

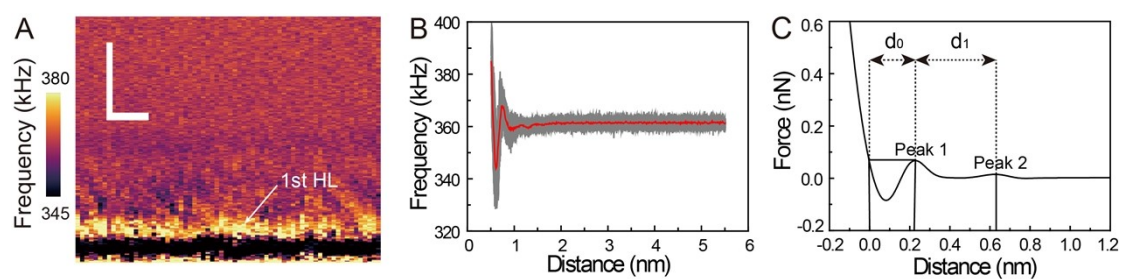
## Supporting Information

### **Probing the hydration friction of ionic interface at the atomic scale**

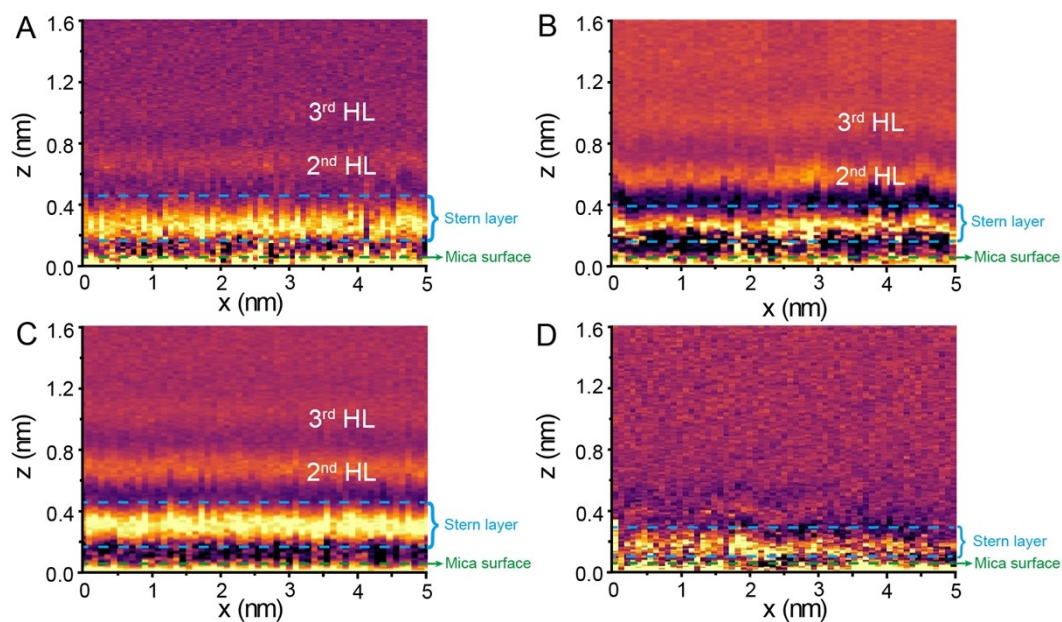
*Zibo Li, Qian Liu, Deliang Zhang, Yin Wang, Yuge Zhang, Qiang Li,\* and Mingdong Dong\**

