TECHNION
הטכניון
Israel Institute
מכון טכנולוגי
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לישראל

הפקולטה
להנדסת
מכונות
Faculty of
Mechanical
Engineering

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות **במסגרת הדוקטורט** שתתקיים

ביום ב׳ 23.03.2020 (כ״ז באדר, תש״פ), בניין דן קאהן, אודיטוריום 1, 14:30.

מרצה :	יבגני בויקו
מנחה :	פרופ׳/ח מורן ברקוביץ
מנחה שותף :	פרופ׳/ח אמיר גת

על הנושא:

Non-uniform electro-osmotic flow: From microscale flow patterning to fluid-structure interaction and instability

The seminar will be given in English

תקציר ההרצאה :

Electro-osmotic flow (EOF) is the fluid motion that arises over electrically charged surfaces due to the interaction of an externally applied electric field with the net charge in the electric double layer on a surface. Since its discovery by Reuss in 1809, EOF has become a common method to manipulate fluids at the microscale. When the surface charge on the walls is inhomogeneous, non-uniform EOF arises, giving rise to internal pressure distribution, which can be (gauge) positive or negative depending on the direction of the flow and the associated boundary conditions.

In the first part of my talk, I will present a novel mechanism that leverages non-uniform electro-osmotic flow to create desired flow patterns in a microfluidic chamber, solely by controlling the surface charge distribution, without the use of physical walls or mechanical components. I will review the theoretical framework that enables relating the desired flow and pressure fields to the surface charge distribution and demonstrate experimental results supporting it.

In addition to controlling flow fields, non-uniform EOF can also be used to generate desired pressure distributions at the microscale. In the second part of my talk, I will present a study that uses these internal pressure distributions as an actuation mechanism to create desired dynamic deformations in a microfluidic chamber, enabling dynamically configurable microstructures. I will review a theoretical framework describing the resulting fluid-structure interaction, which enables to predict the deformation field and the typical timescales of the deformations observed experimentally.

In the final part of my talk, I will present the study of the nonlinear effects arising from two-way coupled fluid-structure interaction between the electro-osmotic flow and the elastic deformation. I will demonstrate that above a certain electric field threshold, such electro-osmotic flow systems may exhibit fluid-structure instability. I will discuss the underlying physical mechanism for instability and demonstrate both theoretical and experimental results, identifying several distinct dynamic regimes.

בברכה,

פרופ״א אמיר גת

מרכז הסמינרים