

The Mechanical Engineering Department cordially invites you to our:
DEPARTMENT SEMINAR

Topic:	Modelling Structure-Property Relations in Polymers
Speaker:	Professor David Porter (University of Oxford)
Date:	20 February 2012 (Monday)
Time:	3:00pm to 4:30pm
Venue:	E3-06-01 (map of NUS can be found at http://www.nus.edu.sg/campusmap/)

Abstract

In order to facilitate the rapid development of materials that are optimised for engineering applications, it is becoming necessary to understand structure-property relations in materials at all levels of their chemistry and structural morphology; from molecular, through nano- and micro-structure, through to bulk failure initiation criteria. While no single technique can bridge all these different scales, we look at a pragmatic approach that uses the storage and dissipation of energy through all the different scales to derive simple quantitative structure-property relations for structural materials, using a minimum number of input parameters, which can all be derived from 'first principles'. The presentation concentrates on polymer properties and shows how energy storage and dissipation can be used quickly to predict their full nonlinear rate and temperature dependence, from quasi-static to shock conditions, and from semi-crystalline to rubber and melt states of matter. The component properties can be applied to the design of composite materials, or the predicted properties can be used for the design and analysis of engineering structures using techniques such as dynamic FEA.

About the Speaker

Dr. Porter obtained his PhD in Physics at Loughborough University and worked for 16 years with Dow Chemical on polymer research and development in Switzerland, The Netherlands and USA. While at Dow, he wrote a book 'Group Interaction Modelling of Polymer Properties' on predicting structure-property relations in polymers. He joined QinetiQ in The UK in 1995 as a QinetiQ Fellow on materials modelling, and worked on all material types over a wide range of applications. His speciality is prediction of structural properties of materials from molecular composition and morphological structure, through their micro- and fracture mechanics to engineering application. As part of his work on composite materials, he was a Visiting Professor in the department of Engineering Materials at the University of Sheffield. After a few years working as an Associate Scientist, he joined Professor Vollrath at Oxford to work on silk and other biological materials in January 2009, where the group is making significant progress in understanding all aspects of silk properties, from spinning to final fibre and natural silk composite properties.

****Admission is Free. All are welcome to attend.****