## **Supplementary Information**

## Temperature dependence of ion diffusion coefficients in NaCl electrolyte confined within graphene nanochannels

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		Activation on	oray (kl mol-1)	
		Activation energy (kJ mol <sup>-1</sup> )		
		Na <sup>+</sup> ion	Cl⁻ ion	
Bulk		17.95	14.76	
Neutral channel width (Å)	7	N/A	N/A	
	12	8.18	7.30	
	16	9.62	9.03	
Negatively	7	5.51	N/A	
harged channel	12	8.77	5.97	
width (Å)	16	10.52	9.21	
Positively	7	N/A	5.46	
arged channel	12	6.41	8.39	
width (Å)	16	9.35	12.42	

**Table S1** Activation energies for ion diffusion coefficients in bulk system and nanochannels

		Hydration number (#)		
	_	Na <sup>+</sup> ion	Cl⁻ ion	
Bulk		5.6	7.6	
Neutral channel width (Å)	7	N/A	N/A	
	12	5.3	6.6	
	16	5.5	7.0	
Negatively	7	4.1	N/A	
charged channel	12	5.4	6.7	
width (Å)	16	5.4	6.9	
Positively	7	N/A	5.0	
charged channel	12	5.3	6.5	
width (Å)	16	5.4	7.0	

**Table S2** The hydration numbers of Na<sup>+</sup> and Cl<sup>-</sup> ions in bulk electrolyte and nanochannels at 298 K



**Fig. S1** Number density profiles in neutral and negatively charged graphene channels of (a) d = 16 Å, (b) d = 12 Å and (c) d = 7 Å at 283, 313 and 333 K. The left Y axes present the number densities of atomic oxygen (black lines) and hydrogen (red lines) in water molecules. The right Y axes present the number densities of Na<sup>+</sup> ions (blue lines) and Cl<sup>-</sup> ions (green lines). The solid lines, dash lines and dot lines represent the number densities at 283, 313 and 333 K, respectively.



**Fig. S2** (a) The number density profile of Na<sup>+</sup> ion in the negatively charged channel of 16 Å with distinct layers close to the surfaces and in the center region. (b) The diffusion coefficient of Na<sup>+</sup> ion in layers close to the surfaces and in the center region at different temperatures.



**Fig. S3** Number density profiles in positively charged graphene channels of (a) d = 16 Å, (b) d = 12 Å and (c) d = 7 Å at 298 K. The left Y axes present the number densities of atomic oxygen (black dash lines) and hydrogen (red dash lines) in water molecules. The right Y axes present the number densities of Na<sup>+</sup> ions (blue lines) and Cl<sup>-</sup> ions (green lines).



**Fig. S4** The concentration coefficient  $\tau$  for Na<sup>+</sup> and Cl<sup>-</sup> ions in (a) negatively charged and (b) positively charged channels at different temperatures.