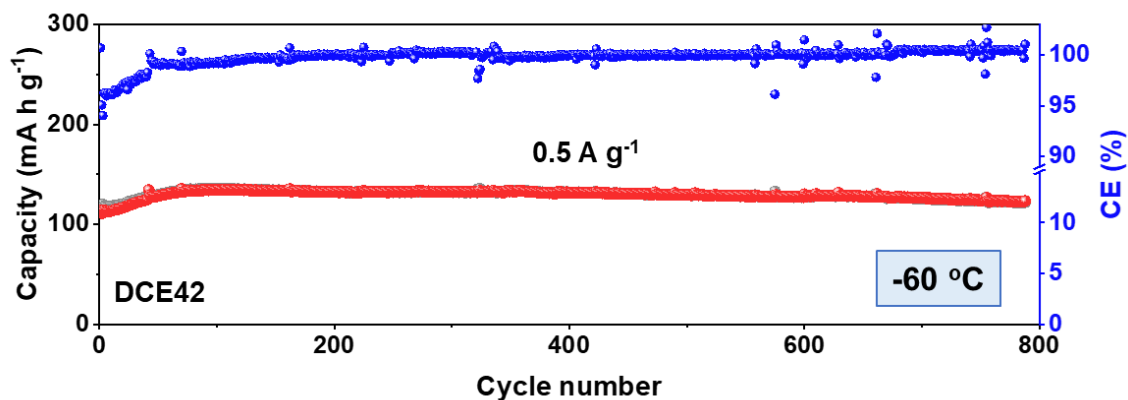
Supplementary Fig. 47 The results of simulated Al^{3+} diffusion coefficient in 4Al and DCE41.



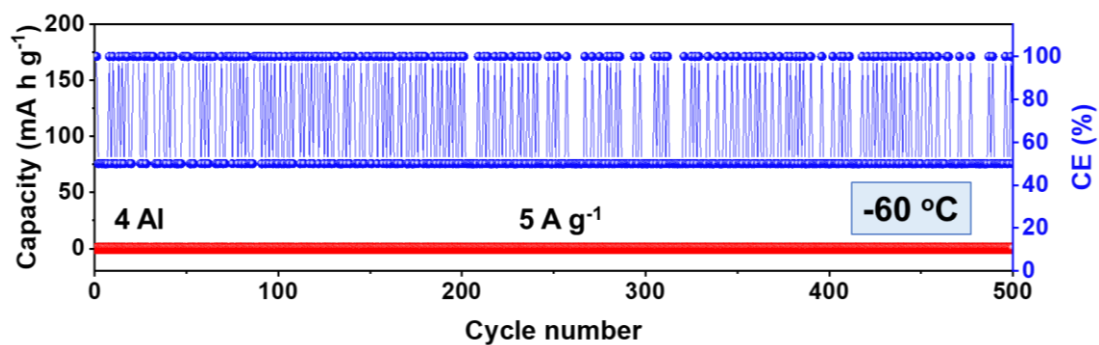
Supplementary Fig. 48 Rate performance of Zn||PANI battery with DCE41 under -60 °C.



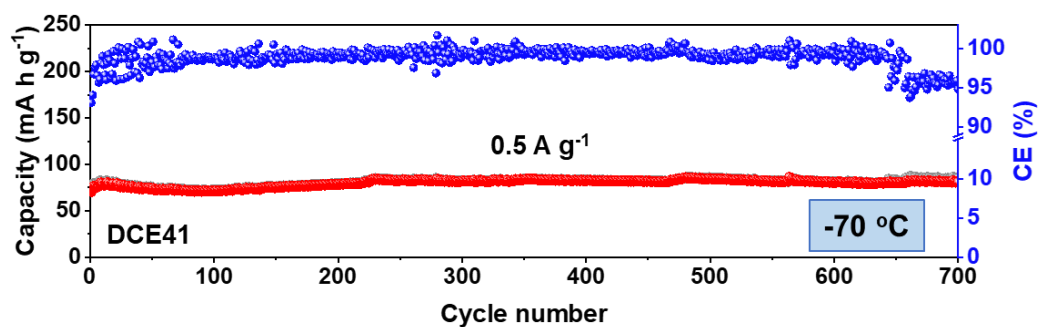
Supplementary Fig. 49 a Galvanostatic charge/discharge curves of Zn||PANI battery with 4Al at different specific currents at -60 °C. **b** Rate performance of Zn||PANI battery with 4Al at -60 °C.



