Improvement in the Power Output of a Reverse Electrodialysis System by the Addition of Poly(sodium 4-styrenesulfonate)

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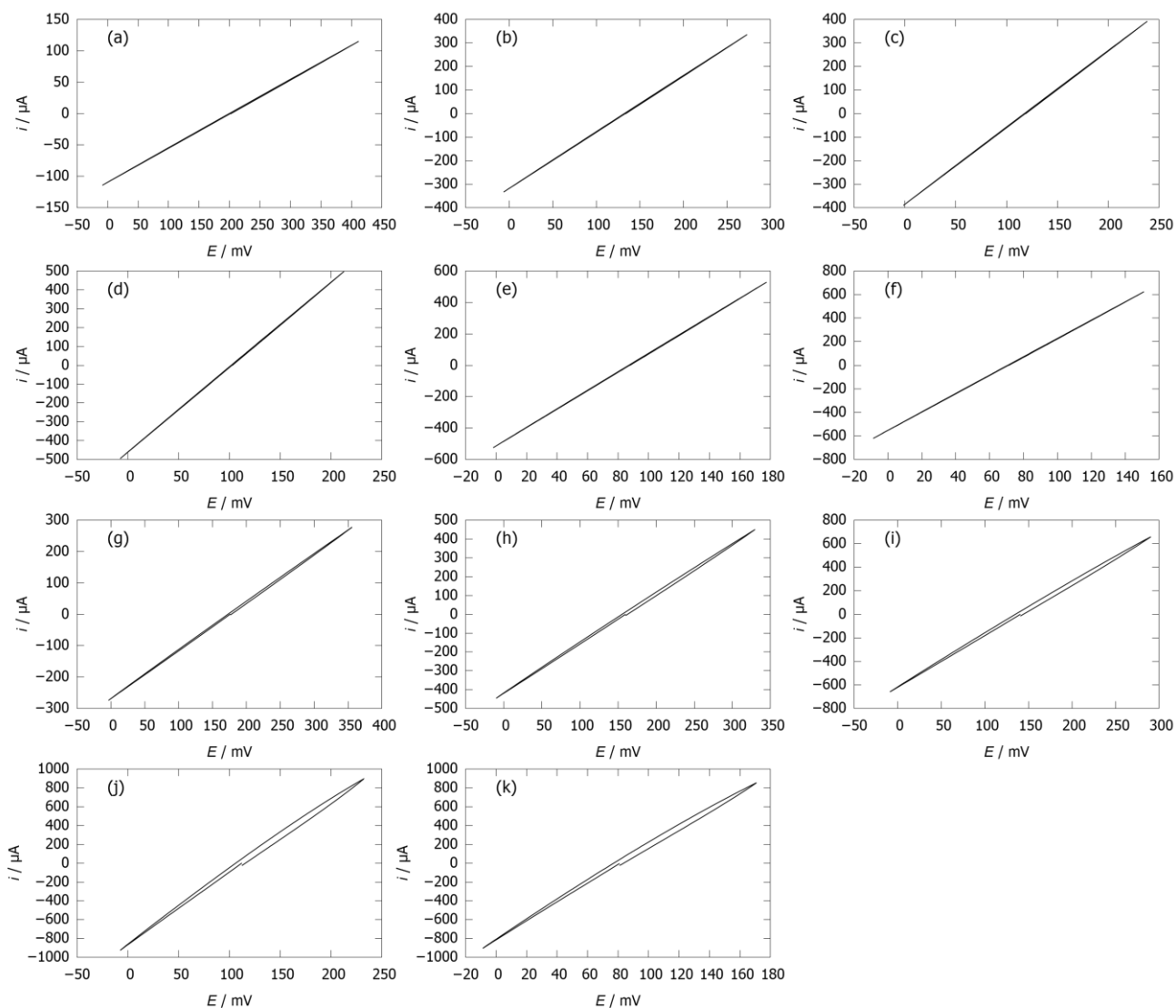§§ ECSJ Active Member

