

Supporting Information for Enhancing Potential Window with Ionic Liquid/Water in Salt Mixture in co-doped Activated Carbon Electrodes for High-Energy Supercapacitors

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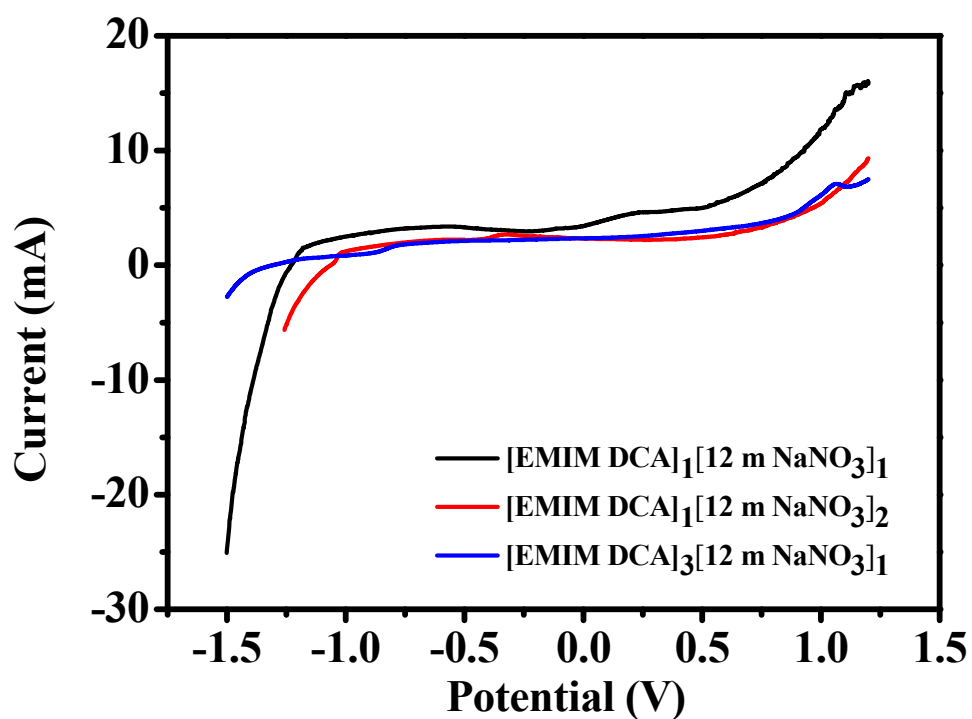


Figure S1. Linear sweep voltammetry (LSV) curves of [EMIM DCA]₁[12 m NaNO₃]_x (x = 1, 2, 3) electrolytes,

Table S1: Raman shifts and corresponding vibrational assignments for 1-ethyl-3-methylimidazolium dicyanamide (EMIM DCA), 12 molal (m) sodium nitrate (NaNO₃), and their binary electrolyte mixtures ([EMIM DCA]₁[12 m NaNO₃]_x, x = 1, 2, 3).

Sample	Raman Shift (cm ⁻¹)	Assignment
NaNO ₃	1029 / 1367	ν_1 NO ₃ ⁻ symmetric & ν_4 NO ₃ ⁻ asymmetric modes
	3335	O–H stretching
EMIM DCA	2220	C≡N stretching (DCA ⁻)
	2936	C–H stretching (imidazolium ring)
	2205	C≡N stretching (DCA ⁻)
[EMIM DCA] ₁ [12 m NaNO ₃] ₁	2945	C–H stretching (imidazolium ring)
	1054 / 1386	ν_1 NO ₃ ⁻ symmetric & ν_4 NO ₃ ⁻ asymmetric modes
	3447	O–H stretching
	2216	C≡N stretching (DCA ⁻)
[EMIM DCA] ₁ [12 m NaNO ₃] ₂	2974	C–H stretching (imidazolium ring)
	1054 / 1386	ν_1 NO ₃ ⁻ symmetric & ν_4 NO ₃ ⁻ asymmetric modes
	3478	O–H stretching
	2216	C≡N stretching (DCA ⁻)
[EMIM DCA] ₁ [12 m NaNO ₃] ₃	2989	C–H stretching (imidazolium ring)
	1054 / 1386	ν_1 NO ₃ ⁻ symmetric & ν_4 NO ₃ ⁻ asymmetric modes
	3503	O–H stretching
	2216	C≡N stretching (DCA ⁻)

Table S2: FTIR absorption bands and their corresponding vibrational assignments for EMIM DCA, 12 m NaNO₃, and their binary electrolyte mixtures ([EMIM DCA]₁[12 m NaNO₃]_x, x = 1, 2, 3).