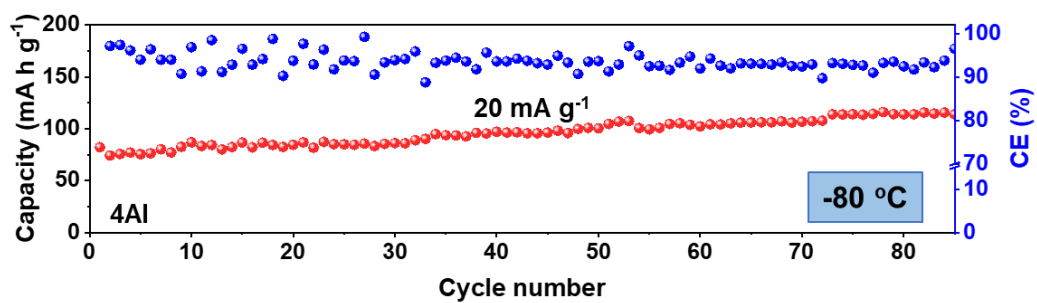
Supplementary Fig. 50 Cycling performance of Zn||PANI battery with DCE41 at 0.5 A g⁻¹ under -60 °C.



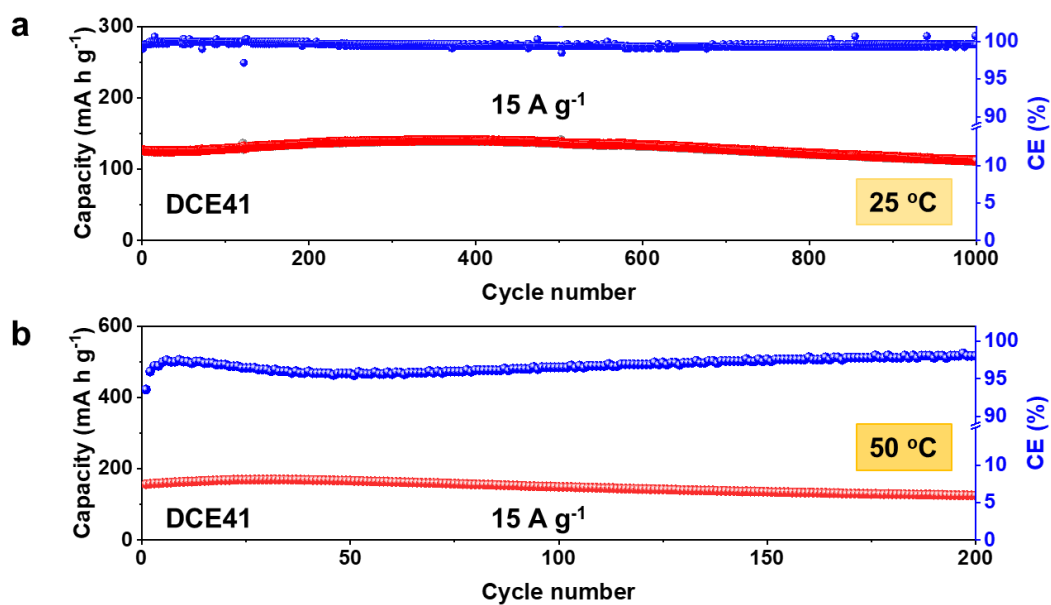
Supplementary Fig. 51 Cycling performance of Zn||PANI battery with 4 Al at 5 A g⁻¹ under -60 °C.



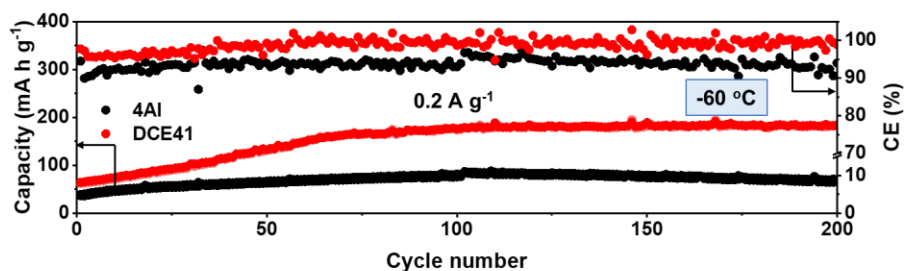
Supplementary Fig. 52 Cycling performance of Zn||PANI battery with DCE41 at 0.5 A g⁻¹ under -70 °C.



Supplementary Fig. 53 Cycling performance of Zn||PANI battery with DCE42 at 20 mA g⁻¹ under -80 °C.



Supplementary Fig. 54 Cycling performance of Zn||PANI battery with DCE41 at 15 A g⁻¹ under **a** 25 °C and **b** 50 °C.



