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Department Seminar

Topic: **Particle Manipulation in Microfluidic Devices Using Acoustic Radiation Force**

Speaker: **A/Prof Lim Kian Meng**
Department of Mechanical Engineering
National University of Singapore

Date: **Tuesday, 26 February 2013**

Time: **5.00pm to 6.00pm**

Venue: **E1-06-16** (map of NUS can be found at <http://map.nus.edu.sg/>)

Abstract

Acoustophoresis is the phenomenon of movement of particles, such as microspheres and biological cells, in a sound field via the acoustic radiation force. This force is a second order, time-averaged force that acts on suspended particles in a sound field. Typically, an ultrasonic standing wave is set up in a microfluidic channel, and suspended particles will be pushed to the pressure node or anti-node of the channel, depending on their acoustic contrast factors (positive or negative). This contrast factor is a function of the bulk moduli and densities of the particle and the surrounding medium. In this talk, some experimental and numerical studies on this phenomenon will be presented.

Experiments were carried out to demonstrate the manipulation of micro-sized particles using this acoustic radiation force. These experiments were conducted on polystyrene microspheres and some biological cells. It was shown that cells of different sizes and material properties can be separated using this acoustophoresis process. The microfluidic chamber was also used to measure the bulk modulus or stiffness of cells by comparing the cell trajectory against a numerical model.

Both theoretical and numerical models were used to calculate the acoustic radiation force acting on the particles. Two numerical schemes had been used to calculate the radiation force: finite element method and multipole expansion method. The numerical methods are necessary for cases where the theoretical results breakdown, namely when the particle size is comparable to the wavelength of the acoustic field. The numerical methods are also more versatile in handling particles with arbitrary shapes (such as non-spherical).

About the Speaker

Dr. Lim Kian Meng is an Associate Professor of the Department of Mechanical Engineering in the National University of Singapore. He is also a Fellow of the Computational Engineering Program under the Singapore-MIT Alliance II. He has worked on projects involving manipulation of particles and cells in microfluidic systems using dielectrophoresis and acoustophoresis. He also has a strong research interest in numerical methods and algorithms for modeling and solving multi-physics problems.

**** Admission is free. All are welcome to attend. ****