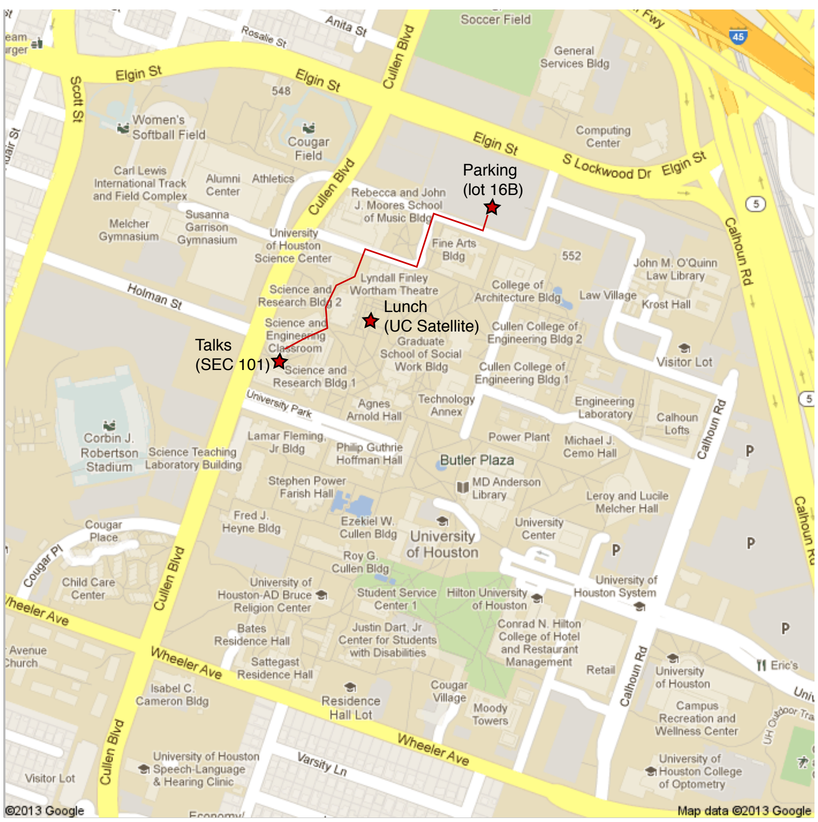
Texas Soft Matter Meeting #1: Schedule (updated 2013-06-30)
University of Houston, January 11, 2013

Events held in Science and Engineering Classroom Building (SEC) 101 unless otherwise noted. See txsoftmatter.chee.uh.edu/information for detailed information.

7:45–8:25	Registration
8:25–8:35	Introductory remarks
8:35–9:40	Contributed session I: Rheology, Interfacial Phenomena, and Transport
9:40–10:20	Invited talk: Matteo Pasquali
10:20–10:40	Coffee break
10:40–11:20	Invited talk: Christopher Ellison
11:20–12:20	Contributed session II: Polymers and Polyelectrolytes
12:20–13:40	Lunch (UC Satellite)
13:40–14:20	Invited talk: Peter Vekilov
14:20–15:20	Contributed session III: Biomaterials
15:20–16:00	Invited talk: Yuanqiao Rao
16:00–16:20	Coffee break
16:20–17:00	Invited talk: Sindee Simon
17:00–18:10	Contributed session IV: Nanomaterials, Nanocomposites, and Nanointerfaces
18:10–18:15	Closing remarks



Texas Soft Matter Meeting #1: Invited Abstracts
University of Houston, January 11, 2013