Supplementary Fig. 55 Cycling performance of Zn||Zn_{0.25}V₂O₅ with different electrolytes at 0.2 A g⁻¹ at -60 °C. At -60 °C and a specific current of 0.2 A g⁻¹, the Zn||Zn_{0.25}V₂O₅ battery with 4Al electrolyte delivers a capacity of 65.2 mA h g⁻¹ after 200 cycles. In contrast, when using DCE41, the battery still maintains a capacity of 181.5 mA h g⁻¹ after 200 cycles. The initial increase in capacity observed during early cycles is attributed to the gradual activation of the positive electrode material. The relatively higher capacity achieved in the DCE41 system further supports the positive role of our dual-cation strategy in enhancing cation transport kinetics under low-temperature conditions.

Supplementary Table 1. The fitted EIS results for the symmetrical Zn batteries with 4Al at different temperatures.

Test temperature	R_{ct}	Error	$\ln(R_{ct}^{-1})$
(°C)	(Ω)	(%)	(Ω^{-1})
25	12.05	1.07	-2.49
0	108.80	1.18	-4.69
-20	431.70	1.62	-6.07
-40	1233.00	0.83	-7.12
-50	2889.00	1.55	-7.97
-60	5667.00	1.64	-8.64

Supplementary Table 2. The fitted EIS results for the symmetrical Zn batteries with DCE41 at different temperatures.

Test temperature	R_{ct}	Error	$\ln(R_{ct}^{-1})$
(°C)	(Ω)	(%)	(Ω^{-1})
25	37.52	6.20	-3.62
0	107.20	1.64	-4.67
-20	350.00	2.81	-5.86
-40	998.90	0.70	-6.91
-50	1596.00	0.90	-7.38
-60	2286.00	0.96	-7.73

Supplementary Table 3. The current density, areal capacity, Zn plating/stripping lifespan, cumulative capacity, DOD, Zn thickness and operating temperatures of the symmetrical Zn cells with DCE41, compared with reported low temperatures (≤ -40 °C) aqueous Zn-based systems.

Electrolyte	Current density (mA cm ⁻²)	Area capacity (mA h cm ⁻²)	Zn plating/ stripping g life (h)	T (°C)	Cumulative capacity (mA h cm ⁻²)	Depth of discharge (%), Zn thickness (μm)	Ref.
DCE41	0.2	0.2	10,340 (shelving-recovery test)		1,378	1.6 (22)	
	0.2	0.2	3,100	-60	620	1.6 (22)	This work
	0.2	0.6	1014		202.8	4.7 (22)	
	0.2	0.8	740		148	6.2 (22)	
	0.4	0.4	718		287.2	3.1 (22)	
	1	0.25	540		540	1.9 (22)	
	0.2	0.2	1,100	-70	220	1.6 (22)	
MSE-1D1W	0.2	0.2	2,000	-80	400	0.34 (100)	⁷
Li ₂ ZnCl ₄ ·9H ₂ O	1	-	135	-70	135	-	⁸
7.5 ZnCl ₂	0.2	0.2	450	-70	90	-	⁹
1 M ZnCl ₂ +4 M CaCl ₂	0.5	0.5	480	-60	240	1.7 (50)	²
ZnCl ₂ +SF	1	1	1200	-60	1200	1.7 (100)	¹⁰
MIAE	0.5	0.5	700	-60	350	0.85 (100)	³
	1	10	800	-40	800	57 (30)	

BPE	0.2	0.2	1,370	-60	274	0.34 (100)	4
	0.5	0.5	2,300	-40	1,150	0.85 (100)	
TMP-40	0.4	0.4	7,000	-50	2,800	0.68 (100)	11
0.08 M C- ZnCl ₂ /PG- H ₂ O	0.2	0.1	2,200	-50	440	-	12
ZnCl ₂ +100 mM αDG	5	2.5	800	-40	4,000	43 (10)	1
LACA	0.25	0.25	2,000	-40	500	-	13
3.0 M ZClO + 0.3 M Zn(OAc) ₂	2.5	5	1,300	-40	3,250	32.5 (30)	14
ZHF50	0.5	0.25	770	-40	385	0.43 (100)	5
ACDE-3	0.5	0.5	1,100	-40	550	0.85 (100)	6
20% GVL/ ZnOTF	0.2	0.2	2,300	-40	460	-	15

Supplementary Table 4. Comparison of the aqueous Zn-based batteries performance in this work with previously reported electrolytes at low temperatures (≤ -40 °C).

