Dielectric Properties of Liquids Confined in Two-Dimensional Nanopores

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Dielectric and electrodynamic properties of water and other liquids under extreme confinement are of great interest due to their significant impact on a variety of phenomena such as surface hydration, ion solvation and transport, the electric-double-layer formation, chemical reactions, etc. [1-3] Theoretical studies have predicted anomalous dielectric behaviour of liquids under extremely strong confinement, yet experiments are difficult due to challenges in both device fabrication and measurement. They require to controllably confine few molecular layers of liquids into nanocavities and reliably measure them, which is a challenge to achieve on the large scale. Recently, Fumagalli *et al.* succeeded to probe the out-of-plane dielectric constant of water confined into two-dimensional (2D) nanochannels by measuring its local capacitance through advanced scanning probe microscopy [4,5]. Yet, this approach is limited to 2D confinement. Here, we present preliminary results towards measurement of dielectric and electrodynamic properties of water and other liquids under 1D confinement. To this aim, we fabricate nanopores of few nm in size in suspended 2D crystals [6] and characterize the liquids confined inside on the atomic scale by advanced scanning probe microscopy. Results are expected to improve our understanding of the electrical properties of confined liquids and should be of interest in various fields, from physics to electrochemistry and biology.

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