Abstract Submitted
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Microfluidic flow-dependent optical particle trapping and circulation.[1] DAVID SINTON, Univ. of Victoria, Mech. Engr., THOMAS BLAKELY, Univ.of Victoria, Elec. and Computer Engr., REUVEN GORDON, Univ. of Victoria, Elec. and Computer Engr. — Through the planar integration of microfluidics and fiber optics, flow-dependent optical trapping and stable circulation are achieved. Two configurations are demonstrated: Single tapered fiber traps aligned with the up-stream flow direction; and dual fiber cross-flow optical traps with alignment bias relative to the flow direction. In both configurations, particle trapping results from a combination of flow-induced drag force and optical scattering forces. In the tapered fiber traps, the stable particle trapping is achieved through a balance of forward scattering and fluid drag force, with particle position indicating the relative strength each. In the dual fiber traps, two fibers are oriented in the cross-stream direction. Employing a bias in the optical fiber in-plane alignment angle results in a flow dependence for stability and circulation. The result is a microfluidic flow-dependent circulating optical trap which may be employed to indicate flow direction, magnitude, or employed to mix co-laminar streams. A strong dependence on particle size also indicates potential for stream-wise particle sorting by size. Lastly, two extensions of this work are discussed: Microfluidic and optical interactions in multiphase (oil-water-particle) systems; and flow dependencies of optically-trapped linear arrays of particles.

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