Title: Turbulence-On-a-Chip: Supercritically Overcoming the Energy Frontier in Microfluidics

Abstract:

The technological opportunities enabled by understanding and controlling the microscale world have not yet been capitalized to disruptively improve energy processes, especially heat transfer and power generation. This is mainly due to the laminar flows typically encountered in microdevices resulting in low mixing and transfer rates. This is a central unsolved problem in the thermal-fluid sciences, in what some researchers refer to as "lab-on-a-chip and energy - the microfluidic frontier". Therefore, the overarching goal of this presentation is to present the "Turbulence-On-a-Chip" concept. The idea is to overcome this long-standing frontier by (i) discovering the fundamentals of inducing turbulent flow in microchips by means of utilizing high-pressure supercritical fluids, (ii) finding the critical conditions to drastically enhance and control mixing and transfer processes, and (iii) designing, fabricating and testing a disruptive first-ever series of turbulence-on-a-chip prototypes for transferring energy with a hundredfold performance improvement with respect to standard microsystems .