Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting Information

Transition of Interfacial Capacitors in Electrowetting on Graphite Surface by Ion Intercalation

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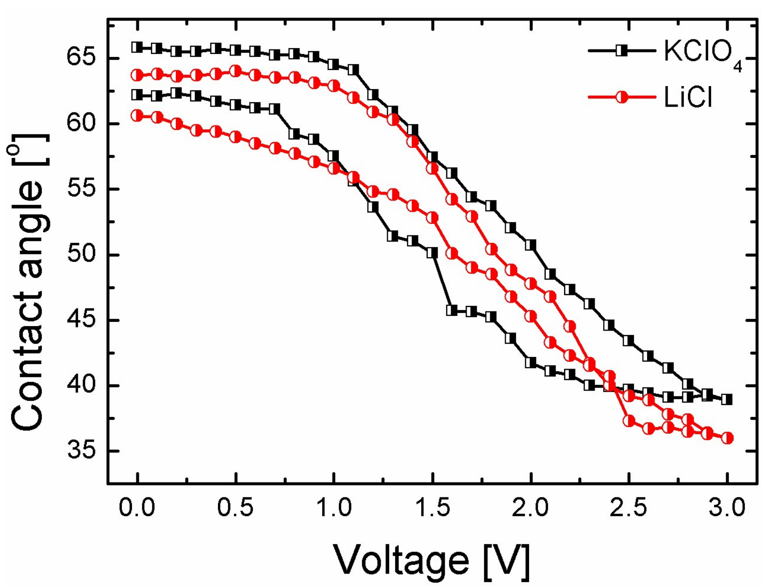


Figure S1: Comparison of Electrowetting response of 1 mM electrolyte aqueous solutions of $KClO_3$ and LiCl. The electrowetting behaviour of both the anions is similar with a slight difference in transition voltage. ClO_4^- is well known intercalation anion in graphite and previously used by Zhang *et al.* for intercalation/de-intercalation based electrowetting experiments.[1] In the present study, LiCl has been used as it is very commonly used salt in electrowetting experiment[2, 3] and Cl^- is also has been used for intercalation based graphene exfoliation.[4, 5]

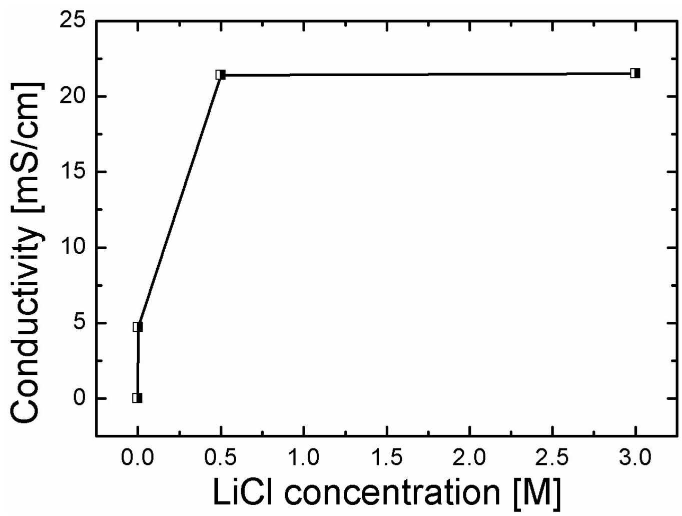


Figure S2: Electrical conductivity of the electrolyte aqueous solution as a function of LiCl concentration. Electrical impedance spectroscopy (EIS) measurements were done only for the high conductive solutions (0.5 and 3 M LiCl concentration).

