

COLLOQUIUM

Microfluidic Applications of AC Electrokinetic Phenomena

Ali Beskok

Southern Methodist University



We present experimental and theoretical research on manipulation of colloidal particles and biological cells in microfluidic systems using AC electric fields. Electrophoresis, dielectrophoresis (DEP) and AC-electroosmosis are introduced, and their dominance in the frequency domain are determined using an experimentally validated scaling analysis. DEP is frequently used for manipulating biological cells in microfluidic systems. However, the method loses its effectiveness in high conductivity buffers, and often requires sample dilution to adjust the medium conductivity. In addition, biological cells suspended in low conductivity buffers exhibit time dependent changes in their dielectric properties, making determination of the applied DEP frequency difficult. Our group addressed the first problem by fabricating fractal-electrodes using electrochemical deposition of gold nano-particles, and showed that DEP response can be maintained in high conductivity physiological buffers. The second problem was addressed by development of a microfluidic impedance spectroscopy technique that enables real-time measurements of dielectric properties of biological cells. Using enhanced electrodes and the impedance spectroscopy data, we demonstrate separation of prostate cancer cells from blood.



9 January 2017, Monday



13³⁰ - 15⁰⁰



Mech. Eng. Seminar Room