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Electrokinetic trapping of non-fluorescent nanoparticles in water

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Anti-Brownian electrokinetic trapping enables the confinement of single nanoparticles in solution by applying feedback electric forces that counteract Brownian motion. This technique facilitates the long-term observation of nanoparticles to study their different physio- and bio- chemical properties. However, the method has been greatly restricted to nanoparticles that can be visualized by photoluminescence. In this work, we demonstrate the electrokinetic trapping of fluorescence-free nanoparticles that scatter the evanescent field induced by total internal reflection (a). Using the measured intensity of scattered photons (b) as a feedback, we generate an external electric field (c) that holds the particle at the desired distance from the glass surface. As a result, we are able to trap the nanoparticle and trace its response to the applied voltage (d) at kilohertz rates without any fluorescent labeling. Our approach significantly extends the range of nanoobjects that can be trapped at the single-particle level in an aqueous solution based purely on their light-scattering properties.