Chemistry Departmental Colloquium

Probing Single Particles with Integrated Micro- and Nanofluidic Devices

Stephen C. Jacobson

Professor, Dorothy & Edward Bair Chair
Department of Chemistry
Indiana University

Abstract: We are developing integrated micro- and nanofluidic devices to react, size, and separate individual micro- and nanoscale particles, e.g., virus capsids, liposomes, extracellular vesicles, bacteria, and nanocrystals, with improved spatial and temporal resolution. To develop these integrated systems, we design in-plane architectures into which a range of functions can be combined, e.g., mixers, reactors, filters, pores, separators, and antennae. We have applied these systems to a range of problems. In one example, reactions are directly coupled with particle-size measurements to characterize assembly and disassembly of virus-like particles. Second, antenna arrays are disposed in microchannels to combine optical forces with microfluidic flows for size-selective separation of particles. In a third example, microchannel arrays confine the growth of bacteria in one dimension to simplify image analysis for tracking bacterial development at the subcellular level.

Bio: Stephen C. Jacobson is a Professor of Chemistry and holds the Dorothy & Edward Bair Chair in the Department of Chemistry at Indiana University (IU). He received a B.S. in mathematics from Georgetown University in 1988 and a Ph.D. in chemistry from the University of Tennessee in 1992. After graduate school, Stephen was awarded an Alexander Hollaender Distinguished Postdoctoral Fellowship at Oak Ridge National Laboratory (ORNL), and in 1995, he became a research staff member at ORNL. In 2003, Stephen joined the faculty in the Department of Chemistry at IU. His research efforts are directed toward miniaturization of analytical instrumentation with an emphasis on advancing micro- and nanofluidic devices. Stephen and his research group are actively working in measurement science, including microfluidic separations, nanofluidic transport, virus sensing and assembly, bacterial development, and cancer screening.

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