Non linear ionic transport in angstrom-scale channel

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Over the past decade, the ability to reduce the dimensions of fluidic devices to the nanometre scale (by using nanotubes or nanopores, for example) has led to the discovery of unexpected water- and ion-transport phenomena. More recently, van der Waals assembly of two-dimensional materials has allowed the creation of artificial channels with ångström-scale precision. Such channels push fluid confinement to the molecular scale, wherein the limits of continuum transport equations are challenged. Water films on this scale can rearrange into one or two layers with strongly suppressed dielectric permittivity or form a room-temperature ice phase. Ionic motion in such confined channels is affected by direct interactions between the channel walls and the hydration shells of the ions, and water transport becomes strongly dependent on the channel wall material. We explore how water and ionic transport are coupled in such confinement. The transport, driven by pressure and by an applied electric field, reveals a transistor-like electrohydrodynamic effect.
Further we will discuss how this novel fabrication techinque can lead to the creation of fluidic channel presenting highly non linear ionic transport leadice to memory like behaviours and paving the way for complex iontronic functionalities