Supplementary Information for

Investigation of polyacrylamide based hydroxide ion-conducting electrolyte and its application in all-solid electrochemical capacitors

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Relative Humidity During Tracking under Ambient Conditions

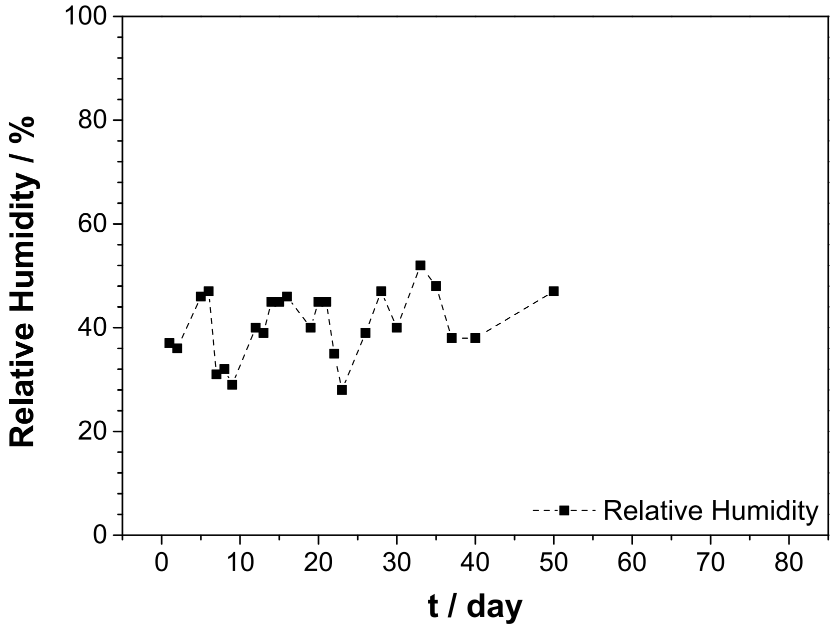

Figure S1: The relative humidity under ambient conditions during cell tracking from day 1 to day 50.

Fig. S1 shows the relative humidity under ambient conditions during the duration of cell tracking. Readings were taken from a Thomas Traceable® digital hygrometer once a day during the day of test.

Temperature Dependence Study of TEAOH-PAM

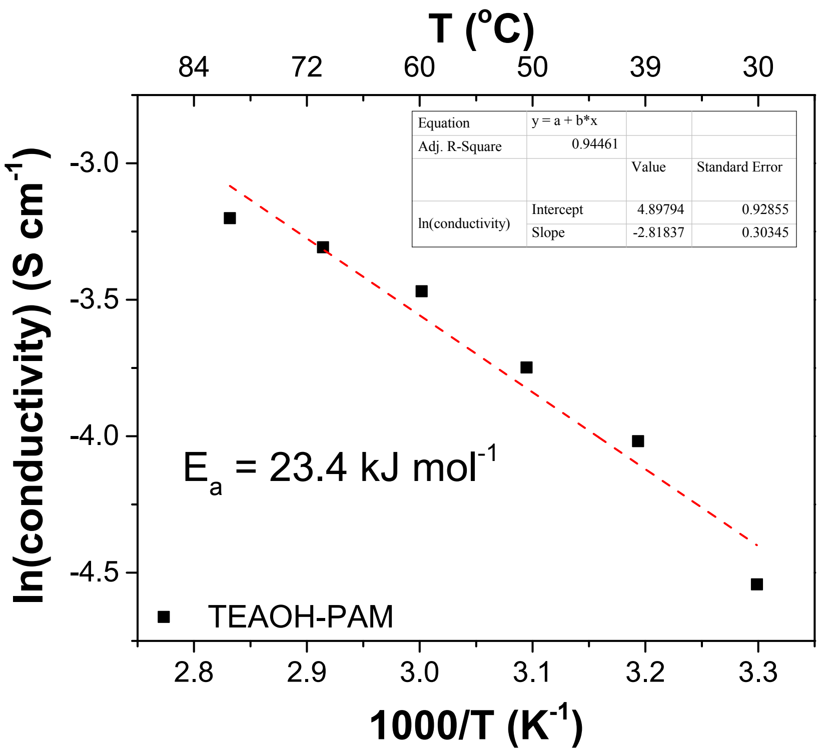

Figure S2: Temperature dependence study of TEAOH-PAM solid polymer electrolyte.

