TEXAS TECH UNIVERSITY
Department of Mechanical Engineering

Presents

Surface tension of soft materials, how to measure it and how does it affect mechanical behavior.

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The role of surface energy in determining mechanical properties such as adhesion, friction and fracture toughness is well known. In comparison, the role of the closely related surface mechanical property, surface tension or surface stress on mechanical properties is less studied. This is because the surface tension (stress) of solids can be very difficult to measure. In this talk, I will present a simple analysis which shows that the deformation caused by a liquid drop on a thin film can caused it to bulge by tens of microns. The deformed shape of the film is governed by tensions exerted by various interfaces and the solid film. Tensions in the solid film have a contribution from elastic stretch and a constant residual component. The residual component, extracted by extrapolation to films of vanishing thickness, can be interpreted as the solid-fluid surface tension. These interfacial tensions are determined by experiments using PDMS (Polydimethylsiloxane) thin films with various non-swelling liquids. As an example of how surface tension affects mechanical behavior, I will show surface tension reduces the energy release rate of cracks in elastic solids.

C.Y. (Herbert) Hui has a BA degree in Physics and Mathematics from the University of Wisconsin-Madison. He received his Master degree in Ap. Math and his Ph. D degree in Solid Mechanics from Harvard University. He is the Joseph-Ford chair professor of Mechanical and Aerospace Engineering and has been a professor in Cornell since he graduated from Harvard. His current interest is in the mechanics of soft materials. He has received several teaching awards including the excellence in teaching award from Tau-Beta-Pi. He has published over 230 Journal papers on various subjects in Mechanics of Solids.

Monday, May 5 2014
Petroleum Engineering 121 | 2:00 – 3:00 pm
Coordinator: Dr. Burak Aksak (burak.aksak@ttu.edu)