Electrolyte	Positive electrode	Specific current (A g ⁻¹)	Cycle number	Capacity retention (%)	T (°C)	Ref.
DCE41	PANI	0.5	788	100.0	-60	This work
		5	2,000	95.0		
			12,000	80.0		
		0.1	500	100.0	-70	
		0.5	700	90.0		
		DCE42		0.02	85	

Na-H ₂ O-Ca	NaFeMnH	0.1 C	20	93.1	-80	16
Na-H ₂ O-EG		0.5 C	70	85.1	-60	
MSE-1D1W	PANI	0.5	3,000	97.0	-80	7
5m Zn(ClO ₄) ₂	PANI	1	1,200	~85.0	-80	17
		1	5,000	~100.0	-70	
4 M Zn(BF ₄) ₂	TCBQ	0.1 C	20	70.0	-80	18
		0.1 C	50	94.7	-60	
3.5 M						
Mg(ClO ₄) ₂	PTO	0.2	100	~100.0	-70	19
+1 M						
Zn(ClO ₄) ₂						
Zn(BF ₄) ₂ -PAM	PANI	0.05	100	100.0	-70	20
7.5 m ZnCl ₂	PANI	0.2	2,000	100.0	-70	9
1 M ZnCl ₂ +4 M	PTO	1	1,600	96.0	-60	2
CaCl ₂						
ZnCl ₂ +SF	VOH	0.5	1,500	100	-60	10
BPE	V ₂ O ₅	1	1,100	100	-60	4
3.0 M ZClO +	I ₂ /AC	1	16,500	~99.8	-60	14
0.3 M		1	3,000	94.4	-40	
Zn(OAc) ₂						
ZnCl ₂ +100mM	PANI	0.2	10,000	60.4	-50	1
αDG						
3ZC6LC	PANI	0.5	2,000	100	-50	21
0.08 M C-	PANI	0.05	1,000	100	-50	12
ZnCl ₂ /PG-H ₂ O						
7.6 m ZnCl ₂	VOPO ₄	1/3 C	200	95.0	-50	22
-0.05 m SnCl ₂						
60% G2	PANI	0.1	1,000	95.2	-45	23

	KVOH	0.1	4,000	82.9		
ZGBCP	PANI	10	30,000	85.4	-40	²⁴
P20 (3 M Zn(OTf) ₂ +20% PC)	NaV ₃ O ₈ · 1.5H ₂ O	0.2	400	100	-40	²⁵
8 m LiCl	PANI	1	4,000	95.7	-40	²⁶
ZnAc ₂ +EDGFL	PANI	1	1,000	~52	-40	¹⁵
MIAE	PANI	0.5	12,000	~100	-40	³
		5	35,000	~56		
ZHF50	PANI	5	6,500	90	-40	⁵
8 M ZnCl ₂ /EG20	V ₂ O ₅	0.1	1,000	~87	-40	²⁷
7P1W	TCBQ	0.1	700	76.3	-40	²⁸
HE	NVO	0.1	~1,800	100	-40	²⁹
ACDE-3	poly (1, 5- NAPD)	0.1	1,500	100	-40	⁶

Supplementary Table 5 Total electronic energies of individual components involved in binding energy calculations.

Structure	Energy (Ha)	Structure	Energy (Ha)
H ₂ O	-76.43	H ₂ O-H ₂ O	-152.8711790
Al ³⁺	-240.4021947	Al ³⁺ -H ₂ O	-317.1599228
Zn ²⁺	-1778.333368	Zn ²⁺ -H ₂ O	-1854.926665
Ca ²⁺	-676.8832233	Ca ²⁺ -H ₂ O	-753.4077311
Mg ²⁺	-199.2261975	Mg ²⁺ -H ₂ O	-275.7907659

Na ⁺	-162.0709867	Na ⁺ -H ₂ O	-238.5436533
Li ⁺	-7.275950535	Li ⁺ -H ₂ O	-83.76521811

Supplementary Table 6 Total electronic energies of relevant species involved in desolvation energy calculations.

Structure	Gibbs Free	Structure	Gibbs Free
	Energy		Energy
	(Ha)		(Ha)
[Al ₂ Cl(4H ₂ O)]	-1468.75	[Al ₂ Cl(3H ₂ O)]	-1392.28
[Al ₂ Cl(2H ₂ O)]	-1315.80	[Al ₂ Cl(1H ₂ O)]	-1239.29
[Al ₂ Cl]	-1162.75	H ₂ O	-76.46
[AlCl(4H ₂ O)]Cl[Zn(5H ₂ O)]	-4090.85	[AlCl(2H ₂ O)]Cl[Zn(2H ₂ O)]	-3708.48
[AlCl(4H ₂ O)]Cl[Zn(4H ₂ O)]	-4014.38	[AlCl(2H ₂ O)]Cl[Zn(H ₂ O)]	-3631.98
[AlCl(4H ₂ O)]Cl[Zn(3H ₂ O)]	-3937.91	[AlCl(H ₂ O)]Cl[Zn(H ₂ O)]	-3555.47
[AlCl(3H ₂ O)]Cl[Zn(3H ₂ O)]	-3861.44	[AlCl(H ₂ O)]Cl[Zn]	-3478.95
[AlCl(2H ₂ O)]Cl[Zn(3H ₂ O)]	-3784.95	[AlCl]Cl[Zn]	-3402.40

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