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Self organization of exotic oil-in-oil phases driven by tunable electrohydrodynamics ANAND YETHIRAJ, Department of Physics & Physical Oceanography, Memorial University of Newfoundland, St. John's, NL, Canada, ATUL VARSHNEY, SHANKAR GHOSH, S. BHATTACHARYA, Department of Condensed Matter Physics and Materials Science, Tata Institute of Fundamental Research, Homi Bhabha Road, Mumbai 400-005, India — The tuning of electrostatic interactions has helped to elucidate when coherent crystalline structures or incoherent amorphous structures form in colloidal systems. However, there is little understanding of self-organization in situations where hydrodynamic interactions are also present. We present a minimal two-component oil-in-oil model system where we can control the strength and length scale of the electrohydrodynamic interactions by tuning the amplitude and frequency of the imposed electric field. As a function of the hydrodynamic length scale, we observe a rich phenomenology of exotic structure and dynamics, from incoherent cloud-like structures and chaotic droplet dynamics, to polyhedral droplet phases, to coherent droplet arrays.

Reference: A. Varshney et al., Scientific Reports 2, 738 (2012).

Anand Yethiraj
Memorial University of Newfoundland

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