



KOÇ UNIVERSITY

Math-Science Seminar

Speaker: Hür Köser (Dept. of Electrical Engineering, Yale University, New Haven, USA)

Title: Magnetic Liquids for Lab-on-a-Chip and Rapid Diagnostics Applications

Date and Time: Friday, November 17, 2006, 11:00 am

Place: Room Z42, Science Building, Koç University, Rumelifeneri Yolu, Sariyer 34450 Istanbul.

Abstract: Ferrofluids are stable colloidal suspensions of nanosize ferromagnetic particles in either aqueous or oil-based media. They have found their way into a variety of applications, such as sealing, damping and blood separation; in dilute, functionalized forms, they have also been used as drug delivery and MRI contrast agents. These complex liquids offer attractive alternatives to moving mechanical components in miniaturized cooling, pumping and integrated micro-total-analysis-systems for chip-scale chemistry and biology. Water-based ferrofluids can also be made bio-compatible, rendering them useful in novel cell manipulation and sorting schemes. We have recently proposed, modelled and experimentally confirmed that ferrofluids can be actuated and pumped in closed-loop geometries, even within geometries of micro-scale devices. The pumping dynamics depend on the average nanoparticle size within the ferrofluid. If particles are functionalized with a receptor molecule, the entire volume of the ferrofluid becomes a pathogen sensor that can detect minute quantities of target antigens efficiently and effectively. We are working on creating portable, disposable, cheap and miniaturized sensor and diagnostic devices based on this dynamic effect. We also briefly report on the development of a novel, ferrofluid-based assay to study a large quantity of ligand-receptor interactions quickly and simultaneously, without the need for any wash cycles.