Supplementary Material (ESI) for *PCCP*

Electronic Supplementary Information:

Resonance Shear Measurement of Nanoconfined Ionic Liquids

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Characterization of the ILs

The ionic liquids were synthesized in our laboratory with great care and were transparent and colorless liquids. The halide content in $[C_4mim][BF_4]$ was maintained below the solubility limit of AgCl in water (1.4 mgL^{-1}), which was checked by adding $AgNO_3$ solution. For the $[C_4mim][NTf_2]$, halides in the aqueous phases in contact with the ILs could not be detected by using $AgNO_3$ solution. The water contents of $[C_4mim][BF_4]$ and $[C_4mim][NTf_2]$ determined by Karl-Fischer titration were 680 and 310 ppm, respectively.

Characterization of silica surfaces

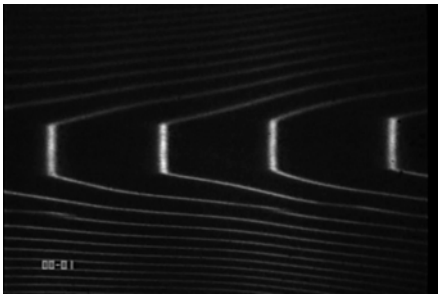

Fig. S1 FECO image of silica surfaces in adhesive contact in air.

Fig. S1 shows typical FECO image of the silica surface in adhesive contact in air. When the surfaces are brought into contact, the shape of the fringe is transformed from curve to flat due to deformation of the surface. By measuring the length of the flatten line, we can estimate the contact line to be typically tens micrometers. As seen in Fig. S1, the flat lines was well-defined without irregularity. Therefore the silica films were found to be sufficiently smooth and have uniform thickness over a distance of tens micrometer.

On the reliability of parameter of b_2 and k_2

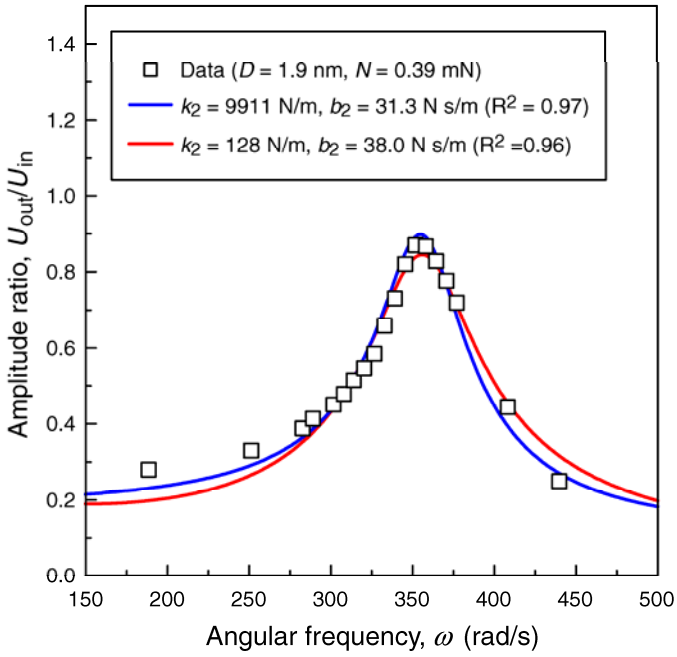

Fig. S2 Typical fitting results for the resonance curve of $[C_4mim][BF_4]$ (D = 1.9 nm, N = 0.39 mN) with different parameters of b_2 and k_2.

Fig. S2 shows the resonance curve and the corresponding fitting curves with different parameters. As clearly seen in Fig. S2, both fitting curves agree with the resonance curve. Whereas the fitting results show similar values of b_2, the obtained parameter of k_2 are greatly different. Hereafter we used the best fitting results of b_2 as shown in the insets of Fig. 4.