Supplementary Information for

A High Power, Low Temperature Molten Sodium Battery

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Contents **Page**

Table S1. Comparison of capacity, current, and power metrics for molten sodium batteries reported in the literature. An asterisk (*) signifies that values were estimated from the data provided in the reference. Where different charge and discharge currents were used in a single cycle, the highest current and power conditions are listed. Reference numbers refer to those cited in the paper.

Temp. (°C)	Cathode Chemistry	Capacity Cycled (mAh cm^{-2})	Current Cycled (mA cm^{-2})	Power Cycled (mW cm^{-2})	Max Current (mA cm^{-2})	Max Power (mW cm^{-2})	Energy Efficiency at Max Power (%)	Ref.
450	Na-Bi_9Sb	200	100	83	-	-	80	52
300	$NiCl_2$	50	80	175	160	318	78	53
300	$NiCl_2$	150	20	52	80	200	80	54
300	$NiCl_2$	80	10	26	20	44	76	55
300	Na-S	340	-	-	680	1,700	Not given	7
300	Na-S	400*	60*	120*	-	-	81	56
270	Pb-Bi	23	5.8	4	-	-	41	57
190	NaI/Ni	38	10	25	33	86	Not given	36
190	Al	19.3	6.8	11	40	72	Not given	40
190	$FeCl_2$	38.6	10	24	33	72	55*	37
180	$NiCl_2$	70	-	-	100	220	72	11
180	NaCl-$FeCl_2$-$AlCl_3$-EmimCl	2*	0.2	0.7	-	-	96	38
170	O_2	0.5	5	19	10	19	90	39
110	NaI/$GaCl_3$	14	5	52	30	84	65	13
100	NaI/I_2(aq)	45	10	38	100	425	40	14
100	BiSnIn	1	4	2.8	-	-	75*	41
135	**NaI/$AlCl_3$**	**102**	**50**	**150**	**250**	**1,070**	**65**	**This work**

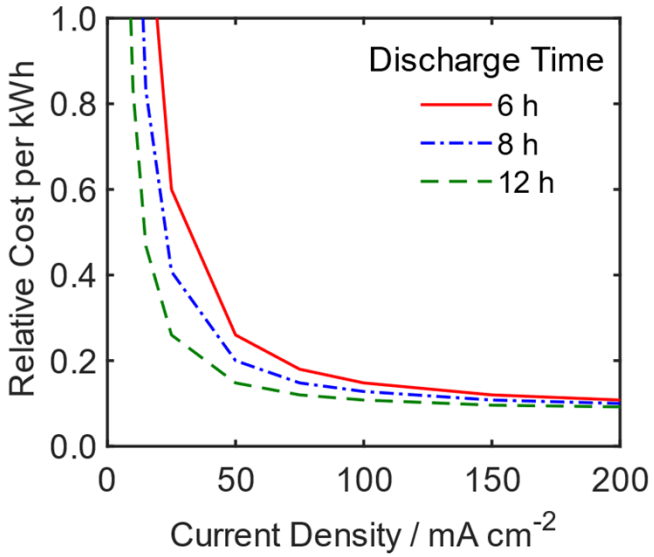

Figure S1. Relative cost of sodium batteries in this work designed with different combinations of current densities and discharge times (i.e. capacities). As the total cell capacity increases, the relative cost per kWh of the cell decreases due to increased fraction of active material to inactive material (housing, seals, etc.).

