SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב׳ 3.04.2017 (ז׳ בניסן, תשע״ז), בבניין דן קאהן, אודיטוריום 1, 14:30.

<u>ירצה</u>:

Dr. Shyamal Roy
Faculty of Mechanical Engineering
Technion

<u>על הנושא</u>:

The effect of size and temperature on the nanoindentation

The seminar will be given in English

<u>להלן תקציר ההרצאה:</u>

The strength of metallic specimens strongly depends on dimensionality and size while approaching the submicrometer scale. The nanoindentation experiments on Au thin-film and nanoparticles demonstrated that nanoparticles are substantially softer than thin-films of the same height, and the smallest nanoparticles are softer than the largest ones [1]. Here we present a computational approach to investigate the dislocation mechanisms governing nanoindentation of particles. Using molecular dynamics (MD) simulations we revealed how dislocations are nucleated beneath the indent and interact with free surfaces for different particle sizes. MD simulations are limited in size, so in order to bridge between the scales, discrete dislocation dynamics (DDD) were performed. In DDD simulations the dislocation nucleation and interactions occur under the nanoindentation stress field distribution calculated with finite element simulations. DDD simulations shown again that dislocations escape at the free surfaces more easily in smaller particles and the plastic zone beneath the indent increases with nanoparticle size. The multiscale approach captures the underlying dislocation mechanisms controlling the size-effect in nanoindentation. In the second part we present the influence of thermally activated processes during nanoindentation. At elevated temperatures thermally activated processes become dominant in contrast to dislocation glide. Therefore, it is imperative to understand the underlying physics behind the plastic deformation during high temperature indentation tests, in particular on the nanoscale, where every single dislocation interaction is momentous [2]. By using MD simulations we investigated the thermally activated processes and how they influence the dislocation annihilation in the plastic zone and material pileup [3].

[1] D. Mordehai, M. Kazakevich, D. J. Srolovitz, and E. Rabkin. Acta Materialia, **59**:2309, 2011
[2] Y. Feruz, D. Mordehai, Acta Materialia, **103**:433, 2016
[3] S. Roy, D. Mordehai, Acta Materialia, **127**:351, 2017

בברכה,

פרופ״א שמואל אוסובסקי
מרכז הסמינרים

<u>המארח</u>: פרופ״מ דן מרדכי