Supplementary Information

Effects of Ion Fraction in an Inorganic Ionic Liquid Electrolyte on Performance of Intermediate-Temperature Operating Sodium-Sulfur Batteries

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Table S1. Viscosities (η) of the Na[OTf]-Cs[TFSA] systems.

Temperature / K	η / mPa s		
	20 mol% Na[OTf]	30 mol% Na[OTf]	40 mol% Na[OTf]
473	18.4	21.6	25.4
463	22.0	26.5	31.6
453	27.1	33.7	40.7
443	34.7	43.7	53.3
433	45.3	59.3	72.6
423	61.5	80.4	104
413	86.4	120	152
403	130	179	241

Table S2. Ionic conductivities (σ) of the Na[OTf]-Cs[TFSA] systems.

20 mol% Na[OTf]		30 mol% Na[OTf]		40 mol% Na[OTf]	
Temperature / K	σ / mS cm^{-1}	Temperature / K	σ / mS cm^{-1}	Temperature / K	σ / mS cm^{-1}
455	17.0	454	14.4	452	12.7
439	12.4	440	10.5	439	9.18
430	9.88	428	7.98	429	7.10
422	8.22	420	6.15	421	5.72
411	6.00	411	4.79	411	4.12
404	4.81	400	3.17	402	2.97
393	3.18	392	2.19	392	1.84

Table S3. Densities for the Na[OTf]-Cs[TFSA] systems.

Temperature / K	Densities / g cm^{-3}		
	20 mol% Na[OTf]	30 mol% Na[OTf]	40 mol% Na[OTf]
443	2.08	2.12	2.17
423	2.10	2.13	2.19
403	2.12	2.15	2.21

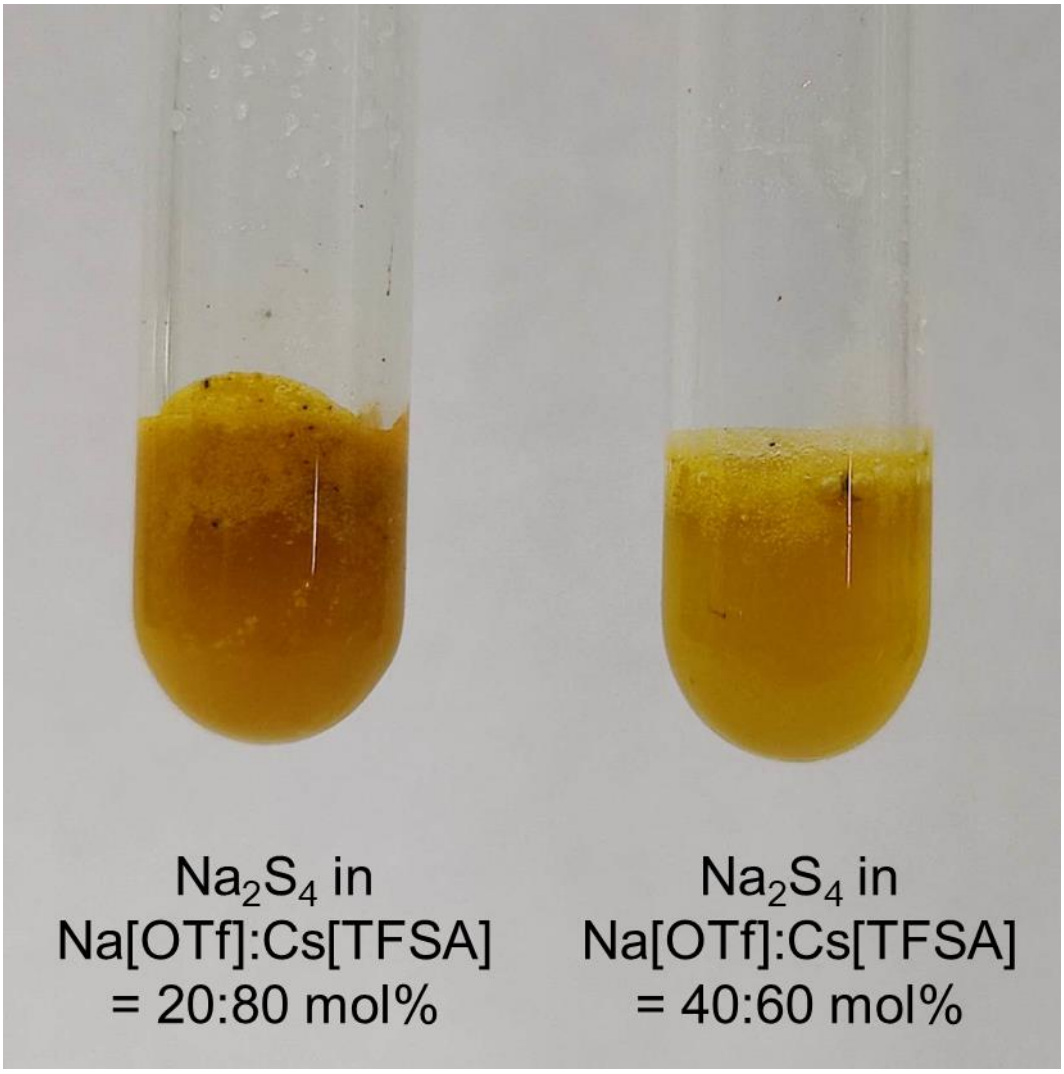

Figure S1. The visual solubility test of Na_2S_4 into the Na[OTf]-Cs[TFSA] ionic liquid electrolytes (Na[OTf] : Cs[TFSA] = 20 : 80 and 40 : 60 in mol%) at 423 K.