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Induced-Charge Electro-Osmosis Micropumps for Portable Microfluidics: theory and experiment[1] JOEL PAUSTIAN, TODD SQUIRES, UCSB Chemical Engineering — Microfluidic devices (e.g. Labs on a Chip) are becoming useful scientific and medical tools for automating chemical and biological lab work. Various impediments prevent complex microfluidic devices from being easily removed from a laboratory setting, limiting their utility for day-to-day applications like in-the-field medical diagnostics and drug delivery. The development of portable and integrable high-pressure pumping techniques will be necessary step for truly portable, complex microfluidic devices. Microfluidic pumps based on the electrokinetic phenomenon of Induced-Charge Electro-Osmosis (ICEO) could potentially fill this role. We describe ICEO and present a simple idea for a low-voltage, high-pressure micropump. We give simple scaling arguments, and a detailed theory, for its expected performance, and describe the design, fabrication, testing and characterization of a functional ICEO micropump. Our results validate the central idea, are consistent with our theoretical expectations, and suggest routes for the optimization and eventual use of the pump.

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Todd Squires
UCSB Chemical Engineering

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