Title:	Universal Stokes's nanomechanical viscometer
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Abstract:	Although, many conventional approaches have been used to measure viscosity of fluids, most methods do not allow non-contact, rapid measurements on small sample volume and have universal applicability to all fluids. Here, we demonstrate a simple yet universal viscometer, as proposed by Stokes more than a century ago, exploiting damping of capillary waves generated electrically and probed optically with sub-nanoscale precision. Using a low electric field local actuation of fluids we generate quasi-monochromatic propagating capillary waves and employ a pair of single-lens based compact interferometers to measure attenuation of capillary waves in real-time. Our setup allows rapid measurement of viscosity of a wide variety of polar, non-polar, transparent, opaque, thin or thick fluids having viscosity values varying over four orders of magnitude from 100−104 mPas. Furthermore, we discuss two additional damping mechanisms for nanomechanical capillary waves caused by bottom friction and top nano-layer appearing in micro-litre droplets. Such self-stabilized droplets when coupled with precision interferometers form interesting microscopic platform for picomechanical optofluidics for fundamental, industrial and medical applications.
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