

Supporting Information

Link between Alkali Metals in Salt Templates and in Electrolytes for Improved Carbon-based Electrochemical Capacitors

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Table S1. Conductivity and pH of studied hydroxide solutions as electrolytes

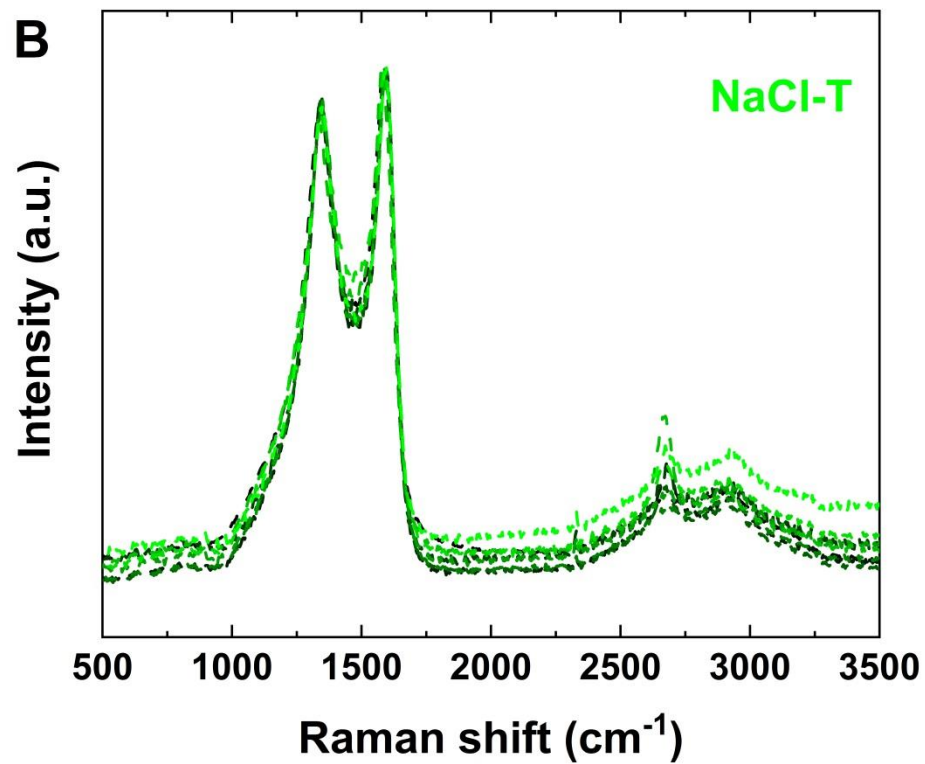
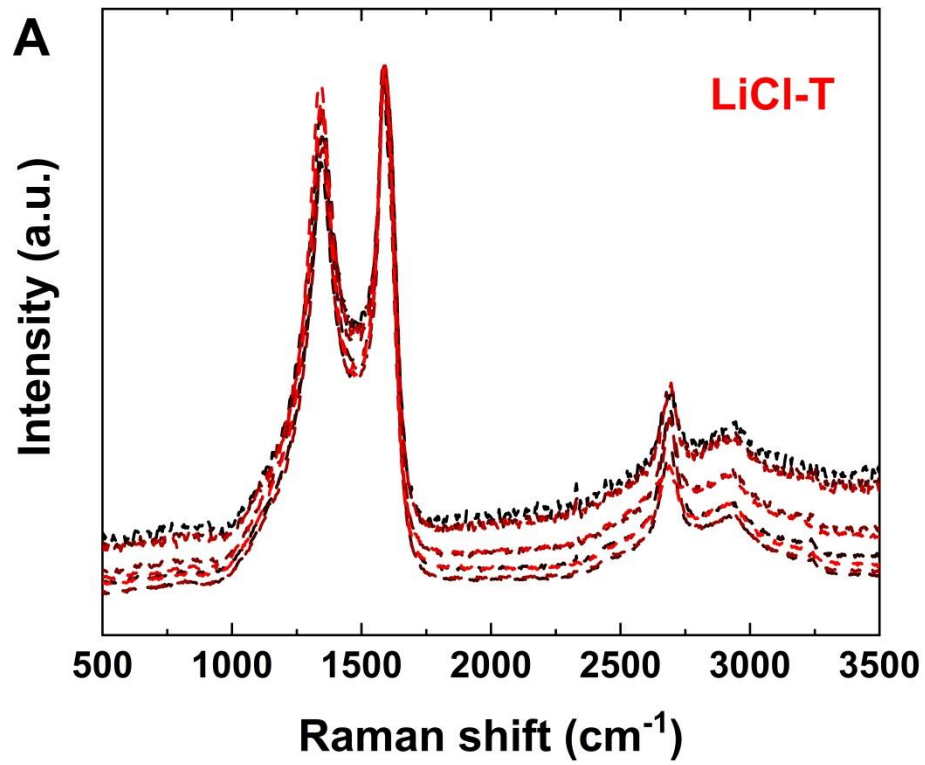
Property	1 mol L⁻¹ LiOH	1 mol L⁻¹ NaOH	1 mol L⁻¹ KOH	1 mol L⁻¹ RbOH	1 mol L⁻¹ CsOH
pH	14	14	14	14	14
Conductivity, mS cm ⁻¹	155	169	178	207	218

Physico-chemical properties of electrolytic solutions used during electrochemical studies of salt-soft template materials.

