Abstract Submitted
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Liquid crystal-enabled electro-osmosis through spatially separated charges in photo-patterned surface alignment[1] CHENHUI PENG, YUBING GUO, SERGIJ SHIYANOVSKII, QIHUO WEI, OLEG LAVRENTOVICH, Liquid Crystal Institute and Chemical Physics Interdisciplinary Program, Kent State University, Kent, OH 44242, USA, DR. OLEG LAVRENTOVICH COLLABORATION, DR. QIHUO WEI COLLABORATION — Electrically-controlled dynamics of fluids and particles at microscales is a fascinating area of research with applications ranging from microfluidics and sensing to sorting of biomolecules. We demonstrate that anisotropic conductivity of liquid crystals in combination with photopatterned surface alignment enables highly efficient electro-osmosis (LCEO) rooted in space charging of regions with distorted orientations. LCEO velocities grow with the square of the field, which allows one to use an AC field to drive steady flows and to avoid electrode damage. By controlling the director patterns, one can dramatically change the nature of LCEO flows, for example, trigger a pumping effect in dipolar configuration and reverse the flow direction in quadrupolar patterns. Ionic currents in liquid crystals that have been traditionally considered as an undesirable feature in displays, offer a broad platform for versatile applications such as liquid crystal enabled electrokinetics, micropumping and mixing.

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