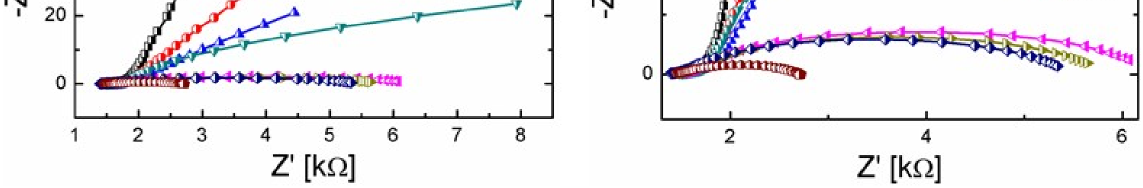
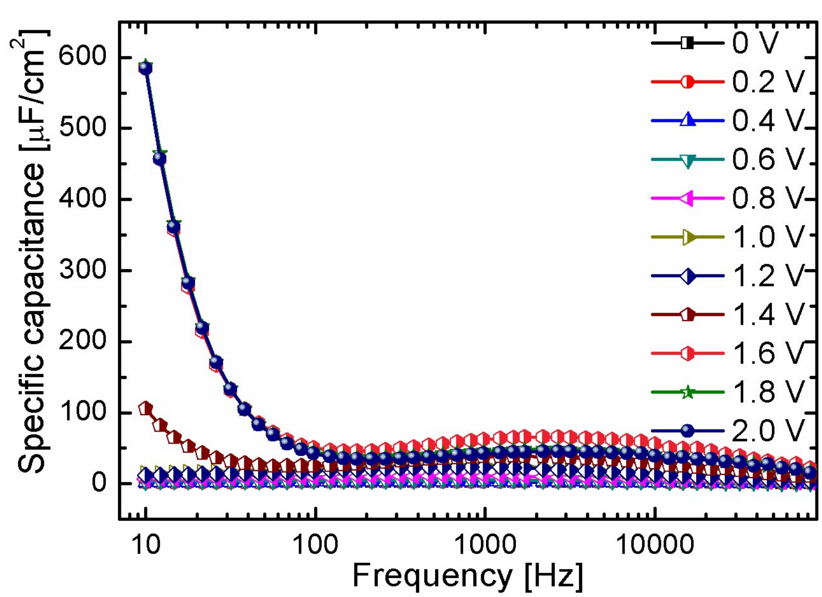


Figure S3: (a) Nyquist plots (the plot of imaginary part of the impedance (Z'') as a function of real part of the impedance (Z'); Total Impedance $Z = Z' + jZ''$, where j is the imaginary unit) of the EIS measurements of 0.5 M LiCl aqueous solution at different voltages. (b) Magnified image of the Nyquist plots.

Figure S4: Specific capacitance (capacitance per unit area) as a function of applied frequency for different applied bias. Capacitance was calculated via equation (1) and (2) using EIS measurements of 0.5 M LiCl aqueous solution.



Concentration Of LiCl	**Voltage (V)**	**Solution Resistance (R_S) (Ω)**	**Charge Transfer Resistance (R_{CT}) (Ω)**	**Constant Phase Element (CPE) (F $s^{\alpha-1}$)**	$\alpha = \left\lvert \frac{d\log Z''}{d\log f} \right\rvert$
	0.0	761.4	9.85 X 10^{11}	4.971 X 10^{-8}	0.951
	0.2	688.5	9.96 X 10^{11}	5.233 X 10^{-8}	0.943
	0.4	701.4	9.95 X 10^{11}	7.256 X 10^{-8}	0.938
	0.6	679.1	9.16 X 10^{11}	9.713 X 10^{-8}	0.899
	0.8	700.2	9.96 X 10^{11}	1.746 X 10^{-7}	0.878

	1.0	717.9	4.44×10^{6}	3.100×10^{-7}	0.876
3 M	1.2	567.6	3.78×10^{2}	3.359×10^{-7}	0.856
	1.4	567.6	23970	2.922×10^{-7}	0.806
	1.6	548.7	12960	1.702×10^{-7}	0.796
	1.8	552.4	16430	1.911×10^{-7}	0.801
	2.0	600.8	10180	1.371×10^{-7}	0.807
	2.2	266	8762	2.41×10^{-7}	0.761
	2.4	282.4	7666	2.558×10^{-7}	0.766
	2.6	246.9	3003	2.781×10^{-7}	0.748
	2.8	226	1600	3.816×10^{-7}	0.650
	0.0	1632	1.00×10^{12}	1.765×10^{-7}	0.843
	0.2	1641	$1 .00 \times 10^{12}$	1.881×10^{-7}	0.878
	0.4	1636	1.00×10^{12}	2.431×10^{-7}	0.886
	0.6	1630	9.91×10^{11}	3.508×10^{-7}	0.851
	0.8	1632	5.77×10^{11}	6.539×10^{-7}	0.814
	1.0	1618	1.00×10^{12}	1.229×10^{-6}	0.744
0.5 M	1.2	1606	2.27×10^{5}	9.579×10^{-7}	0.753
	1.4	1558	1.15×10^{4}	7.831×10^{-7}	0.68
	1.6	1530	4927	9.092×10^{-7}	0.61
	1.8	1508	4431	8.998×10^{-7}	0.63
	2.0	1536	4376	8.587×10^{-7}	0.62
	2.2	1484	4295	9.070×10^{-7}	0.634
	2.4	1446	4105	8.581×10^{-7}	0.64
	2.6	1411	2196	8.923×10^{-7}	0.611
	2.8	1476	1239	1.061×10^{-6}	0.549

Table S1: Equivalent circuit elements (Solution resistance (R_S), Charge transfer resistance (R_{CT}), and Constant phase element (CPE)) values extracted from the fitting with the experimental data of the impedance measurements. α Values for different applied bias are also reported. α s were calculated via line fitting on the graph between $\log Z''$ and $\log f$.

References:

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