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Understanding the hydrodynamics of drops in microfluidic networks for high throughput analysis

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Venue : Level 5 Perseverance Rooms, Enterprise Wing, CREATE Campus, NUS UTown

Droplet-based microfluidics where reactants or biological species are encapsulated in thousands of tiny water droplets is witnessing a tremendous interest for applications in chemistry, biology, medicine and material science. To enable the development of robust droplet-based devices, my laboratory has been investigating the dynamics of confined drops in a special class of fluidic networks called microfluidic parking networks. These networks consist of a repeated sequence of loops, with each loop containing a fluidic trap to park drops. In this talk, I will discuss how we harness collective hydrodynamics of drops to engineer multi-functional microfluidic devices. I will also present some counterintuitive fluid phenomena associated with squeezing and coalescence of parked drops; and highlight the underlying hydrodynamic mechanisms. Finally, I will discuss our efforts to translate these inexpensive microfluidic platforms for high throughput analysis in material science and biology.

Biography

Dr. Siva Vanapalli is an Associate Professor in Chemical Engineering at Texas Tech University. He obtained his Ph.D. from the University of Michigan under the supervision of Prof. Michael Solomon. He is currently the holder of the Bill Sanderson and the Ed & Linda Whitracre Faculty Fellowships at Texas Tech. His research interests are in the areas of microfluidics, complex fluids, cancer, healthy aging and technology development. He received the CAREER Award from the National Science Foundation and the Rising Star Award from the Cell & Molecular Bioengineering Group of Biomedical Engineering Society. He has developed several enabling microfluidic technologies, which led to six pending patents, two of which have been licensed to start-up companies. To date he has mentored 8 Postdoctoral researchers, 14 PhD students, 38 Undergraduate students and 3 high school students.