Matteo Pasquali (mp@rice.edu)
Chemical and Biomolecular Engineering, Rice University
Carbon Nanotubes and Graphene: From Fluid Phases to Multifunctional Materials
Nanoscale carbon includes Carbon Nanotubes (CNTs) as well as graphene, *i.e.*, graphite in its single layered form. Nanoscale carbon has remarkable electrical, thermal, and mechanical properties, more so than previously known polymer molecules or colloidal particles. Realizing these properties in applications requires understanding and controlling the behavior of fluid phases. Biological and environmental applications are likely to require dilute phases of nano-carbon; material processing, *e.g.*, production of coatings and fibers, will require more concentrated phases. Yet, “nano-carbon fluid” is almost an oxymoron because dispersing or dissolving CNTs and graphene into fluid phases is exceedingly difficult. In this lecture, I will discuss how CNTs as well as graphene can and should be viewed as hybrids between polymer molecules and colloidal particles. Even at low concentrations (few parts per million), CNTs form complex fluid phases with intriguing properties. In crowded environments (*e.g.*, gels), CNTs reptate like stiff polymers; surprisingly, the small bending flexibility of CNTs strongly enhances their motion: The rotational diffusion constant is proportional to the filament-bending compliance and is independent of the network pore size. In strong acids, CNTs as well as graphene dissolve spontaneously. At low concentration, these fluids can be used for making transparent, conducting films and coatings, as well as highly porous three-dimensional structures. At sufficiently high concentrations, CNTs and graphene both form liquid crystals that can be spun into well-aligned, macroscopic fibers. High quality bulk-grown CNTs can be processed by high-throughput wet spinning to yield high-performance multi-functional CNT fibers that combine the specific strength, stiffness, and thermal conductivity of carbon fibers with the specific electrical conductivity of metals. These scalable CNT fibers are positioned for high-value applications, such as aerospace electronics and field emission, and can evolve into engineered materials with broad long-term impact, from consumer electronics to long-range power transmission.

Christopher Ellison (ellison@mail.utexas.edu)
Chemical Engineering, University of Texas at Austin
Manipulating Polymers With Light Activated Chemistries for Patterning Films and Manufacturing Fibers
Light activated chemistries are powerful for controlling the structure and function of polymers without the need for contacting the sample. Here recent research will be described from two projects where light is employed to enable new polymer processing. First, a new non-contact strategy for high-speed patterning of arbitrary in polymer films will be described. In this approach, a topographical pattern can be preprogrammed and stored in a smooth solid film using light activated chemistry. The topography is later revealed without use of a wet or dry etch step, unlike traditional photoresist methods. The second project seeks to address the fact that fibers have been manufactured for decades using solvents or heat to reduce the viscosity of polymers and promote drawing. However, nature has engineered spiders and silkworms with benign ways of making silk fibers with high strength and toughness. Their approach of chemically linking small functional units into long chain molecules and solid fibrillar structures while simultaneously extruding the fibers is fundamentally different from current synthetic fiber manufacturing methods, where extrusion of pre-formed long chain polymers is facilitated with organic solvents or heat. Drawing inspiration from nature, a method will be described which uses light to trigger a thiol-ene chemical interaction to rapidly transform small reactive liquid mixtures into solid thread-like structures as they are forced out of a capillary at high speeds. Besides being manufactured without using solvents/volatile components or heat, these fibers are mechanically robust and have excellent chemical and thermal stability.

Peter Vekilov (pgvekilo@central.u.edu)
Chemical and Biomolecular Engineering, University of Houston
The Physical Chemistry of Sickle Cell Anemia
Sickle cell anemia is a deadly inherited disease. Every year, about 500,000 children are born with this disease, mostly in the poorest countries of equatorial Africa and the inland regions of India. The sickle cell gene leads to the expression of a mutant hemoglobin, HbS, which induces two main pathological sequences: (i) HbS forms polymers which stretch and rigidify the erythrocytes. (ii) HbS is unstable to autoxidation and hence to release of its hemes. The released heme oxidizes to hematin, which, among other pathological consequences, is known to damages the erythrocyte membranes, and enhance their adhesion to the endothelial walls. Both of these sequences lead to blood flow obstruction, organ damage, and death. We study the interactions between the two consequences of the sickle cell gene. We show that the concentration of free heme in HbS solutions typically used in the laboratory is 0.02 - 0.05 mole heme/mole HbS. We show that dialysis of small molecules out of HbS arrests HbS polymerization. The addition of 100 - 260 uM of free heme to dialyzed HbS solutions leads to rates of nucleation and polymer fiber growth faster by two orders of magnitude than prior to dialysis. Towards an understanding of the mechanism of nucleation enhancement by heme, we show that free increases by two orders of magnitude the volume of the metastable clusters of dense HbS liquid, the locations where HbS polymer nuclei form. These results suggest that free heme in the erythrocytes of sickle cell anemia patients may be a major factor for the puzzling complexity of the clinical manifestations of sickle cell anemia. The prevention of free heme accumulation in the erythrocyte cytosol may be a novel avenue to sickle cell therapy.