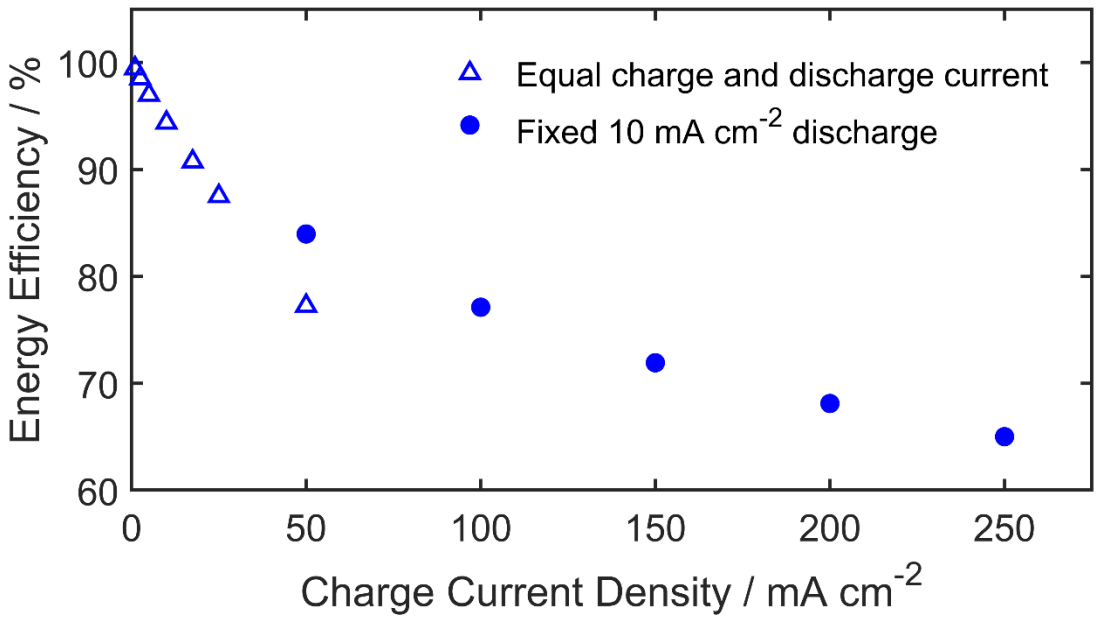

Figure S2. Energy efficiencies from extended, high current density rate tests for cell P-1B (replicate of P-1). For current densities >50 mA cm^{-2}, the "equal charge and discharge current" battery cannot complete discharge without exceeding the 2.4 V limit. All data were collected at 135 °C.

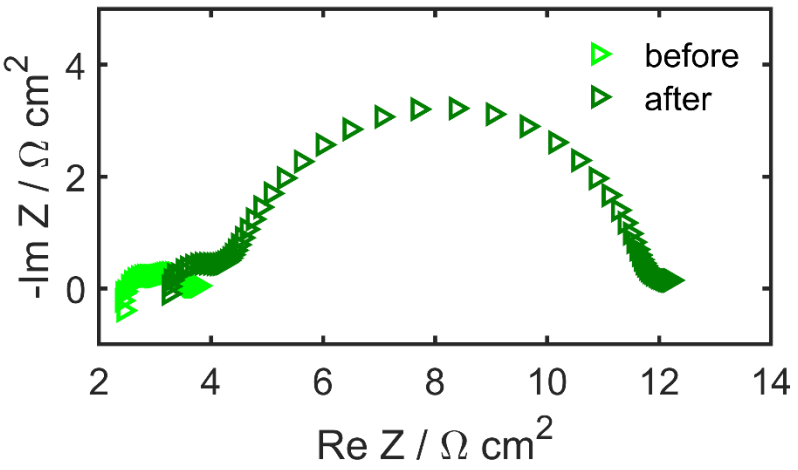

Figure S3: Nyquist plots for cell P-3 before and after capacity testing at 135 °C. Capacity testing was performed at 50 mA cm^{-2} charge and 10 mA cm^{-2} discharge, with failure occurring on discharge from 77.5% state of charge down to 7.5% state of charge. At this point, the cell voltage dropped precipitously to hit the lower voltage limit and the test was stopped.

