Supplementary Information (SI) for Materials Chemistry Frontiers.
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Supporting Information

Upgrading Low-Temperature Cycling Stability of Hybrid Na-Air Batteries via Sodium Biphenyl Modification

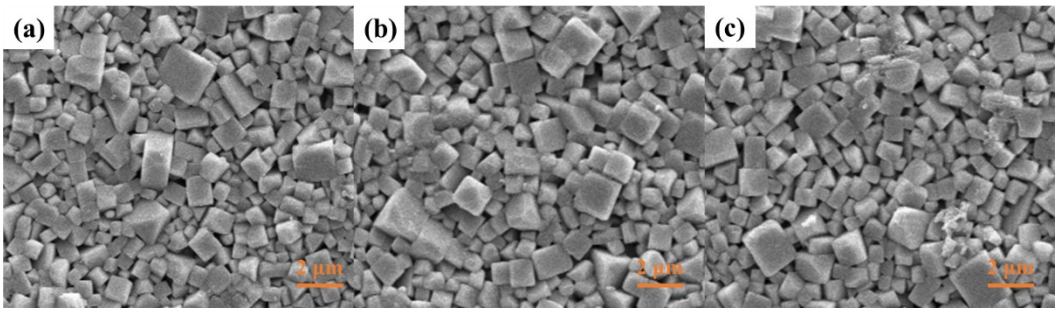

Fig. S1 (a) SEM of primitive NASICON; (b) SEM of NASICON after immersion in a liquid anode (3 M Na-BP-DME + 20% DOL) for 10 days; (c) SEM of NASICON after immersion in the cathode electrolyte (1 M NaOH + 30% DMSO) for 10 days

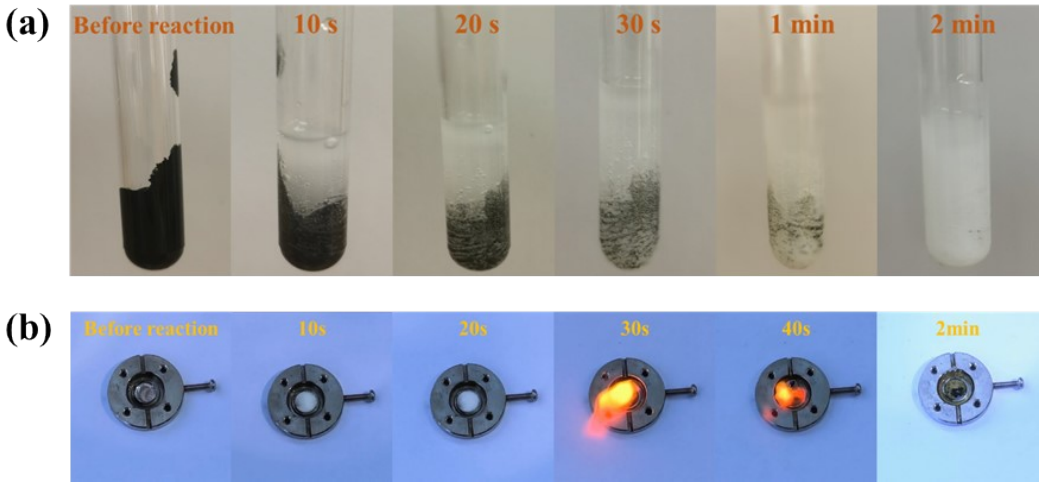

Fig. S2 (a) Safety evaluation of the reaction between 3 M Na-BP-DME and water; (b) Safety evaluation of the reaction between Na and water

