LiMe
Institute for Life and Medical Sciences
Kyoto University

24th nanobiofluids seminar

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Conference Room (Room 134), 1st Floor, Bldg. No.1
https://www.infront.kyoto-u.ac.jp/en/access/
Zoom link

High resolution printing with electrified liquid jets

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Abstract

Liquid jets stretched under a strong electric field form the basis of electrohydrodynamic (EHD) jet printing process, wherein these fine jets are precisely deposited on a motion-controlled substrate. EHD jet printing offers high-resolution rapid prototyping of micrometre and sub-micrometer-sized two- and three-dimensional patterns. Consequently, this method paves the way for additive printing in various applications, including flexible electronics, biotechnology, and microfluidic networks. To achieve consistent and reliable printing results, a comprehensive understanding of the physics of liquid jets in the EHD jet printing configuration is essential. In this talk, I will first describe the physics of electrified jets in EHD jet printing configuration based on our experimental observations and mathematical modelling. In particular, I will describe the necessary process and geometric parameters required to obtain a stable jet from the tip of the conical Taylor cone. Next, based on the experimental visualisation of EHD jets and current measurements and scaling analysis, I will talk about various regimes of stable EHD jetting, namely the cone-jet, moderately stretched jet, and thick jet regimes. Lastly, I will present the development of our in-house EHD jet printer for printing miniaturised polymeric structures and its applications in fabricating complex microfluidic devices.

Biography

Dr. Supreet Singh Bahga is an Associate Professor in the Department of Mechanical Engineering at Indian Institute of Technology Delhi. He received his B.Tech. degree in Mechanical Engineering from Indian Institute of Technology Bombay in 2007, and M.S. and Ph.D. in Mechanical Engineering from Stanford University (USA) in 2009 and 2013, respectively. Dr. Bahga's expertise is in experimental and theoretical microfluidics. His research group is currently working on electrokinetics, electrohydrodynamics, and multiphase flow on microscopic scale. He has authored 59 journal publications and is a named inventor on 5 granted patents.

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