Yuanqiao Rao (yrao@dow.com)
Materials Science and Engineering, Dow Chemical Company
Materials by Design Through Heterogeneous Structures
Nature has given us some remarkable examples of creating critical functionalities through the heterogeneous structural control of basic component molecules. Some examples include bones, superhydrophobic surfaces, and iridescence colors. It has been well known that the properties of polymers can be improved through blends and fillers. However, the length scale of these heterogeneous structures is too big to have sufficient interaction with light, electron, and molecular chains. Only with the arrival of effective characterization tools such as scanning tunneling microscope, atomic force microscope and other enhanced traditional analytical tools, it becomes possible to create, characterize and understand the interplay of nanosized heterogeneous structures. In this talk, we will discuss some new heterogeneous structures and their unique properties enabled by the control of the heterogeneous structure at nanoscale. Specifically we will discuss material properties that are important for industrial applications such as mechanical, thermal mechanical, optical properties, and thermal conductivity.

Sindee Simon (sindee.simon@ttu.edu)
Chemical Engineering, Texas Tech University
The Calorimetric Glass Transition Under Nanoconfinement
The behavior of materials confined at the nanoscale has been of considerable interest over the past two decades. Recent work in our laboratory has focused on the influence of nanoconfinement on the glass transition and associated kinetics, on melting and crystallization, and on polymerization kinetics and resulting properties. In this talk I will present recent results investigating the depression of the glass transition temperature for nanoconfined materials, including single polystyrene ultrathin films, glass-formers confined to nanopores, and glass-formers nanoconfined by crystalline domains. The results will be discussed in the context of the leading explanation for the T_g depression in nanoconfined glasses, *i.e.*, that the mobility arises from free surface and interface effects.

Texas Soft Matter Meeting #1: Sound Bite Titles

Session I: Rheology, Interfacial Phenomena, and Transport (8:35am–9:40am)

1. Brian Rohde (University of Houston, bjrohde@uh.edu)
   Tough Interpenetrating Polymer Networks of Dicyclopentadiene and Epoxy Resin
2. Ziniu Yu (Texas Tech University, ziniu.yu@ttu.edu)
   Effect of Crosslink Density on Mechanical Response of Smectic Main Chain Elastomer
3. Aditya Agrawal (Rice University, aa21@rice.edu)
   Self-Stiffening Behavior in Liquid Crystal Elastomers Under Dynamic Stress
4. Ben Xu (Texas Tech University, ben.xu@ttu.edu)
   Peak or No Peak, That's the Question
5. Taskin Binte Karim (Texas Tech University, taskin.karim@ttu.edu)
   Unusual Surface Mechanical Properties of Poly(alpha-methylstyrene)
6. Jinhua Wang (Texas Tech University, jin-hua.wang@ttu.edu)
   Viscoelastic Properties of Ultrathin Polystyrene Films by Dewetting From Liquid Glycerol
7. Di Du (Rice University, dd13@rice.edu)
   Molecular Melting Mimicked by a 2-D Paramagnetic Particle System
8. Xiaoguang Peng (Texas Tech University, xiaoguang.peng@ttu.edu)
   Physical Aging of Colloidal Glasses After Concentration Jump
9. J. Alex Lee (Rice University, jalexlee@rice.edu)
   Computation of Polymer Solutions in Free Surface Flows
10. Yanfei Li (Texas Tech University, yanfei.li@ttu.edu)
    Flow Field Visualization of Entangled Polybutadiene Solutions Under Nonlinear Viscoelastic Flow Conditions
11. Abhijit Patil (University of Houston, abhijit7.patil@gmail.com)
    Acid Catalyst Diffusion in Glassy Polymer Resin
12. Yueyi Xu (Texas Tech University, Yueyi.xu@ttu.edu)
    Brownian Dynamics Simulation of Dispersed Graphene Under Flow
13. Rahul Pandey (University of Houston, rahulpandey.79@gmail.com)
    Effect of Interparticle Attraction Strength on Confined Flow of Colloid-Polymer Mixtures
14. Hadi ShamsiJazeyi (Rice University, hadi.shamsi.jazeyi@rice.edu)
    Sodium Polyacrylate as Sacrificial Adsorption Agent for Anionic Surfactants
15. Charles Conn (Rice University, conn.charles@rice.edu
    Oil Displacement Using Foam in Porous Media Micromodels
16. Firoozeh Babaye Khorasani (University of Houston, firoozehbkh@gmail.com)
    Nanoparticle Transport in Non-Newtonian Aqueous Dispersions
17. Shannon Eichmann (Rice University, se5@rice.edu)
    Single-Walled Carbon Nanotube Dynamics in Rock-Like Porous Media
18. Kai He (University of Houston, kaihe.uh@gmail.com)
    Dynamics of Nanoparticle Dispersions in Model Porous Media
19. Sourav Barman (Texas Tech University, sourav.barman@ttu.edu)
    Effect of Polydispersity in a Solid Stabilized Interface
20. Christian Shi (Texas Tech University, christian.shi@ttu.edu)
    Pickering Emulsions Production by Using Microfluidic Method
21. Xuezhen Wang (Texas A&M University, xuezhenwang@neo.tamu.edu)
    Pickering Emulsion as Delivery System