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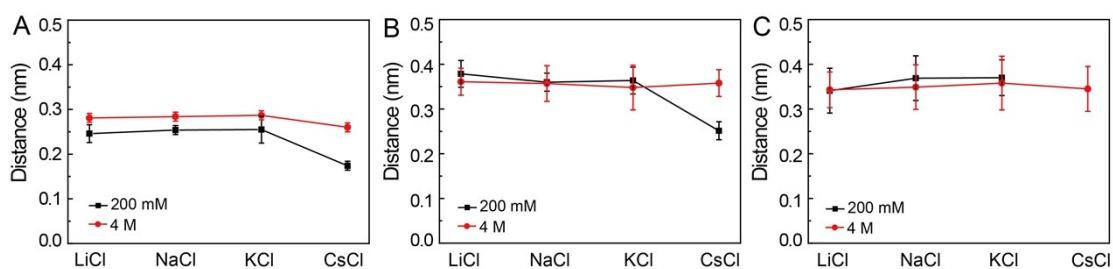
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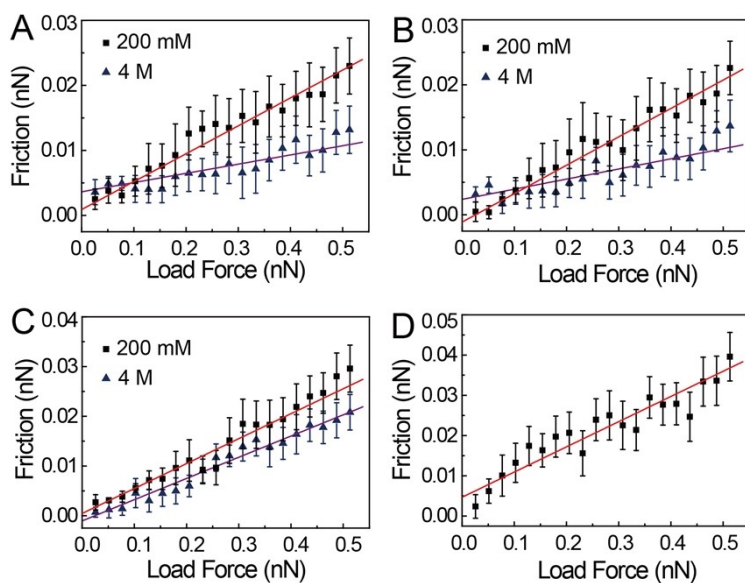
**Fig. S1.** (A) XZ mapping of the hydration layer in pure water. (B) Averaged  $\Delta f$  curves extracted from the XZ hydration layer mapping. (C) Force curves transferred from  $\Delta f$  curves in (B).



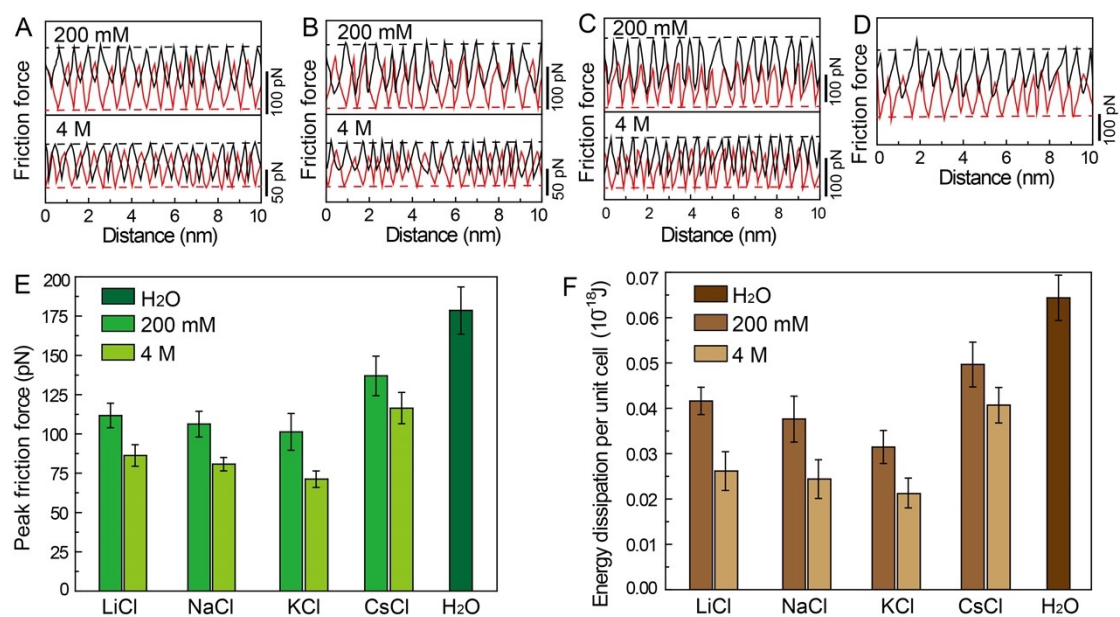
**Fig. S2.** XZ frame of the hydration layer recorded at 200 mM electrolyte solution (A) LiCl, (B) NaCl, (C) KCl, (D) CsCl.



