

SEMINAR

Mechanical Engineering
Bilkent University



SPEAKER

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ABSTRACT

Dynamic shear localization, also known as adiabatic shear banding (ASB), is a frequently observed failure mechanism in dynamically loaded solids (crystalline and amorphous). ASB is traditionally considered as a material instability, and modeled consequently. Since the early days of Zener and Hollomon (1944), it is well established that ASB arises from the destabilizing competition between strain (rate) hardening and thermal softening, the latter ultimately prevailing at failure. In this talk, we will present a completely different point of view, based largely on experimental and microstructural work at various scales. It will be shown that the phenomenon is first of all related to the so-called dynamically "stored energy of cold work", which implies in turn a direct connection with the material microstructure, and hence its deformation micromechanisms, as an alternative to the classical continuum approaches. We will elaborate on those microstructural evolutions, with emphasis on dynamic recrystallization, twinning and their interaction. Finally, ballistic perforation experiments and their modeling based on the above-mentioned concepts will be briefly presented, as an application of the above.



ABOUT THE SPEAKER

D. Rittel holds a PhD in Materials Science (1988) from the Hebrew University of Jerusalem. He spent 2 years as a postdoc at Yale University working on the fracture of tungsten base heavy alloys, followed by 3.5 years at École Polytechnique (France), working on experimental dynamic fracture mechanics. He then joined Technion (Mechanical Engineering) in 1994 where he founded the Dynamic Fracture Laboratory. As of today, D. Rittel holds the Zandman Chair in Experimental Mechanics, heads the Materials Mechanics Center. He is also the Deputy Senior Vice President (Vice Provost) of Technion. D. Rittel was the Clark B. Millikan Visiting Professor in Aeronautics (2007) at Caltech where he holds a Visiting Associate position, and incumbent of a Catedra de Excelencia at UC3M (Madrid) in 2012, where he is now Honorary Professor. Throughout the years, D. Rittel has developed expertise in the many aspects of dynamic failure, including fracture mechanics, constitutive behavior, dynamic failure mechanisms and numerical modeling. He is a Fellow of the Society for Experimental Mechanics (SEM) and of the American Society of Mechanical Engineers (ASME). D. Rittel's interest is in the thermomechanics and physics of dynamic failure with regard to dynamic fragmentation, fracture, adiabatic shear banding and hysteretic heating. In addition, D. Rittel is active in the field of biomechanics of dental implants. As of today, he has co-authored about 160 journal publications. Dr. Rittel is Associate Editor of Mechanics of Materials, the International Journal of Engineering Science, as well as the International Journal of Impact Engineering. In 2015, D. Rittel was awarded the prestigious Gili Agostinelli Prize (Torino Academy of Sciences, Italy) for his work on adiabatic shear localization.

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