NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Materials Science and Engineering

Seminar Topic:
Engineering with Stimuli Responsive Functional Polymers

Professor Hu Xiao

Abstract

Stimuli responsive polymers have attracted great attention both from the scientific and engineering viewpoints. Although water-soluble responsive polymers and hydrogels have been extensively studied and reported, there is little work on non-aqueous responsive polymer systems. This presentation gives an overview of our recent and past work in the field of responsive polymers, which include photo-, thermal-, pH- and CO_2-responsive systems and their applications.

The discussion will include our recent work on a new class of thermally responsive elastomeric ionogels. These non-aqueous responsive ionogels are derived from robust polyurethane elastomers and ionic liquids. The discussion will be focused on their unique properties, phase transition behaviour and mechanistic insight of molecular interactions. For example, the complex hydrogen bonding between the polymer network and the ionic liquids is better understood with the aid of molecular dynamic simulation. The phase transition temperature of such ionogels can be tuned to cover an unprecedented range which is unattainable with hydrogels. These ionogels represent a new class of stimuli responsive materials with characteristics and attributes not only stemming from the intrinsic stability and non-volatility of the ionic liquids and the mechanical robustness of the polyurethane elastomer, but also due to the specific molecular interactions. As a comparison, the discussion will also cover stimuli responsive aqueous ionic liquids and polyionic liquids. Potential uses of such stimuli responsive systems for water treatment, waste heat harvesting, 'smart' windows, etc will be highlighted. These applications are developed based on the understanding of the underlying driving forces for phase separation and distinct changes in water affinity, as well as the secondary molecular binding interactions.

Biography

Professor Hu Xiao gained his B.Eng. from Tsinghua University and M.Sc. and PhD from the University of Manchester. He joined Nanyang Technological University, Singapore in 1992 as one of the founding members of the School of Materials Science and Engineering (MSE). In April 2016, he helped to establish the Environmental Chemistry and Materials Centre (ECMC) at the Nanyang Environment and Water Research Institute (NEWRI). Professor Hu is a recipient of the 2017 National Day Medal (Ministry of Education – Long Service). In addition, he is the President of the Pacific Polymer Federation (PPF) and a representative at the Council of the Federation of Asian Polymer Societies (FAPS). He served as a consultant and advisor for a number of companies/organizations, including Borealis (Austria), DSO National Laboratories (Singapore), West Pharmaceutical (USA/Singapore) and TTRI (Taiwan Textile Research Institute).

His main research interests are in functional polymers, nano-hybrids and nanocomposites as well as materials for environmental and water technologies. His group pursues studies on the underlying principles for materials design, synthesis, and processing and fabrication for targeted end uses. He has so far contributed more than 350 international journal papers and more than 100 conference presentations, including a number of invited, keynote and plenary presentations. Professor Hu has 25 IP inventions.

Wednesday, 24 October 2018 ǁ Time: 2:00 pm – 3:00 pm
Venue: MSE Meeting Room (N4.1-01-28)
Hosted by: Professor Lam Yeng Ming

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