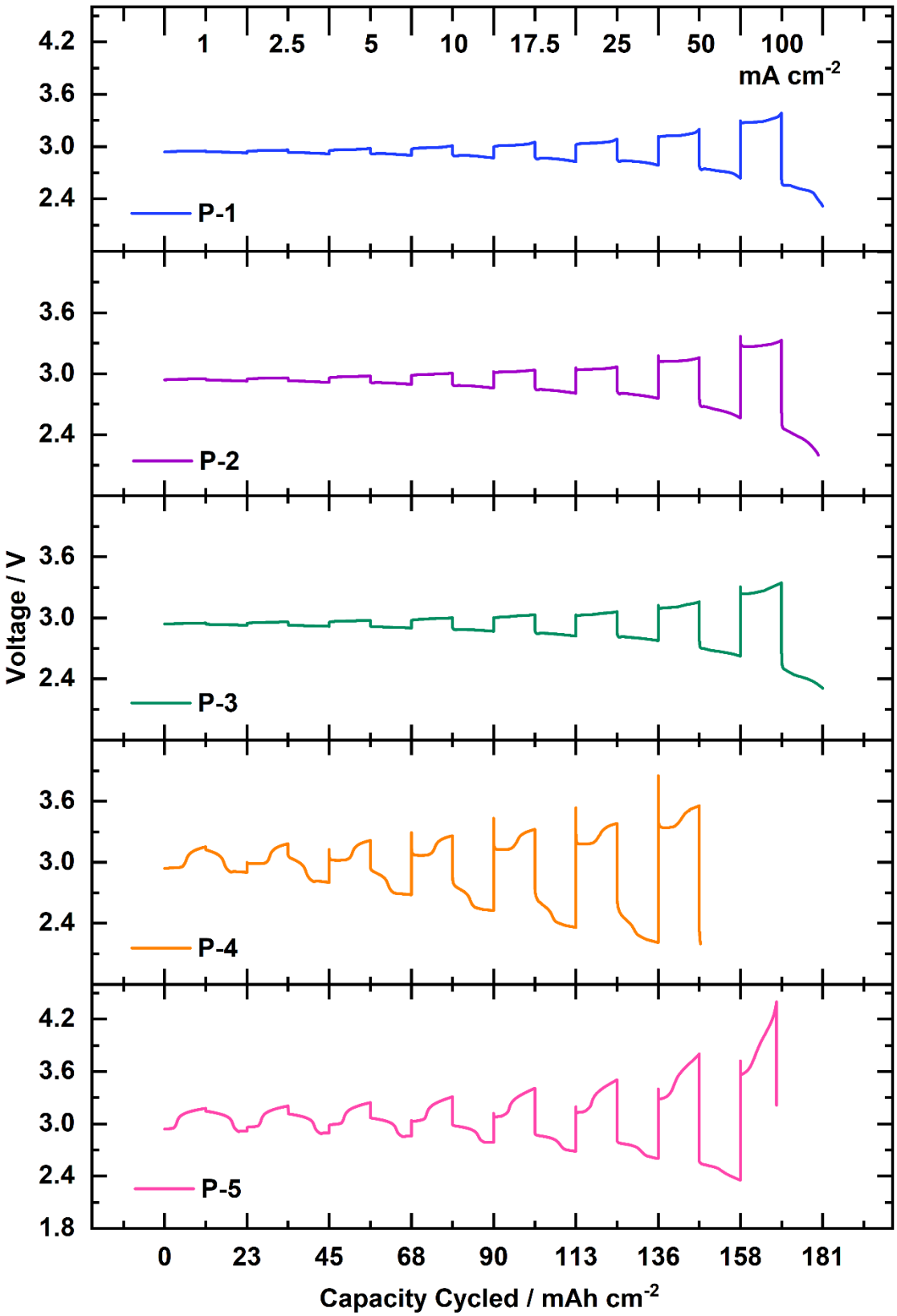

Figure S4. Rate tests for cells P-1, P-2, P-3, P-4 and P-5. All data were collected at 135 °C.