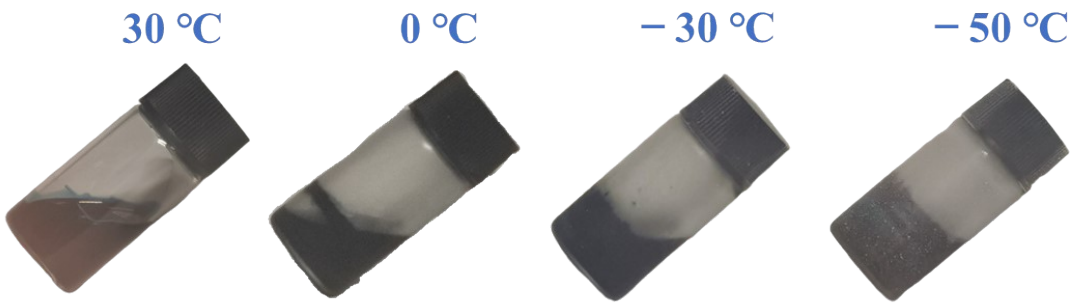

Fig. S3 Temperature variation fluidity test of 3 M Na-BP-DME + 10% DOL liquid anode

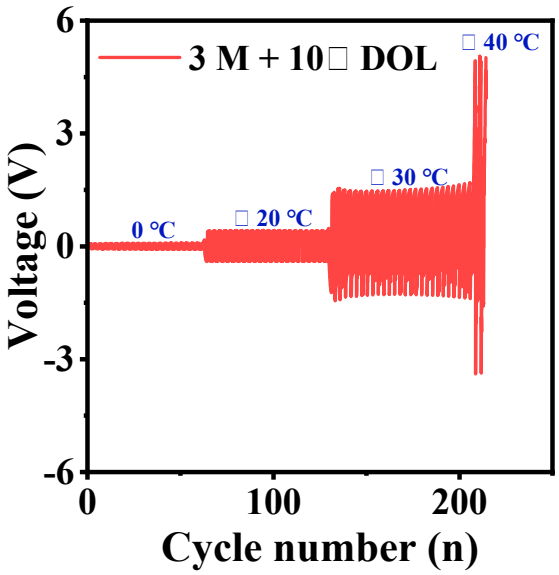

Fig. S4 Temperature variation cycling performance test of 3 M Na-BP-DME + 10% DOL symmetrical battery

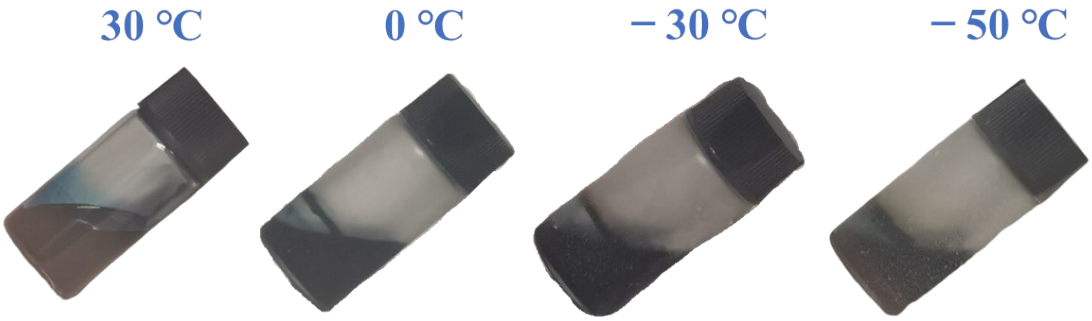

Fig. S5 Temperature variation fluidity test of 3 M Na-BP-DME + 30% DOL liquid anode

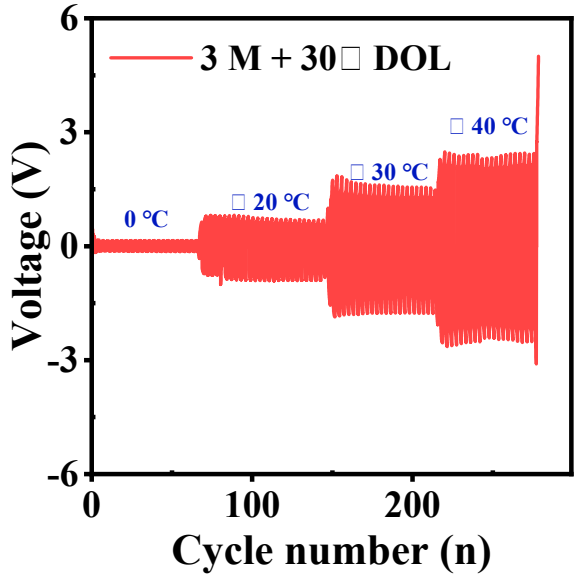

Fig. S6 Temperature variation cycling performance test of 3 M Na-BP-DME + 30% DOL symmetrical battery