Table S2. Structure characterization (I_D/I_G) of carbon samples and electrodes by Raman spectroscopy

Material	I_D/I_G Carbon powder	I_D/I_G Electrode material
LiCl-T	0.89	0.90
NaCl-T	0.93	0.90
KCl-T	0.91	0.93
RbCl-T	0.89	0.91
CsCl-T	0.89	0.90

Addition of conductive carbon and polymer binder in the 5 wt.% ratio to the active material (90 wt.%) allows electrochemical performance of synthesized carbons to be studied. Moreover, **Figure S1** presents 11 Raman spectra collected over the 11 different points on the sample for LiCl-T, NaCl-T, KCl-T and CsCl-T pristine materials: with examples of heterogeneity (NaCl-T and KCl-T) and homogeneity (CsCl-T). RbCl-T reveals similar dispersion over the recorded Raman spectra as CsCl-T, thus it has not been displayed here. However, materials exhibiting second order peaks (LiCl-T, NaCl-T and KCl-T) are characterized by various intensity of 2D peak. Especially for NaCl-T and KCl-T spectra without evidence of this peak were also found during sample mapping. LiCl-T as the most graphitic material with consistent structural analysis (XRD, Raman and TEM images), as its Raman spectra almost overlapped each other, all exhibiting 2D peak.



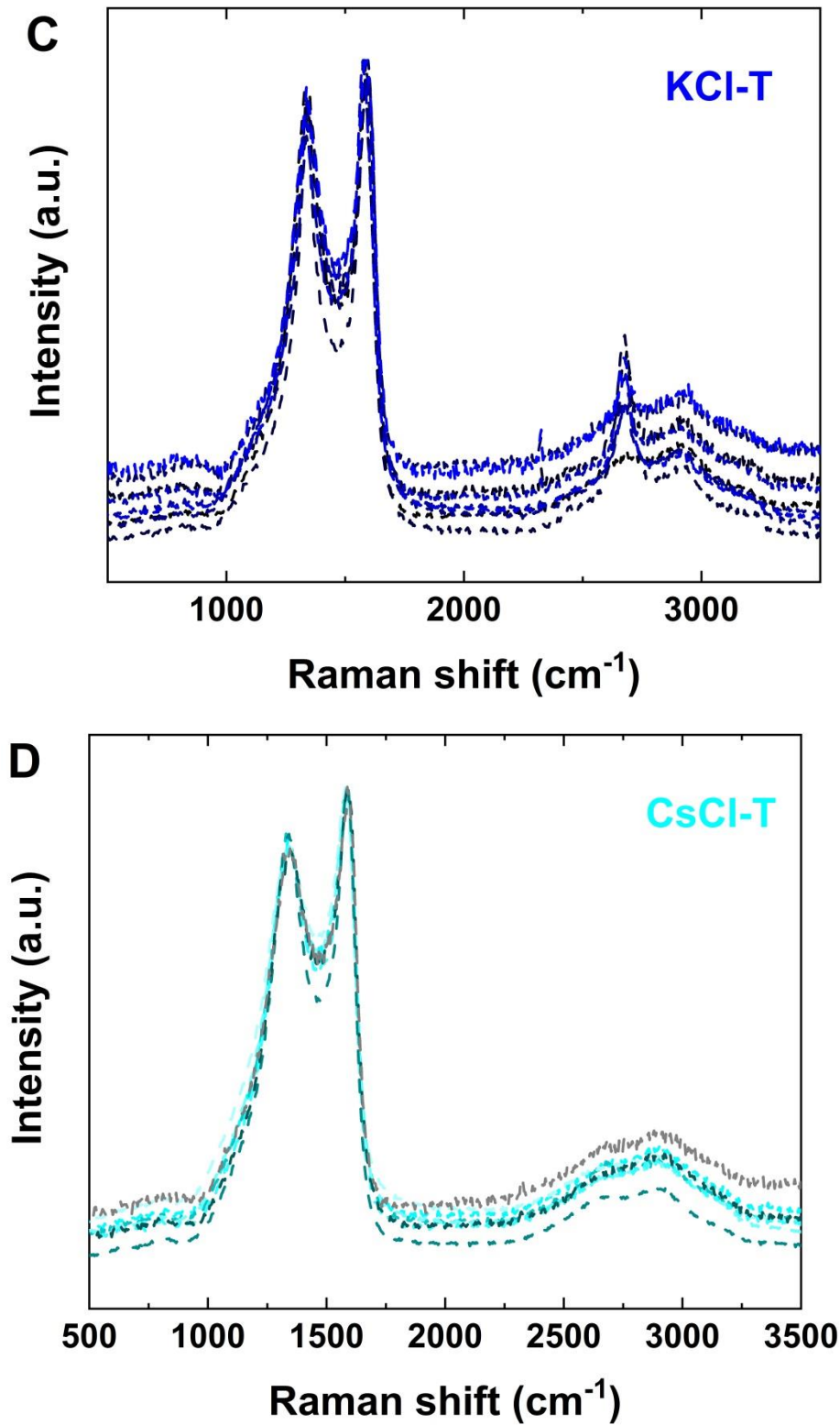


Figure S1. Normalized Raman spectra collected at 11 different places over the: LiCl-T (a); NaCl-T (b); KCl-T (c) and CsCl-T (d) pristine carbon sample.