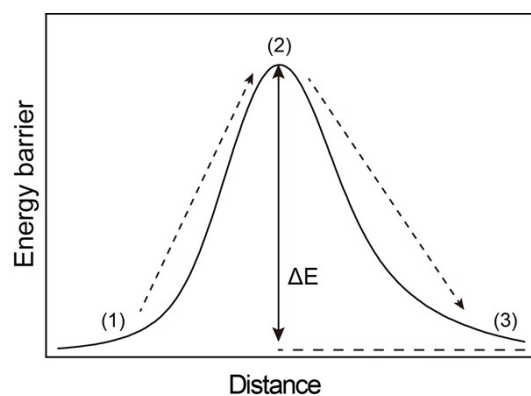
**Fig. S3.** Linear plot of the distances in Table 1. (A)  $d_0$ , (B)  $d_1$ , (C)  $d_2$ .



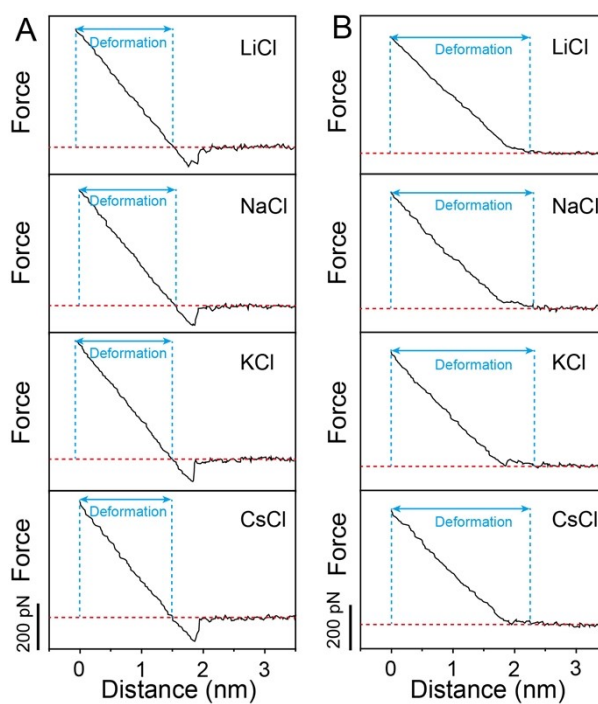
**Fig. S4.** Linear fitting friction-load force curves for (A) LiCl solution at 200 mM and 4 M, (B) NaCl solution at 200 mM and 4 M, (C) CsCl solution at 200 mM and 4 M, (D) pure water.



**Fig. S5.** Atomic-scale stick-slip curves on mica surface under load force of  $\sim 500$  pN, (A) in LiCl solution at 200 mM and 4 M, (B) in NaCl solution at 200 mM and 4 M, (C) in CsCl solution at 200 mM and 4 M, (D) in pure water. (E) Peak friction force in different electrolyte solutions. (F) Energy dissipation per unit cell in different electrolyte solutions.



**Fig. S6.** Schematic diagram of energy barrier ( $\Delta E$ ) during AFM tip sliding through hydrated cation.



**Fig. S7.** Force-distance curves recorded at 500 pN load force in (A) 200 mM and (B) 4 M electrolyte solution.