הטכניון – מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

TECHNION – Israel Institute of Technology
Faculty of Mechanical Engineering

SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב׳ 25.05.15 (ז׳ בסיון, תשע״ה), בבניין דן-קאהן, קומה 0, אודיטוריום 1, שעה 14:30.

יוצא:

Asst. Prof. Gilad Yossifon
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על הנושא:

Nonlinear Electrokinetic Phenomena in Micro and Nano-Fluidics

להלן תקציר ההרצאה:

Electrokinetics (the use of electric fields to impart a force on liquids and particles) is the technique of choice for many portable and miniaturized micro- and nano-fluidic based devices, owing to advantages which include high efficiency at small scales and ease of integratability. While linear electrokinetic flows will decay to zero under alternating current electric fields, non-linear electrokinetic phenomena have a non-vanishing time-averaged effect, which become dominant with increasing voltage, generally scaling with the square of the field strength. Aside from their fundamental scientific importance, exploitation of such non-linear effects is ideal for practical tasks such as net pumping, mixing, and manipulation of particles in lab-on-a-chip devices. The talk reviews two major examples of non-linear electrokinetic phenomena -- ion transport through fabricated nanochannels and induced-charge electrokinetics. Fabricated nanochannel systems share a number of similarities with the older and more well-known field of ion-selective membranes, but we are finding it is the differences which have the most applicative and fundamental scientific importance. In contrast to the highly tortuous, multi-pore and almost ideal ion permselective membrane, the straight fabricated nanochannel exhibits discernible electroosmotic permeability, non-ideal permselectivity and geometrical heterogeneity. Additionally, in contrast to studies using bulk nanoporous membranes, the pseudo two-dimensional microfabricated nanoslot enables direct imaging of the polarized layers, as well as almost absolute control over geometry and surface properties. It will be shown how relatively simple nanoslot devices are already useful in understanding some open-problems and poorly understood phenomena in membrane science. The second non-linear phenomenon we will examine occurs at the interface between polarizable surfaces and a surrounding fluid. Application of an external field polarizes the solid, creating a net charge at the surface which must be shielded by ions in the fluid to preserve electroneutrality. Thus within the fluid, a diffuse ionic charge cloud appears, induced by the field itself. Flow generated by the action of the applied field on this charge cloud, when combined with introduction of an asymmetry into the system, results in net motion for particles with control of their direction and alignment.

בברכה,

פרופ׳/מ אמיר שת
מרכז הסמינרים