

Combined Shear and Electroosmotic Flows for New Methods in Colloidal Assembly

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Abstract:

Understanding the science and manipulating colloidal materials to yield structures has been a topic of research for over 200 hundred years. Colloidal particles typically range in size of from 100 nm to 1 μm and assembling these particles to structures that provide properties different from the individual particles themselves is of significant engineering interest. Over the past century, manipulating colloidal particles with flow-based methods has been an important tool to develop such material assemblies. In this presentation, I will share our method of using both pressure driven flows and electrokinetic flows to systematically manipulate migration of colloidal particles within a microfluidic channel. The results show that during migration towards the microfluidic channel walls, the particles aggregate and then form bands in the microchannels. The migration of particles occurs normal to the direction of flow, where no externally applied forces exist. Moreover, the organization of these particles to bands occurs above a minimum threshold electric potential for a given flow rate. My group has recently developed a technology to extract these pre-formed bands from the microchannels to generate structures on porous substrates enabling a new approach to continuous flow and assembly of colloidal matter.

Biography:

Shaurya Prakash graduated with a Ph.D. in Mechanical Engineering from the University of Illinois at Urbana-Champaign in 2007. Following his brief stint as an Assistant Professor at Rutgers University, he joined the faculty in the Department of Mechanical and Aerospace Engineering at The Ohio State University in 2009. At Ohio State, he directs the Microsystems and Nanosystems Laboratory, where his team develops novel technologies for applications in energy, water treatment, and healthcare for cancer, wound healing, and infectious disease. Therefore, his group addresses fundamental scientific questions towards enabling new technologies that solve problems critical to modern societal needs. Prof. Prakash has published over 100 peer-reviewed articles, holds multiple patents, and has authored a book titled, "Nanofluidics and Microfluidics: Systems and Applications". He is an Associate Editor for Microfluidics and Nanofluidics and Scientific Reports, both part of the SpringerNature journal collection. His multi-disciplinary research is funded by diverse government and industry sponsors.

***This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.**

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