Table S3. The textural properties of the carbon electrode materials by N₂ and CO₂ adsorption

Material	N ₂ adsorption					CO ₂ adsorption	
	S _{BET} m ² g ⁻¹	S _{CUM} m ² g ⁻¹	V _{MICRO} cm ³ g ⁻¹	L _{0 MICRO} <2 nm	V _{MESO} cm ³ g ⁻¹	S _{BET} m ² g ⁻¹	V _{MICRO} cm ³ g ⁻¹
LiCl-T	1066	1072	0.38	0.76	0.46	651	0.29
NaCl-T	1158	1136	0.43	0.77	0.09	702	0.30
KCl-T	1353	1388	0.51	0.74	0.06	925	0.52
RbCl-T	1764	1641	0.65	0.81	0.11	1141	0.48
CsCl-T	2143	1828	0.81	0.91	0.16	1109	0.57

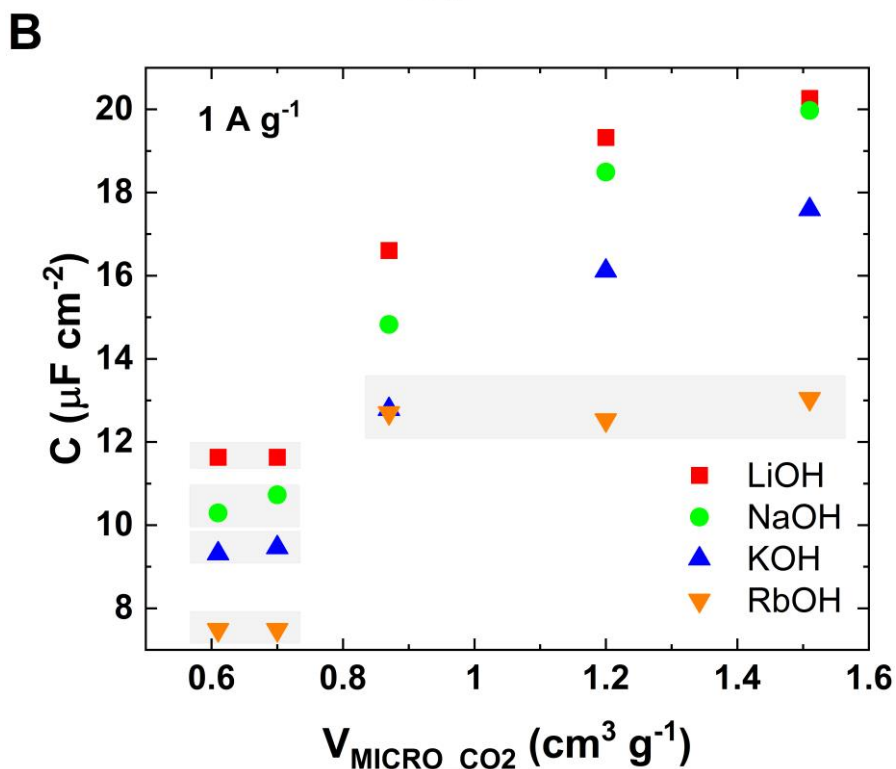
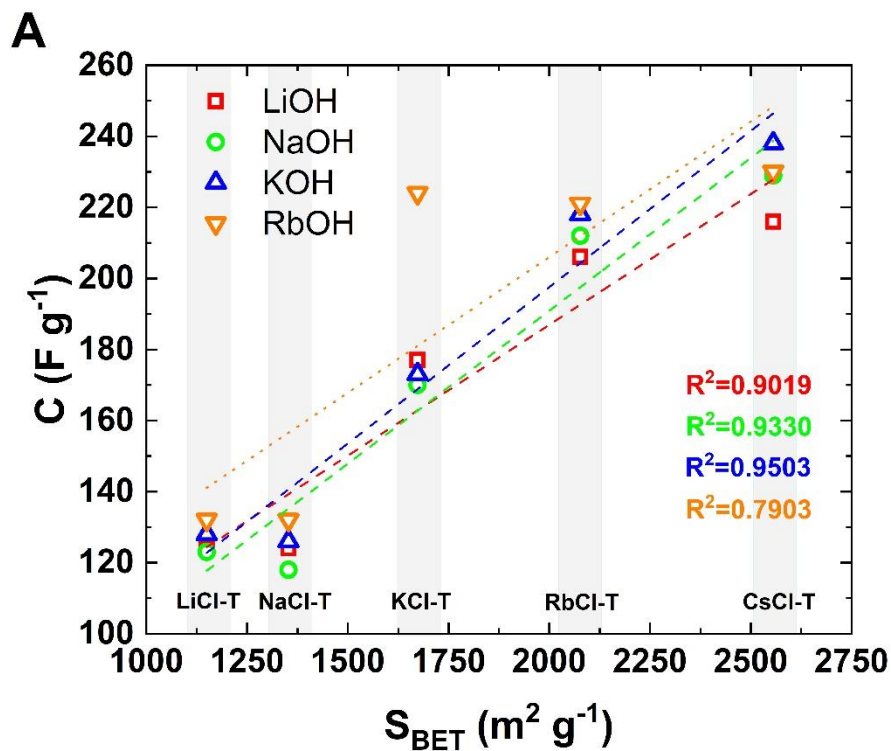
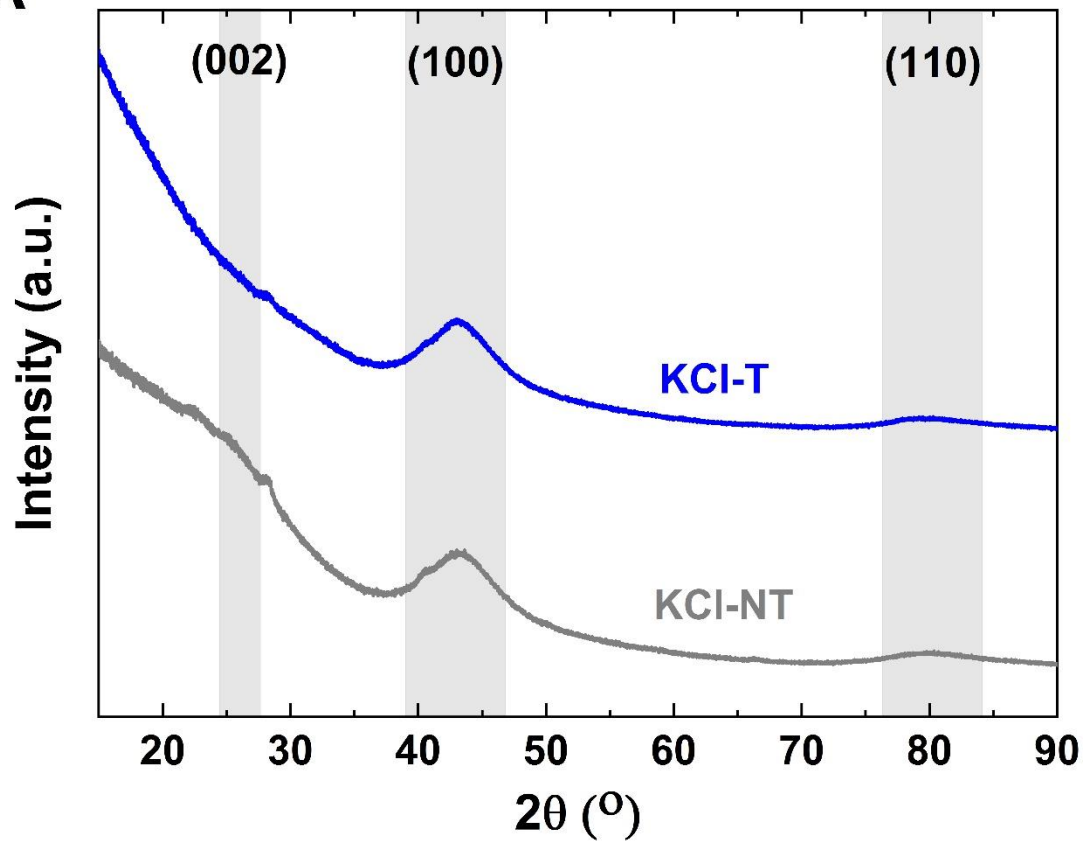
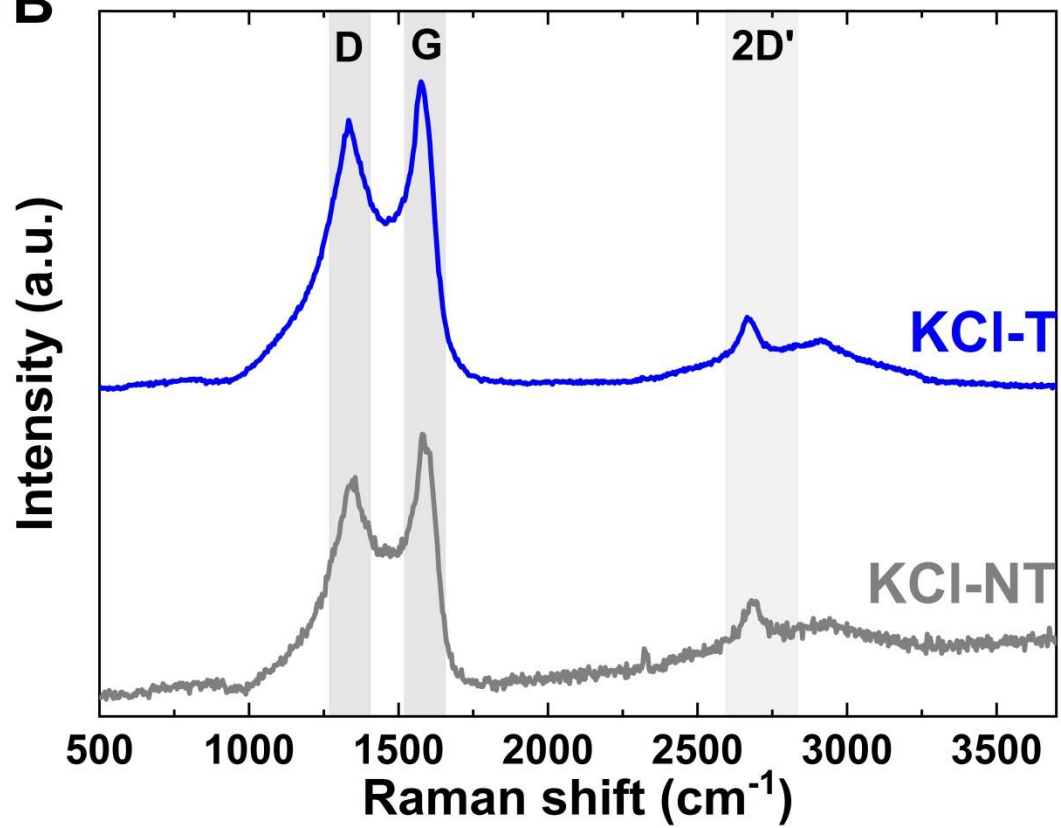


Figure S2. Correlation of carbon texture properties with electrochemical performance in the form of: gravimetric capacitance as the function of S_{BET} (a); specific capacitance in the function of micropore volume found by CO_2 adsorption (b).

