171c Pulsed Electrohydrodynamic Jetting for "Drop-and-Place" Particle Manipulation

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Drop-and-place aims at delivering the building blocks of microstructures using colloidal droplets as carrying medium; this approach combines the merits of pick-and-place and self-assembly. Among contemporary techniques used for drop generation, pulsed electrohydrodynamic (EHD) jetting is the only one which can produce on-demand drops with dimensions at least one-order-of-magnitude smaller than the nozzle. Here, we report an experimentally validated model for externally pulsed EHD jetting, and the application of this model in the drop-and-place of an array of colloidal particles. We show that the flow rate is limited by viscous drag in a thin nozzle, which leads to intrinsic pulsations of the cone-jet. We demonstrate that millimeter-scale nozzles can be utilized to achieve micron-scale positioning accuracy and single-particle dosing accuracy.