Mechanical Engineering Department Seminar

3:35pm March 12, 2014
1130 Mechanical Engineering
111 Church Street SE, Minneapolis, MN 55455

Mechanical and Interfacial Reliability of Nanoporous Zeolite Thin Films for Low-k and Anti-wear Applications

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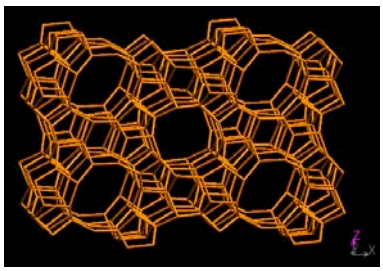
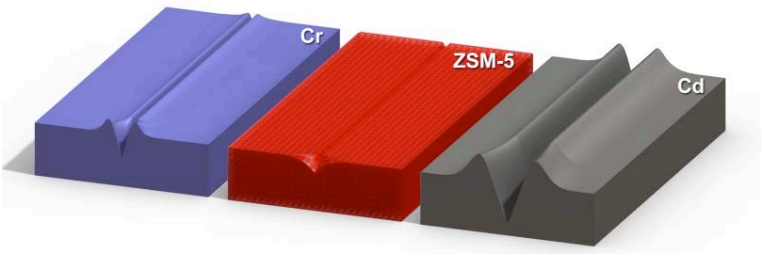
Nanoporous thin films and coatings are of significant interest to the scientific and technology community due to the size scale of the pores they contain and the wide range of applications they can satisfy. While increased levels of porosity are beneficial for achieving the desired functionality, high levels of porosity deteriorate the mechanical integrity of porous materials. Therefore the mechanical and interfacial properties of the nanoporous thin films must be carefully measured and understood. This talk will present recent work on characterizing the mechanical reliability of nanoporous zeolite coatings in the context of two interesting applications – as low dielectric constant (low-k) material in microelectronics and as wear-resistance coatings in potential aerospace structures. The experimental techniques involved include both traditional as well as modified nanoindentation, and in-house developed laser-induced surface acoustic waves and laser-induced thin film spallation techniques. As a potential low-k candidate, nanoporous zeolite thin films out performs many other candidates due to its unique combination of ultra-low-k value and a high mechanical strength. As a potential wear-resistance coating, zeolite out performs hard chrome in low-to-medium load regimes due to its high resilience rendered by the unique combination of intermediate hardness and relatively low elastic modulus. For both applications, reliable characterization and understanding of the mechanical properties are essential.





Bio: Junlan Wang is currently an Associate Professor in the Department of Mechanical Engineering at the University of Washington (UW). Her research focuses on nano and micromechanics of thin films/coatings and biomatierlas, surface and interface properties, high strain rate phenomena, as well as optics and laser based sensing and metrology. She earned her B.S. (1994) and M.S. (1997) in Mechanics and Mechanical Engineering from the University of Science and Technology of China, and Ph.D. (2002) in Theoretical and Applied Mechanics from the University of Illinois at Urbana-Champaign. Before UW, she was a postdoc researcher at Brown University (2002-03), an Assistant (03-08) and later Associate (08) Professor at University of California, Riverside. She is a recipient of the NSF CAREER award, ASEE Beer and Johnston Outstanding New Mechanics Educator award, SEM Hetenyi award, and Bourns College of Engineering Teaching Excellence award. She is a member of ASME Materials Division Executive Committee and Associate Technical Editor for Experimental Mechanics journal.