Table S1 Elemental resistances (R_e, R_i, R_{ct} and Z_w) in the equivalent circuits estimated in Na-air batteries using liquid anode.

Battery no.	R_e (Ω)	R_i (Ω)	R_{ct} (Ω)	Z_w (Ω)
Battery i (1 M)	85.49	98.02	18.75	0.46
Battery ii (3 M)	82.27	42.95	7.07	0.41
Battery iii (5 M)	85.33	69.62	9.12	0.42

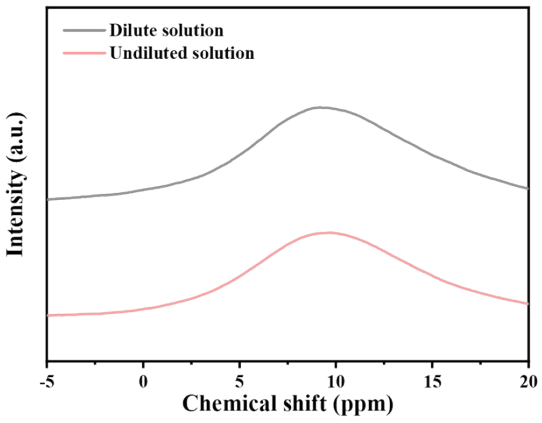

Fig. S7 ^{23}Na-NMR spectrum of diluted and undiluted liquid anodes

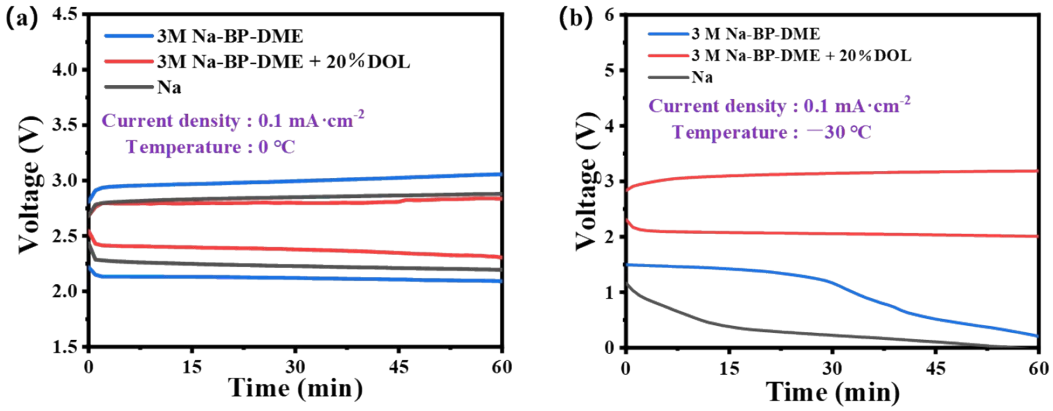

Fig. S8 Polarization comparison of metallic sodium anode and liquid anode at: (a) 0 ℃ and (b) −30 ℃

