Supporting Information for

Effect of various electrolyte cations on electrochemical performance of polypyrrole/RGO based supercapacitors

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1. Specific surface area and pore size distribution analysis

The specific surface area (SSA) and porosity of the as-prepared samples was analyzed by nitrogen adsorption-desorption technique. The SSA and pore size distribution were determined via the Brunauer-Emmett-Teller (BET) method and non-local density functional theory (NLDFT) method.



Figure S1. N₂ adsorption-desorption isotherms and pore size distribution (the inset)

curves of PPy/RGO composites and pure PPy.

2. SEM and the thickness of the nano-sheet PPy/RGO



Figure S2. High-resolution SEM image of the nano-sheet PPy/RGO, the sign is the thickness of the nano-sheet.

3. EIS analysis and Zsimpwin simulation

The interfacial charge transfer of the electrode in various electrolytes was simple equivalent to a model as shown in Scheme S1 by the Zsimpwin simulation. The good fit quality is obtained using this model, and as shown in Fig. S1, there is a very good adjustment between the experimental data and calculated data. Moreover, in this model, R_s and R_{ct} represents the ohmic resistance and interfacial charge transfer resistance, respectively, and the parameter values in various electrolytes are shown in Table S1.





Scheme S1. Schematic illustration of the analog equivalent circuit for Zsimpwin simulation.

Figure S3. Nyquist plots of the SCs in various electrolytes and their fitting curves by Zsimpwin simulation: (a) HCl, (b) LiCl, (c) NaCl, and (d) KCl.

Electrolyte	$R_s (\Omega \ { m cm}^2)$	R_{ct} (Ω cm ²)	χ^2
3M HCl	0.52	0.19	1.631e-03
3M LiCl	1.94	8.42	9.607e-04
3M NaCl	1.86	5.15	2.283e-03
3M KCl	0.58	1.31	1.864e-03

Table S1. Results of the equivalent circuit fitting.



Figure S4. Nyquist plots of the SCs after 10000 cycles test in various electrolytes.



4. XPS C 1s core-line spectra analysis



5. EDS measurement of the PPy/RGO electrodes before and after 10000 cycles test.

The electron dispersive spectroscopy (EDS) was performed to verify the element content and distribution of the PPy/RGO electrodes before and after 10000 cycles test in various electrolytes.

Table S2. Element content and distribution of PPy/RGO electrodes before and after10000 cycles test in various electrolytes.

Element type	Initial PPy/RGO	HCl	LiCl	NaCl	KCl
С	72.82%	73.18%	72.40%	69.50%	68.83%
Ν	11.92%	10.37%	10.27%	10.85%	10.42%
0	12.91%	14.06%	15.86%	17.96%	19.38%
S	2.27%	0.076%	0.077%	0.074%	0.048%
Cl		2.38%	1.37%	1.50%	1.47%
Na				0.08%	
K					0.19%



Figure. S6 SEM image of PPy/RGO electrodes before 10000 cycles test and the corresponding

elemental mapping images for each element.



Figure. S7 SEM image of PPy/RGO electrodes after 10000 cycles test in HCl and the corresponding elemental mapping images for each element.



Figure. S8 SEM image of PPy/RGO electrodes after 10000 cycles test in LiCl and the corresponding elemental mapping images for each element.



Figure. S9 SEM image of PPy/RGO electrodes after 10000 cycles test in NaCl and the

corresponding elemental mapping images for each element.



Figure. S10 SEM image of PPy/RGO electrodes after 10000 cycles test in KCl and the corresponding elemental mapping images for each element.