Sample	FTIR Band (cm ⁻¹)	Assignment
NaNO ₃	3335	O–H stretching (free water)
	1341	NO ₃ ⁻ bending
EMIM DCA	2127	C≡N stretching (DCA ⁻)
	1343	N–C–N bending (DCA ⁻)
	1573	Aromatic C–H stretching (imidazolium ring)
	1163/620	Aromatic C–H / C–N ring modes
[EMIM DCA] ₁ [12m NaNO ₃] ₁	3335	O–H stretching (free water)
	2126	C≡N stretching (DCA ⁻)
	1343	N–C–N bending (DCA ⁻)
	1573 / 620	Aromatic C–H / C–N ring modes
[EMIM DCA] ₁ [12m NaNO ₃] ₂	3335	O–H stretching
	2126	C≡N stretching (DCA ⁻)
	1343	N–C–N bending
	1163 / 620	Aromatic C–H / C–N ring modes
	1341	NO ₃ ⁻ bending
EMIM DCA] ₁ [12m NaNO ₃] ₃	3335	O–H stretching (free water)
	2125	C≡N stretching (DCA ⁻)
	1343	N–C–N bending (DCA ⁻)
	1163 / 620	Aromatic C–H / C–N ring modes
	1341	NO ₃ ⁻ bending

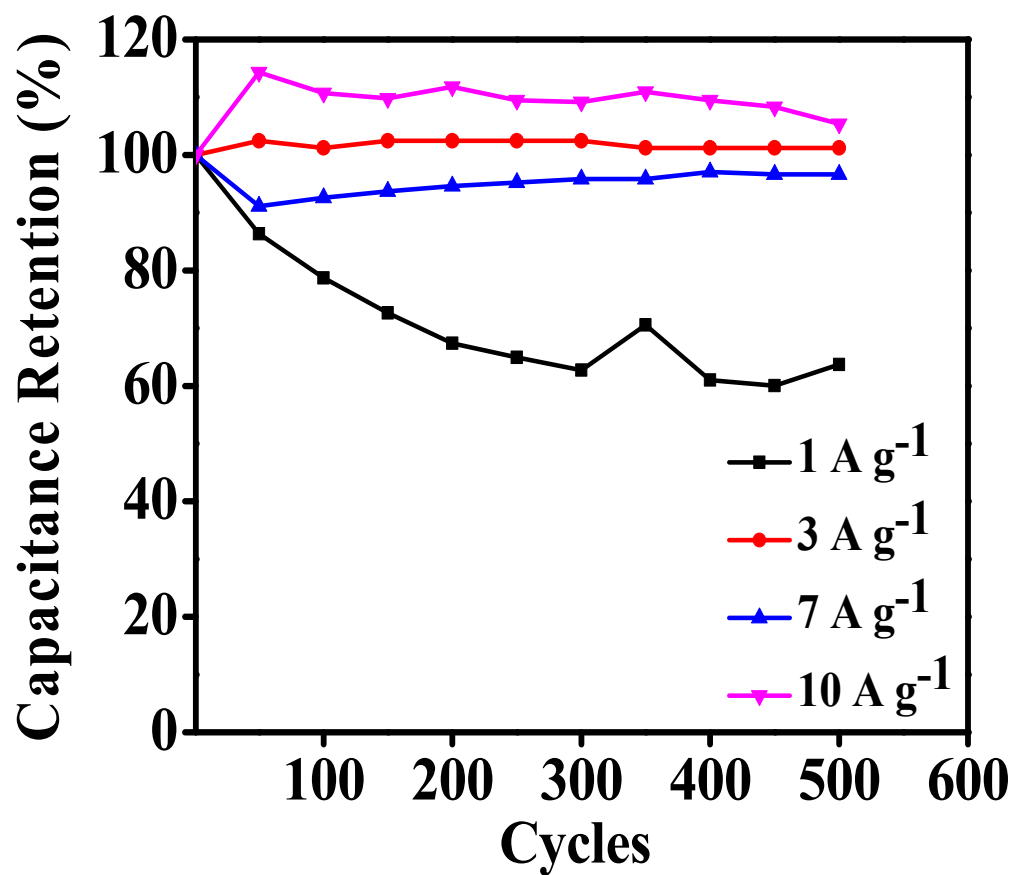


Figure S2. Cycling performance of the N,S-AC//N,S-AC supercapacitor in [EMIM DCA]₁[12 m NaNO₃]₁ at low and high current densities.