A**B**

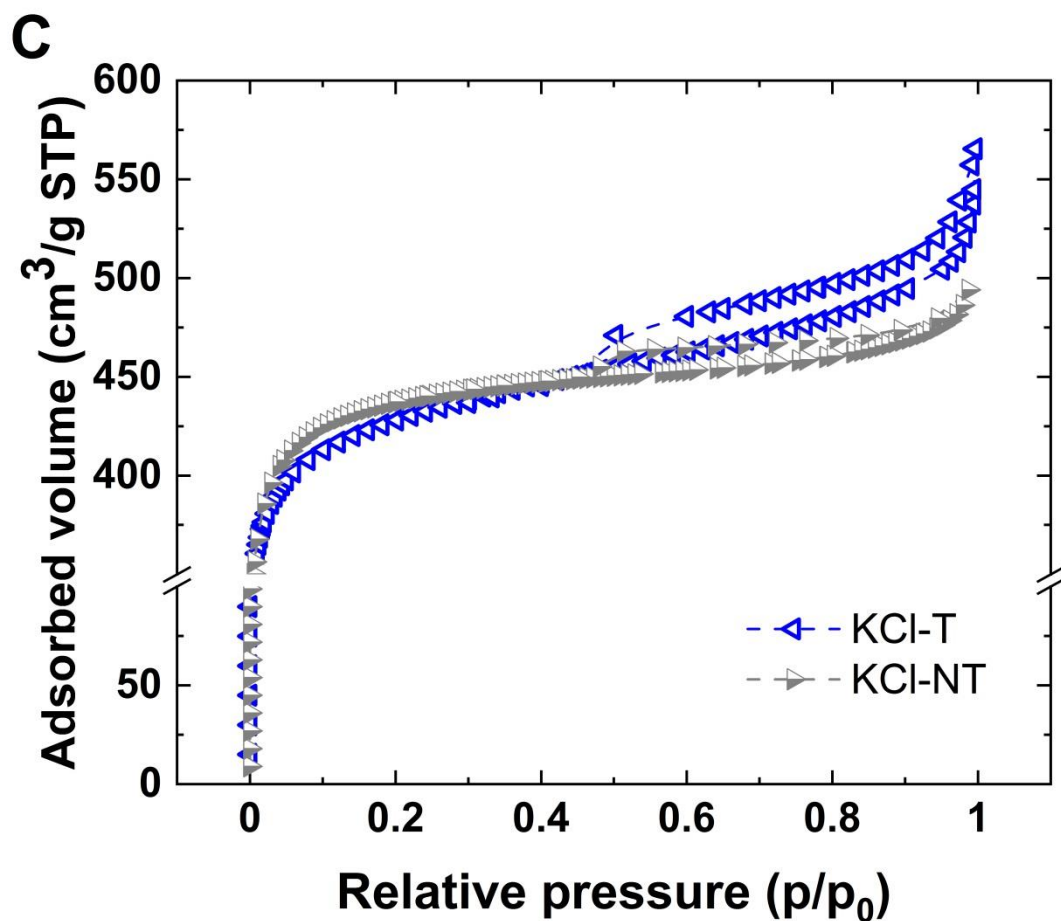


Figure S3. Comparison of structural and textural features of KCl-T and KCl-NT: XRD pattern (a); Raman spectra (b); isotherm of N₂ adsorption/desorption at 77K (c).