Session II: Polymers and Polyelectrolytes (11:20am–12:20pm)

22. Thomas Lewis (University of Texas at Austin, tlewis@che.utexas.edu)
    Complexation Between Weakly Basic Dendrimers and Linear Polyelectrolytes
23. Ryan Davis (Texas A&M University, R.A.Davis856@gmail.com)
    Phase Behavior of LPEI-PAA Complexes
24. Morgan A. Priolo (Texas A&M University, mapriolo25@gmail.com)
    Vermiculite Nanobrick Wall Gas Barrier Thin Films
25. Joseph Puhr (Texas A&M University, puhr1@tamu.edu)
    Gas Separation Membrane Studies Using QCM-D
26. Hsiu-Chin Huang (Texas A&M University, hsiuching.huang@gmail.com)
    Polyelectrolyte Multilayers Containing Polyethylene-Based Ionomers
27. Galina Laufer (Texas A&M University, galina2405@tamu.edu)
    Intumescent Nanocoatings for Cotton Fabric Made With Renewable Polyelectrolytes
28. Lin Shao (Texas A&M University, l.shao@yale.edu)
    Polyaniline Nanofiber/Vanadium Pentoxide Layer-by-Layer Electrodes for Energy Storage
29. Choonghyun Sung (Texas A&M University, csung73@tamu.edu)
    Effect of Thickness on the Thermal Properties of Hydrogen-Bonded Layer-by-Layer Assemblies
30. Chungyeon Cho (Texas A&M University, chocy78@gmail.com
    Polyelectrolyte Multilayers Stabilized Catalytic Nanoparticles for Proton Exchange Membrane Fuel Cells
31. Josh Katzenstein (University of Texas at Austin, jkatzens@gmail.com)
    Self-Diffusion of Poly(isobutyl methacrylate) in Thin Films
32. Xiaojun Di (Texas Tech University, Xiaojun.di@ttu.edu)
    Evaluation of Heterogeneity Measures and Their Relation to the Glass Transition
33. Shu Wang (University of Houston, s.yuki.wang@gmail.com)
    Sustainable Triblock Copolymers for Applications as Thermoplastic Elastomers
34. Kendall Smith (Rice University, kas9@rice.edu)
    Synthesis of All-Conjugated Block Copolymers Using Functionalized Initiators and Click Chemistry
35. Indranil Mitra (University of Houston, imitra3@uh.edu)
    Directed Self Assembly of Block Copolymers
36. Julie Cushen (University of Texas at Austin, cushenj@che.utexas.edu)
    Silicon-Containing Block Copolymers for Sub-20 nm Pitch Pattern Generation
37. Dustin Janes (University of Texas at Austin, djanes1@gmail.com)
    Replicating Thin Film Block Copolymer Patterns by Light-Activated Chemistries
38. Xin Zhang (University of Houston, shinch.2010@gmail.com)
    Flexible OPV Fabricated With Highly Conductive PEDOT:PSS
39. Nikhila Mahadevapuram (University of Houston, nmahadev@central.uh.edu)
    Systematic Studies in Printed Polymer Based Solar Cell
40. Amrita Haldar (University of Houston, amrita.haldar@gmail.com)
    Inkjet Printing of Organic Photovoltaics (OPVs) : Precise and Versatile
41. Jared Mike (Texas A&M University, jfmike@tamu.edu)
    Conjugated Polymers for Energy Storage
42. Kang-Shyang Liao (University of Houston, ksliao00@gmail.com)
    PPy:PSS as Alternative to PEDOT:PSS in Organic Photovoltaics

