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Spiral Flow for a Rapid Micro-Particle Concentrator[1] DIANA HOU, SIDDHARTH MAHESHWARI, HSUEH-CHIA CHANG, University of Notre Dame — A surface driven convection flow is shown to generate a spiral flow that can be used to rapidly concentrate micro-particles. In a point-plate electrode system, an ionic wind is generated at the tip of a needle under a high AC potential. This wind acts as a point source of momentum on the liquid, generating a surface driven electrohydrodynamic flow. At high Reynolds numbers, inertial effects arise, causing a secondary radial flow which is directed outwards near the free liquid surface and inwards near the substrate surface. Combining the azimuthal surface flow with the radial flow, a downward spiral is formed with a converging flow stagnation point at the center of the spiral, near the substrate surface. Suspended particles in the liquid follow the streamlines towards the stagnation point and are trapped at the substrate by a downward acting body force, such as DEP or gravitational force. A critical particle size and liquid velocity for trapping exists due to the balance between the resuspending and trapping forces exerted on the particle near the stagnation point. We quantify these observations and calculate the favorable conditions for particle trapping.

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