Michael D. Campbell

Subject: FW: [GEOSEM] Edwin "Ned" Thomas: Speaker for Current Research in Earth Science: Thursday -10/22/15

From: GEOSEM [mailto:geosem-bounces@mailman.rice.edu] On Behalf Of Department of Earth Science
Sent: Tuesday, October 20, 2015 10:19 AM
To: "seminar-e-mail listserv"
Subject: [GEOSEM] Edwin "Ned" Thomas: Speaker for Current Research in Earth Science: Thursday -10/22/15

Current Research in Earth Science - Guest Speaker, Edwin "Ned" Thomas

Who: Professor - Edwin "Ned" Thomas
Department of Materials Science & NanoEngineering
Rice University

What: "Hypervelocity Projectile Impact of Layered Materials: Lamellar Block Copolymers and Multilayer Graphene"

When: Thursday, October 22, 2015; 4:00 pm

Where: Keith Wiess Geological Laboratories, Room 100

Homepage: http://msne.rice.edu/nedthomas/ <http://msne.rice.edu/nedthomas/>

Reception begins at 3:30 in the second floor library.

Abstract:
Ballistic impacts induce strong material nonlinearity and multiple complex interacting deformation and failure mechanisms. Both block polymers and 2d graphene are nanoscale layered materials and are interesting candidate protection materials. Polystyrene -block- polydimethyl siloxane (PS-PDMS) with an approximately 50/50 composition is a lamellar structure comprised of alternating layers of glassy/rubbery materials. Multilayer graphene is another layered material with exceptional anisotropy due to its two-dimensional carbon lattice structure. The high-strain-rate behavior of block polymers and of multilayer graphene is investigated using miniaturized ballistic tests. The laser induced projectile impact test (LIPIT) can propell micron diameter solid silica beads placed on a laser absorbing polymer coated glass substrate to speeds of up to 4 km/s by rapid expansion of gas produced by laser ablation of the polymer layer. A time delayed series of probe pulses are used to measure the velocity and acceleration of the micro-projectile to determine its KE before/after the sample. For micron thick PS-PDMS films, we employ focused ion beam cross sectional imaging to directly visualize the embedded projectile and the surrounding deformation field. For multilayer graphene (MLG) films of 30-100 layers, the superior in-plane speed of sound, the very high strength, stiffness and structural anisotropy make MLG an extraordinary armor material exhibiting excellent impact energy delocalization under a hypersonic penetration event.

Our LIPIT approach provides a versatile and efficient method to study nanoscale mechanical deformation and failure mechanisms at high rates and large deformations on small samples and will help inform high fidelity modeling of lightweight materials for superior protection.

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Denise Mayberry
Administrative Coordinator