Session III: Biomaterials (2:20pm–3:20pm)

43. Stacy Pesek (Rice University, slp4@rice.edu)
    Synthesis and Conformational Analysis of Polystyrene Bottlebrush Polymers by Small Angle Neutron Scattering
44. Xianyu Li (Rice University, xl11@rice.edu)
    Surface Properties of Bottlebrush Polymer Thin Films
45. Farid Ahmed (University of Houston, frdbuet@yahoo.com)
    Application of PVK-SWNT Nanocomposite for Antimicrobial Surface Coating
46. Hang Ngoc Nguyen (University of Houston, huongem@hotmail.com)
    Preparation and Antimicrobial Investigation of Cu-MMT Nanomaterials
47. Sean C. Smith (University of Houston, sean.cakesmith@gmail.com)
    Protein Adsorbtion by Carbon Based Nanomaterials
48. Fei Yu (University of Houston, fayyufei@gmail.com)
    Formation of Benign E. coli Biofilms on Mannosides Modified PDMS Surfaces Inhibiting Pathogen Colonization
49. B. J. Cooley (University of Texas at Austin, bcooley@chaos.utexas.edu)
    Pel Promotes Symmetric, Short-Ranged Surface Attachment in P. aeruginosa
50. Jun Kyun Oh (Texas A&M University, junkyun09@tamu.edu)
    Effect of Surface Hydrophobicity on Kinetics of Bacterial Adhesion
51. Sumedha Sharma (University of Houston, sumedha.sharma1@gmail.com)
    Single-Bacterium Tracking Study of Adhesion on Engineered Surfaces
52. Alejandro Bilbao (Texas Tech University, alejandro.bilbao@ttu.edu)
    Hydrodynamics of Propulsion of Low Reynolds Number Swimmers in Complex Environments
53. Amar Patel (Texas Tech University, amar.patel@ttu.edu)
    Chemotaxis of Caenorhabditis elegans
54. Anupam Aich (University of Houston, aaich@uh.edu)
    Design of Gastight Picoliter Reactors for the Study of Sickle Cell Hemoglobin Polymerization
55. Maria Vorontsova (University of Houston, mavoront@central.uh.edu)
    Metastable Mesoscopic Clusters in Protein Solutions are Independent of the Coulomb Interactions
56. Mary Beth Browning (Texas A&M University, mbrowning28@gmail.com)
    Bioactive Hydrogels With Enhanced Cell Interactions and Protein Stability
57. Ming Zhang (Texas A&M University, brightzhang09@gmail.com)
    Uptake and Translocation of Polymeric Nanoparticulate Drug Delivery Systems Into Ryegrass
58. Avantika Singh (University of Houston, asingh15@uh.edu)
    Dynamic Processes in Diblock Copolymer Micelles
59. Adeline Mah (University of Houston, huizhen89@gmail.com)
    Immobilization of Colloidal Particles Using Microstructured PEG Hydrogels
60. Carmen Pascente (University of Houston, carmenpascente@gmail.com)
    Micron Scale Retroreflectors for Novel Biosensors
61. Jinsu Kim (University of Houston, jinsukim1119@gmail.com)
    Sensitive, Rapid, Amplification-Free Imaging Immunoassay Using Single Bacteriophage M13 Reporter and Magnetic Beads
62. Parag Katira (University of Texas at Austin, pkatira@utexas.edu)
    Internal Mechanical Forces Drive Active Reorganization and Tissue Dynamics
63. Jing Zhou (Texas A&M University, jing200711@tamu.edu
    Thermal Responsive Layer-by-Layer Assemblies for Nanoparticle Based Drug Delivery System