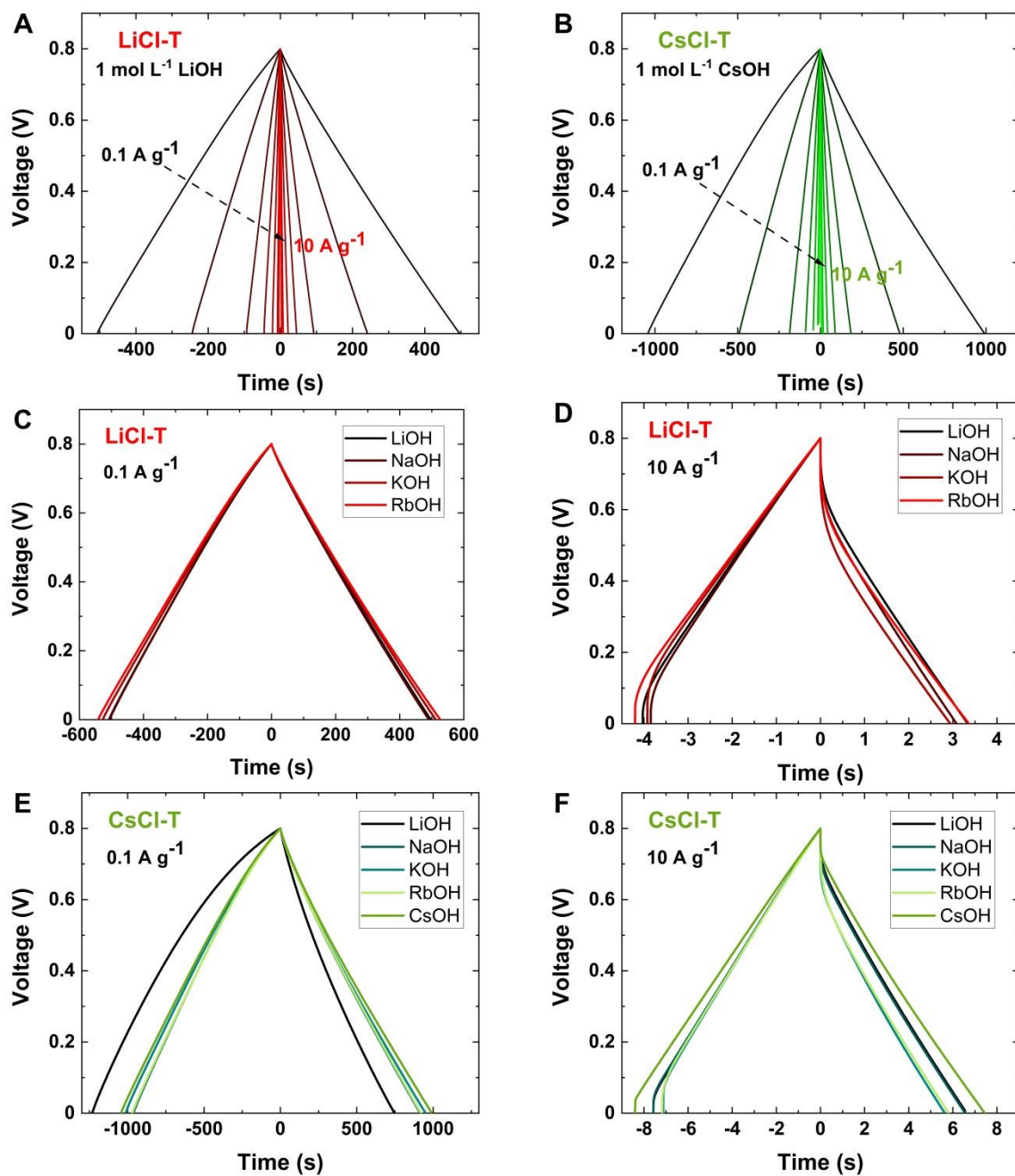
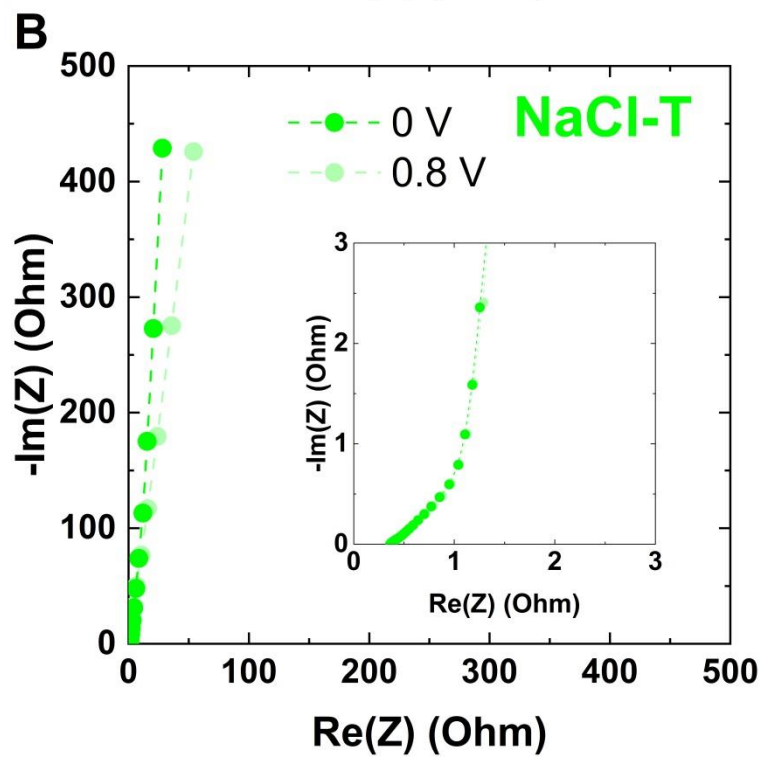
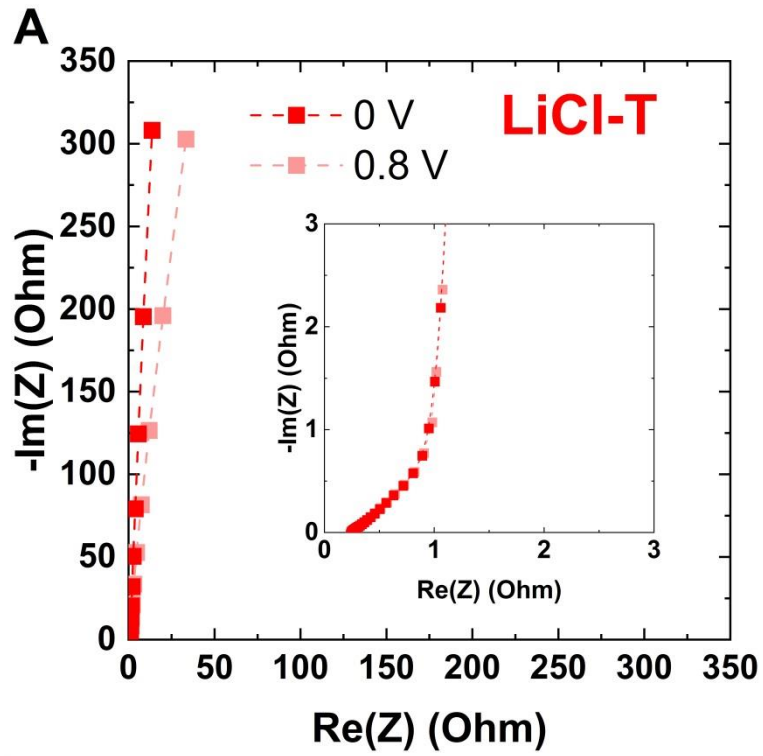