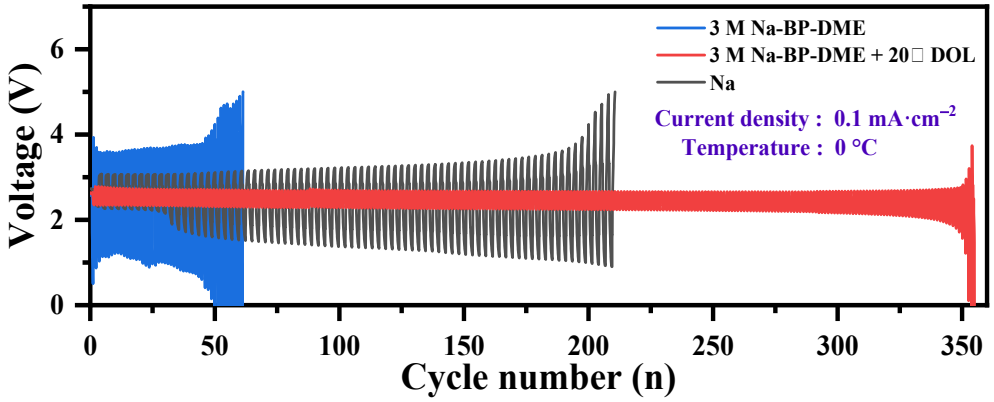

Fig. S9 Comparison of cycling performance of air batteries assembled with metallic sodium anode and liquid anode at 0 ℃

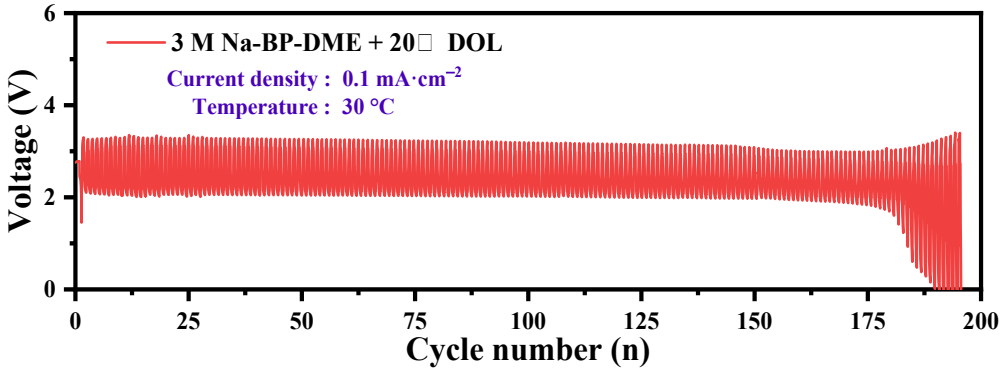

Fig. S10 Cycling performance of air batteries assembled with 3M Na-BP-DME + 20% DOL liquid anode at 30 ℃

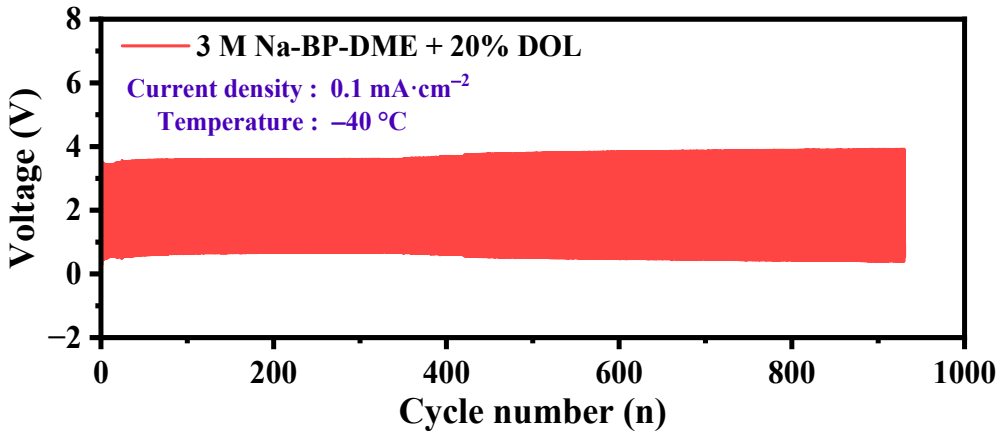

Fig. S11 Cycling performance of air batteries assembled with 3M Na-BP-DME + 20% DOL liquid anode at −40 ℃