Session IV: Nanomaterials, Nanocomposites, and Nanointerfaces (5:00pm–6:10pm)

64. Haoyu Zhao (Texas Tech University, haoyu.zhao@ttu.edu)
    The Effect of Nanoconfinement on Methyl Methacrylate Polymerization: Reactivity and Resulting Properties
65. Dariya K. Reid (Texas A&M University, reid1805@neo.tamu.edu)
    Curvature-Directed Crystallization of Isotactic Poly(propylene) in Nanopores
66. Yung P. Koh (Texas Tech University, yung.p.koh@ttu.edu)
    Hindered Crystallization Under Nanopore Confinements
67. Yi-Hsien Yu (Texas A&M University, cksh21304@gmail.com)
    Zirconium Phosphate Nano-Platelets Sensitized With CdS as Highly Active Visible Light-Driven Photocatalyst
68. Min Shuai (Texas A&M University, shinerice@gmail.com)
    Lyotropic Liquid Crystals of Zirconium Phosphate Disks
69. Vida Jamali (Rice University, vj4@rice.edu)
    Tactoids of Nematic Phase in CNT Solutions
70. Dorsa Parviz (Texas Tech University, dorsa.parviz@ttu.edu)
    Dispersions of Non-Covalently Functionalized Graphene With Minimal Stabilizer
71. Hartmann E. N'guessan (Lamar University, ekouambah@yahoo.fr)
    Measurement of Lateral Adhesion Forces at the Interface Between a Liquid Drop and a Substrate
72. Priyanka Wasnik (Lamar University, pswasnik@lamar.edu)
    Water Tribology on Graphene
73. Sriya Das (Texas Tech University, sriya.das@ttu.edu)
    Effective Crosslinking in Pristine Graphene/Polymer Hydrogels
74. Gregory Moriarty (Texas A&M University, gregory.moriarty@gmail.com)
    The Promise of Fully Organic Thermoelectric Materials
75. Tienyi Theresa Hsu (Rice University, tth4@rice.edu)
    Facile Fabrication of Highly Conductive Carbon Nanotube Solid Foams and Composites Through Scalable Solution Processing
76. Fahmida Irin (Texas Tech University, fahmida.irin@ttu.edu)
    Percolation in Nanomaterial-Loaded Aerogels
77. Bryan Whiting (Rice University, btw1@rice.edu)
    Covalent Crosslinking of Preformed Carbon Nanotube Structures
78. Lan Ma (Texas Tech University, lan.ma@ttu.edu)
    Two-Way Reversible Shape Memory Effect of Polyethylene/Carbon Black Nanocomposites
79. Francesca Mirri (Rice University, fm7@rice.edu)
    Transparent Conductive Carbon Nanotube Films by Scalable Dip Coating
80. Ran Tao (Texas Tech University, ran.tao@ttu.edu)
    Shear and Bulk Rheology and PVT Behavior of Polystyrene Nanocomposites
81. Dmitri Tsentalovich (Rice University, det3@rice.edu)
    Measuring Carbon Nanotube Length With Capillary Thinning Extensional Rheology
82. Lianjie Xue (Texas Tech University, l.xue@ttu.edu)
    Effect of Branch Structure on the Intermolecular Dynamics of Ionic Liquids
83. Fehmi Bardak (Texas Tech University, fehmi.bardak@ttu.edu)
    Dynamic Heterogeneity and Rotational Diffusion in Ionic Liquids Near and Below T_g
84. Mejdi Kammoun (University of Houston, mejdik@hotmail.com)
    Nafion Nanocomposites with Enhanced Properties for Hydrogen Fuel Cells