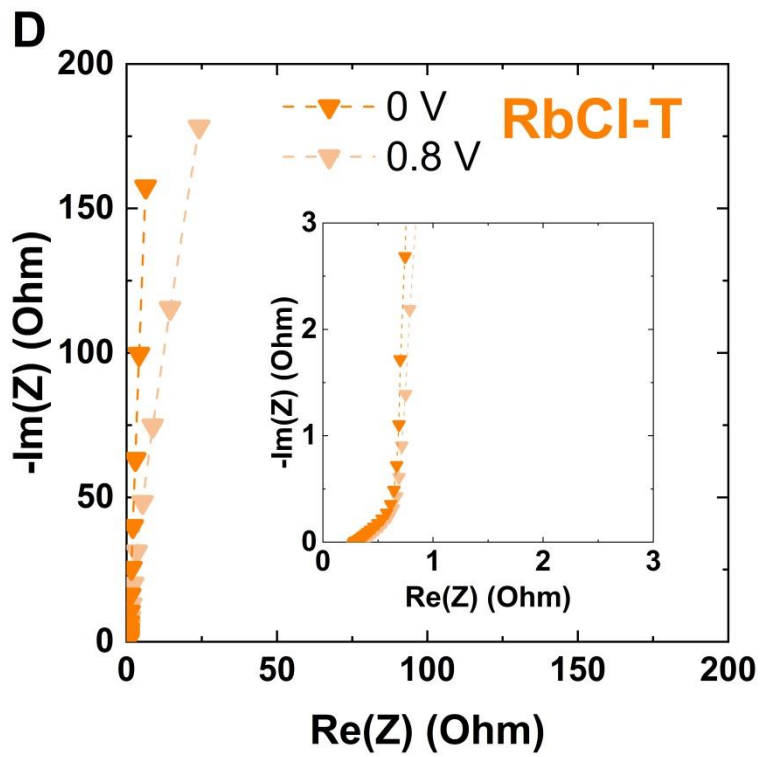
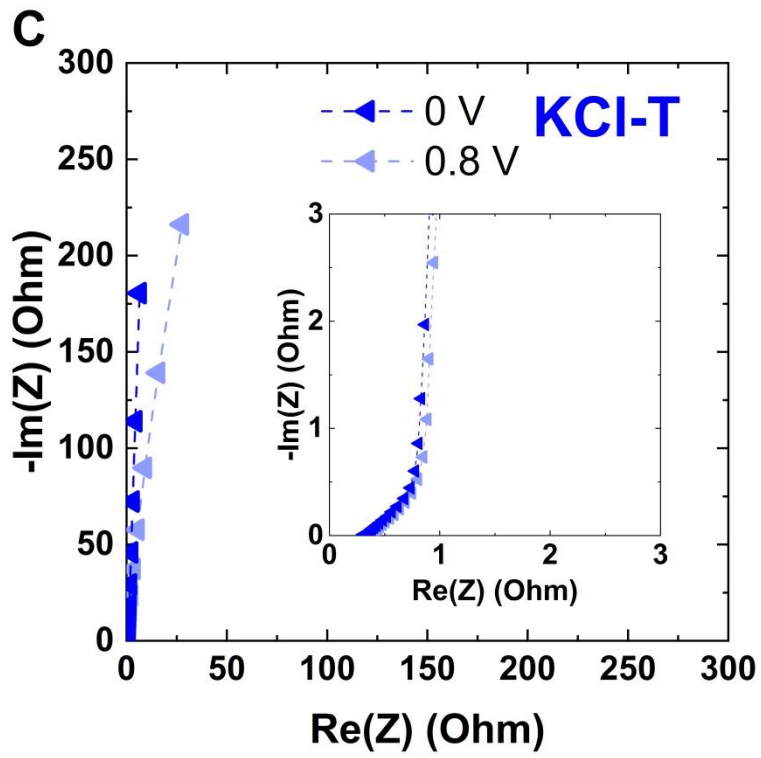