Supporting Information

Figure S1. Cyclic voltammograms of the RED cells. The potential scanning rate: 10 mV s^{-1}. The compositions of the dilute solutions: (a) 10.0 mM NaCl, (b) 50.0 mM NaCl, (c) 70.0 mM NaCl, (d) 100 mM NaCl, (e) 140 mM NaCl, (f) 200 mM NaCl, (g) 10.0 mM NaCl, 40.0 mM NaPSS, (h) 10.0 mM NaCl, 90.0 mM NaPSS, (i) 10.0 mM NaCl, 190 mM NaPSS, (j) 10.0 mM NaCl, 490 mM NaPSS, and (k) 10.0 mM NaCl, 990 mM NaPSS.
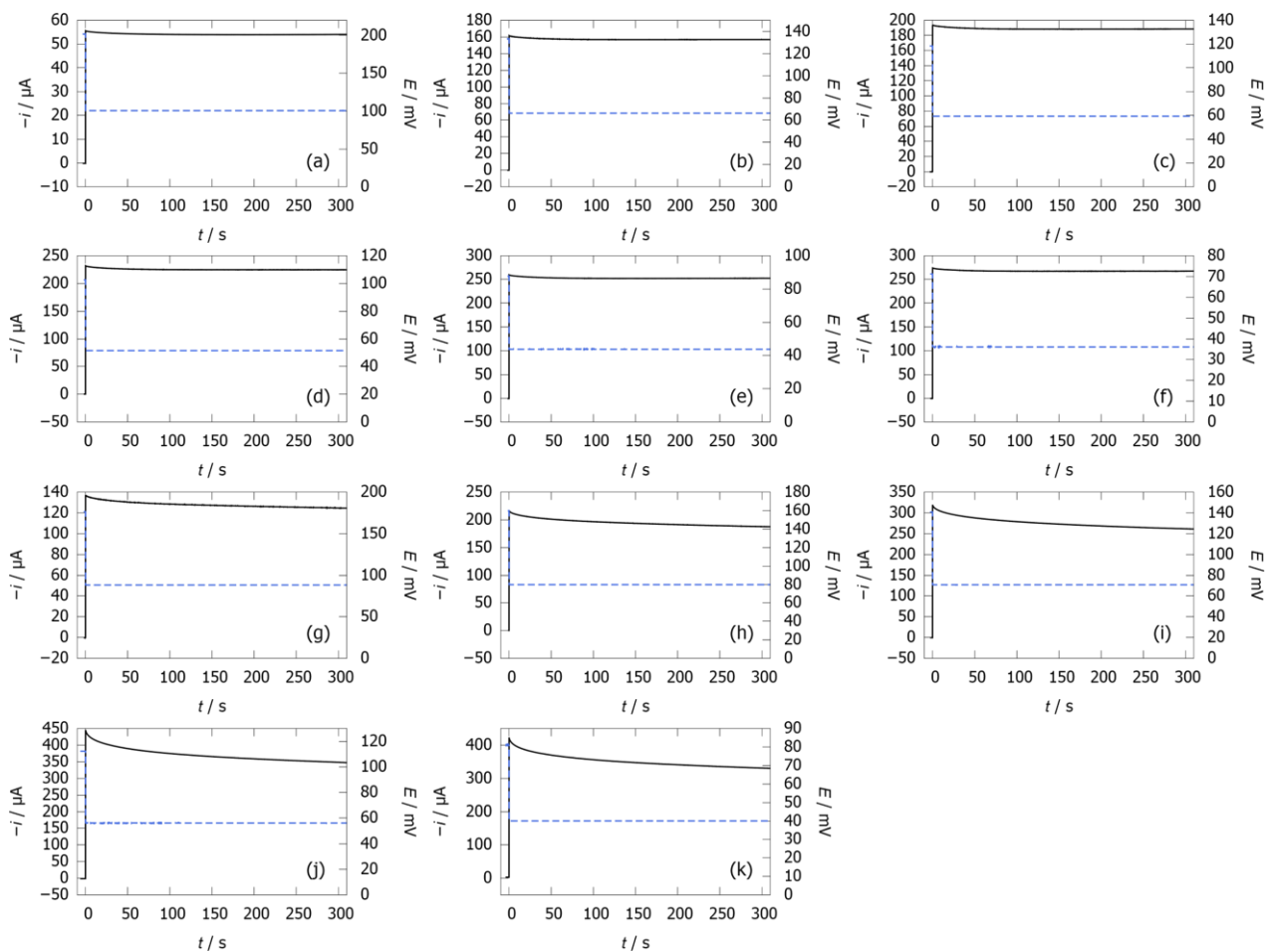
Figure S2. Time-courses of the currents (solid lines) and the applied potential differences (dashed lines) for the RED cells. The compositions of the dilute solutions: (a) 10.0 mM NaCl, (b) 50.0 mM NaCl, (c) 70.0 mM NaCl, (d) 100 mM NaCl, (e) 140 mM NaCl, (f) 200 mM NaCl, (g) 10.0 mM NaCl, 40.0 mM NaPSS, (h) 10.0 mM NaCl, 90.0 mM NaPSS, (i) 10.0 mM NaCl, 190 mM NaPSS, (j) 10.0 mM NaCl, 490 mM NaPSS, and (k) 10.0 mM NaCl, 990 mM NaPSS.
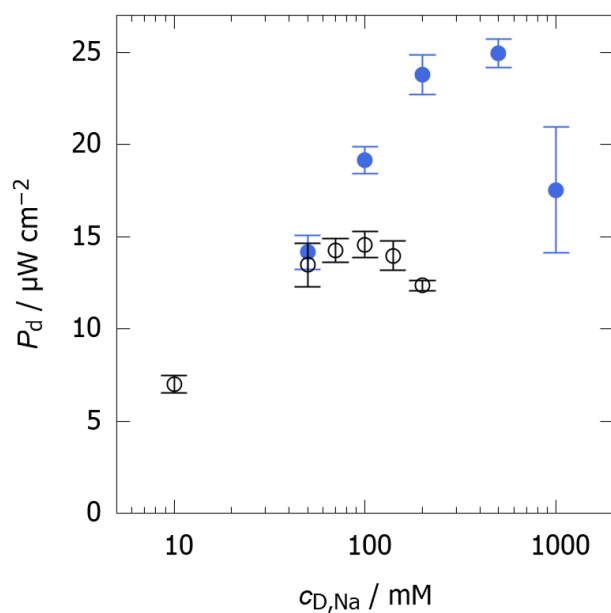
Figure S3. Comparison of the power densities P_d at $t = 300.0$ s against the concentrations of sodium ion in the dilute solutions $c_{D,Na}$. P_d were calculated by dividing the power outputs P by the membrane area (0.79 cm^2). It should be noted that the cross-sectional areas of the current flow paths in the cells were not constant. The error bars were evaluated from the Student t distribution at a 99% confidential level with samples of size 3. (○) and (●) indicate the powers of the cells in the absence and presence of NaPSS, respectively.
