

Monash e-Research Centre



Monday 19 December 2011
Monash-Technion MURPA Seminar

Atomistic Calculations in Fracture - Dynamics of Crack Propagation in Brittle Materials

Presented by Prof Dov Sherman
**(Department of Materials Engineering,
Technion-Israel Institute of Technology)**

Time: 5 - 6pm

Location: Room 135, Bldg 26, Clayton Campus

Visit: <https://messagelab.monash.edu.au/MURPA/TechnionMURPA>

Abstract:

In this talk we will show that computer atomistic 'experiments' can explain phenomena observed during dynamic crack propagation in brittle single crystal, although the volume of the atomistic 'specimens' is 24 orders of magnitude smaller than that of the physical specimens and the time of crack propagation is 6 orders of magnitude shorter.

The dynamic fracture experiments revealed several length scales of path and surface instabilities that cannot be predicted or explained by any of the continuum mechanics based equations of motion. We will show that the missing link to explain these instabilities is the thermally activated phonon emission energy release rate (or heat) generated during crack propagation. This term was calculated for several cleavage systems of brittle single crystal silicon and for a variety of crack speeds by means of molecular dynamics atomistic computer calculations. The results showed the importance of phonon emission in dynamic fracture of brittle crystals. Additional energy term was incorporated into Freund equation of motion, which includes size effect associated with this dissipative mechanism.

Biography:

Professor Dov Sherman has a PhD degree from the University of California, Santa Barbara, 1992, served in the NRCN and joined the department of Materials Engineering, Technion-Israel Institute of Technology in 1994.