

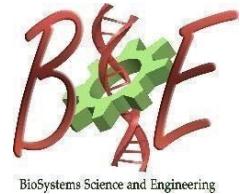


Indian Institute of Science

Centre for BioSystems Science and Engineering

BSSE Seminar

3rd February 2020 (Monday), 11:00 AM, CES Seminar Hall, 3rd floor,
Biological Sciences Building



BioSystems Science and Engineering

Vesicles and Capsules in Strong Electric Fields

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ABOUT THE SPEAKER



Dr. Rochish Thaokar is a professor in the department of chemical engineering, Indian Institute of Technology, Bombay, India since 2005. His education includes a BTech from Laxminarain Institute of Technology Nagpur (1995), ME (1997) and PhD (2003) from Indian Institute of Science Bangalore, India, all in chemical engineering, followed by a Postdoctoral stint at the Max Planck Institute for Polymerforschung in Mainz, Germany in the group of Professor Kurt Kremer. His research interests and areas include pattern formation in planar electrohydrodynamic systems, drop emulsification and coalescence using electric fields, capsule and vesicle electrohydrodynamics for dielectrophoresis and electroporation applications as well as droplet levitation in air and Rayleigh breakup of charged drops in quadrupole fields. He uses analytical theory, experimental methods and boundary integral calculations to understand electrohydrodynamics of soft matter.

ABSTRACT

Biological cells and vesicles are subjected to strong DC electric fields in applications involving electroporation and electrofusion. The process of electroporation involves formation of nanometer sized pores in the lipid bilayer of a biomembrane of a cell or a vesicle, on account of charging of the membrane. In this presentation, I shall discuss results from our group on response of giant unilamellar vesicles (GUVs) and capsules to strong DC pulses, and highlight the resulting electro-deformation in these systems. I shall then present Dissipative Particle Dynamics results on the electroporation of a bilayer, and discuss the role of the interaction of the water and headgroup dipoles of the membrane on the initiation of electroporation. I shall conclude with some other interesting results in our group on electro-deformation of charged and uncharged spherical and cylindrical vesicles subjected to weak AC fields. The talk will be pedagogical in nature.