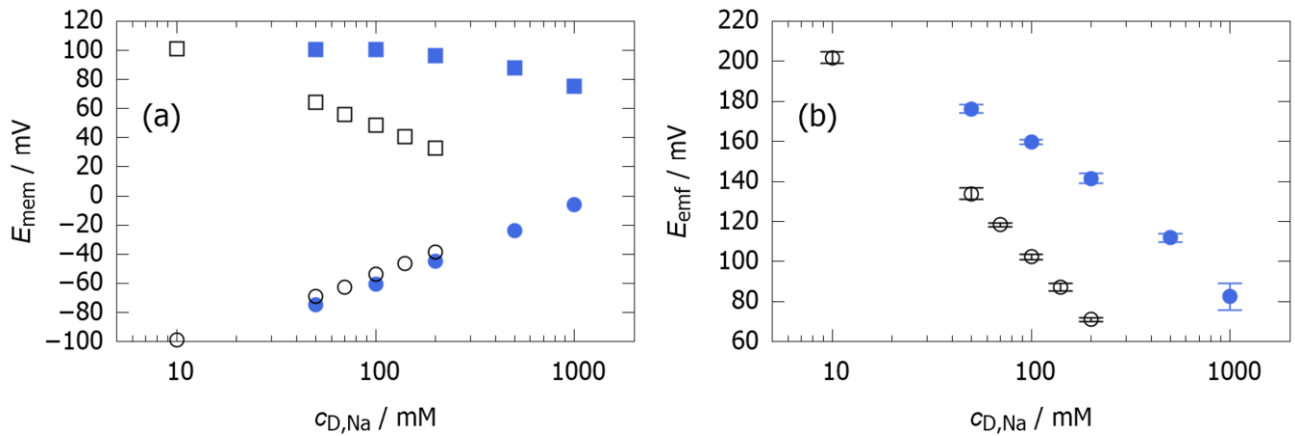
Figure S4. (a) Comparison of the membrane potentials E_{mem} against the concentrations of sodium ion in the dilute solutions $c_{D,Na}$. E_{mem} were measured as the potentials of the reference electrodes (Ag|AgCl|sat. KCl) in W1 (for CIMS) or in W3 (for ACS) against the reference electrodes in W2. (□) E_{mem} of ACS in the absence of NaPSS. (■) E_{mem} of ACS in the presence of NaPSS. (○) E_{mem} of CIMS in the absence of NaPSS. (●) E_{mem} of CIMS in the presence of NaPSS. (b) Comparison of the electromotive forces E_{emf}. E_{emf} were measured as the potentials of the reference electrodes in W3 against those in W1. The error bars were evaluated from the Student t distribution at a 99% confidential level with samples of size 3. (○) E_{emf} of the cells in the absence of NaPSS. (●) E_{emf} of the cells in the presence of NaPSS.

Table S1. The values of $i_{300.0}$ of the cells with CIMS ($i_{300.0,C}$) and the cells with ACS ($i_{300.0,A}$).

Solution	$|i_{300.0,C}|$/mA	$|i_{300.0,A}|$/mA
g	0.559	0.755
h	0.828	1.29
i	0.974	1.52
j	1.05	1.43
k	0.333	1.49