Fig. S2 shows the temperature dependence study of TEAOH-PAM, indicating stability up to 80 °C. The Arrhenius equation $\sigma = \sigma_o e^{-E_a/RT}$ is used to fit the data. Where σ is the ionic conductivity, σ_o is the pre-exponential factor, $E_a$is the activation energy, R is the universal gas constant and T is the absolute temperature. The activation energy was estimated by extracting the slope of the ln of the conductivity and the inverse of the temperature and multiplying it by R.

EIS Before and After cycling of Liquid and Solid TEAOH EDLC devices

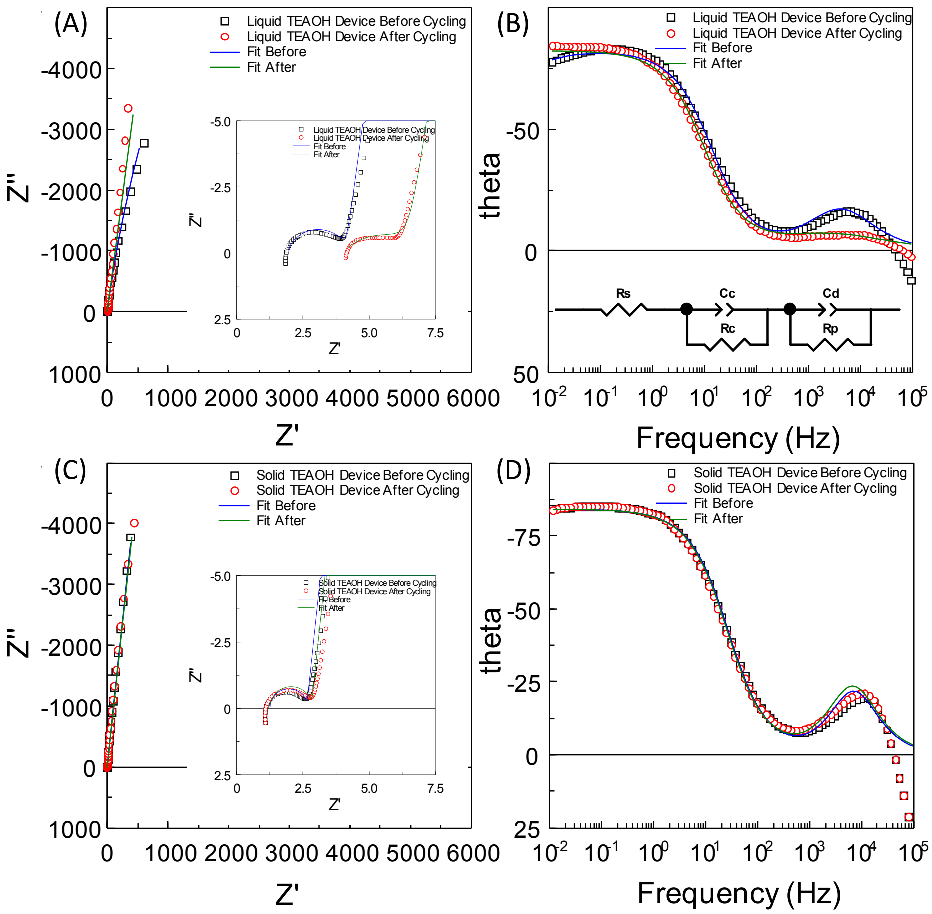

Figure S3: Nyquist (A and C) and Bode (B and D) plots of liquid (A and B) and solid (C and D) TEAOH devices before (black) and after (red) 10,000 charge discharge cycles at 5 mA cm^{-2}.

Fig. S3 (A and B) show that the ESR of the liquid TEAOH device increased from 1.9 Ω to 4.2 Ω after cycling, accompanying with this increase, was the increase of the phase angle in the liquid devices. This indicates the dehydration of the liquid electrolyte. In Fig. S3 (C and D), the ESR of the solid TEAOH device remained at 1.1 Ω for the duration of the cycling and maintained its phase angle at -84 degrees, suggesting a stable film and performance. The data was fitted with a typical equivalent circuit shown in the inset of Fig. S3(B), where the elements include the series resistance of the device (R_s), an RC element (C_c and R_c) that describes the interface between the electrolyte, electrode, and the current collector, and a second RC element (C_d and R_p) that describes the deliverable capacitance of the carbon double layer and the leakage resistance. For EDLC devices, R_p should ideally be sufficiently large. Constant phase elements are used to compensate the non-homogeneity of the system.