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Electronic Supplementary Information

Effect of the ionic size of small quaternary ammonium BF₄ salts on electrochemical dou ble layer capacitors

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Figure S1. Analysis of the pore structure of the activated carbon (MSP20)

(a) N_2 adsorption/desorption isotherm and related results for MSP20 (the specific surface area of MSP20 was determined to be 2379 m² g⁻¹). (b) BJH pore distributions, and (c) micropore (MP) size distributions obtained through the MP plot method.

	Table S1.	Pore	properties	of the	activated	carbon	(MSP20)
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Sample	S _{BET} ^[a]	$V_{T}^{[b]}$		P _r [c]		
			micro	meso & macro		
MSP20	2379.6	1.04	90.0	10.0		

[a] Specific surface area $(m^2 \cdot g^{-1})$ [b] Total pore volume $(cm^3 \cdot g^{-1})$ [c] Pore ratio (%)

The Arrhenius equation of conductivity (Equation S1) is used to determine the activation ener gy of each ionic solution. A logarithmic Arrhenius plot of the conductivity is shown in Fig. S 1.



Figure S2. Logarithmic Arrhenius plot of conductivity.

Table S2. Activation energy values for the conductivity of the electrolytes

Electrolyte (1.0 M in A	E _a (kJ/mol)
N)	
TEA BE.	6 703
I LA DF4 TMEA DE	6.705
I MEA BF ₄	0.485
TMPA BF ₄	6.589
DEDMA BF ₄	6.709
TEMA BF ₄	6.581

The activation energy is obtained from the slope of each electrolyte solution in Fig. S1. The a ctivation energy for each solution decreases in the order (Table S1): DEDMA BF₄ \approx TEA BF $_4 >$ TMPA BF₄ \approx TEMA BF₄ > TMEA BF₄. The activation energy does not correlate with the conductivity values listed in Table 1. Thus, the barriers to conduction for each solution are no t significantly different to influence the movement of charge carriers in the bulk solutions.



Figure S3. Cyclic voltammograms acquired using coin cells. The current values were co nverted to specific capacitance values using equations (2) and (3). The scan rate: 10 mV s⁻¹.



Figure S4. Potential versus time plots from galvanostatic charge and discharge tests. Th e current density for the tests: 2 mA cm⁻².