Figure S4. Constant current charge/discharge for: LiCl-T with 1 mol L⁻¹ LiOH (a); CsCl-T with 1 mol L⁻¹ CsOH (b); LiCl-T with 1 mol L⁻¹ MeOH (Me=Li⁺, Na⁺, K⁺, Rb⁺) at 0.1 A g⁻¹ (c); LiCl-T with 1 mol L⁻¹ MeOH (Me=Li⁺, Na⁺, K⁺, Rb⁺) at 10 A g⁻¹ (d); CsCl-T with 1 mol L⁻¹ MeOH (Me=Li⁺, Na⁺, K⁺, Rb⁺, Cs⁺) at 0.1 A g⁻¹ (e); CsCl-T with 1 mol L⁻¹ MeOH (Me=Li⁺, Na⁺, K⁺, Rb⁺, Cs⁺) at 10 A g⁻¹ (f).





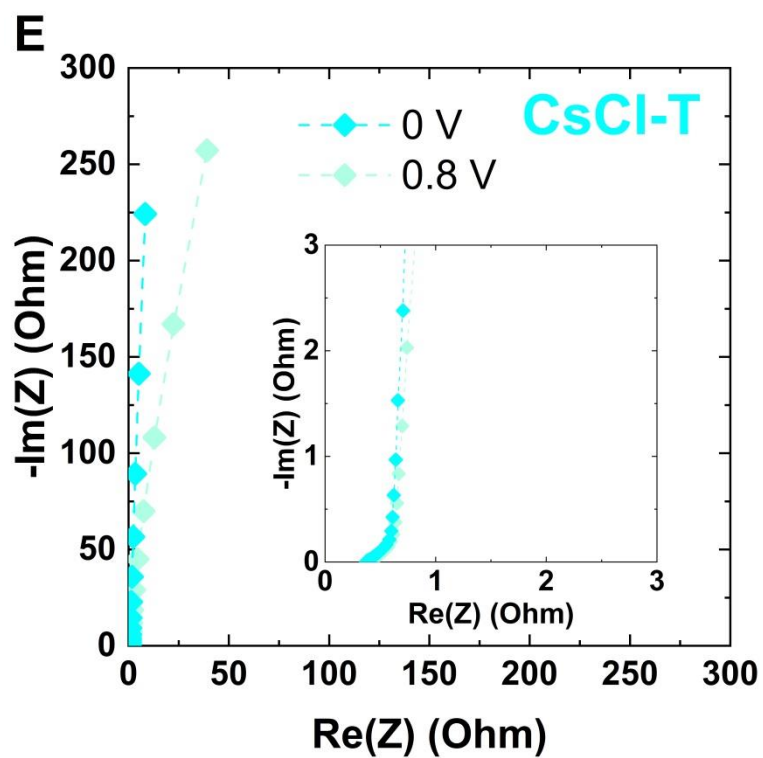


Figure S5. Nyquist plots at 0 V and 0.8 V for: LiCl-T with 1 mol L⁻¹ LiOH (a); NaCl-T with 1 mol L⁻¹ NaOH (b); KCl-T with 1 mol L⁻¹ KOH (c); RbCl-T with 1 mol L⁻¹ RbOH (d) and CsCl-T with 1 mol L⁻¹ CsOH (e).

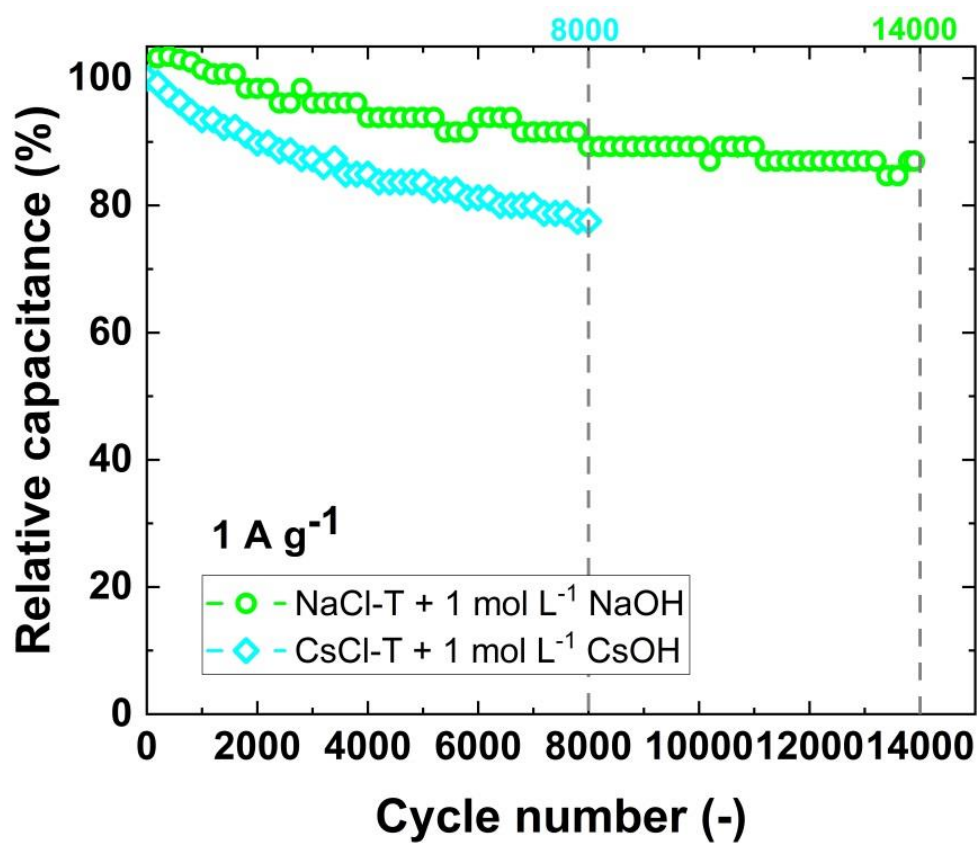


Figure S6. Cycling stability at 1 A g^{-1} constant current charge/discharge up to 0.8 V for ECs with: NaCl-T and 1 mol L^{-1} NaOH; CsCl-T and 1 mol L^{-1} CsOH