Your help is requested. Please reply to George (george@udel.edu) with a time and date between October 1st - October 15th for your research group’s 4th quarter laboratory inspection. One or more students should accompany George during your lab safety audit.

Thanks to everyone in the CBE Community promoting our safety culture we’ve received positive feedback from H&S (Campus Safety) on the very good condition of our laboratories this summer. Keep up the great work!

This Week’s Department Events:

- CCST Seminar
  Dr. Maureen Tang, University of California, Berkeley
  Tuesday, October 2, 2012
  10:00am in 366CLB
  "Electrochemical Characterization of Passivating Films in Lithium-Ion Battery Electrolytes"

- Coast Day 2012 will feature the theme “Checking in on our Coast,” on Sunday, October 7, 2012.
  Coordinated by the University of Delaware College of Earth, Ocean and Environment, Coast Day is held at the Hugh R. Sharp Campus in Lewes, DE and typically attracts over 10,000 visitors a year.
  WHAT: Coast Day, a fun and educational event for the whole family
  DATE: Sunday, Oct. 7, 2012, rain or shine
  TIME: 11 a.m. – 5 p.m.
  WHERE: UD’s Hugh R. Sharp Campus, 700 Pilottown Road, Lewes, DE 19958
  Free bus transportation for University of Delaware students and staff! Limited seating. Reservations required. Call 302-831-8083. Enjoy hands-on activities, like touring a research ship, placing in the crab races, and sampling some coastal fare including the entries in the crab cake cook off!

In the News:
- Colburn Memorial Lecture
  http://www.udel.edu/udaily/2013/sep/colburn-lecture-092612.html

Future Departmental Events:
- You are cordially invited to attend Carrie Street’s defense on Wednesday, October 10th at 1:30pm in 240CLB. The title is: “Rheophysics of Thixotropic Pastes: The Rheology and Microstructure of Systems Containing Surfactants and a Crystallizing Fatty Acid”

Facilities:
- The fire lane between Spencer and the Life Sciences Building will be closed for construction between 9/27 and 10/4. The gates between Colburn and Brown will be open during this time.
- U/D Facilities has scheduled this required filter change for Tuesday, October 9th. Exhaust systems including lab fume hoods will also be shut down to minimize dirt entrainment from dirty filters into the air supply ducts. Please lower the fume hood sashes and curtail lab work during this brief shutdown. Thanks!

Other Department Events:
- AMO Seminar
  Dr. Michele Pavanello, Rutgers University
  Monday, September 24, 2012
  2:00pm in 215 Sharp Lab
  “Charge Transfer Couplings and Excitation Energies from Subsystem DFT: The Ultimate Divide and Conquer Approach to DFT”
Jobs/Recruiting:
- The Department of Chemical and Petroleum Engineering at the University of Kansas (KU) is seeking an outstanding tenure track faculty candidate at the assistant professor rank. Exceptional candidates will also be considered at the rank of Associate Professor. Special consideration will be given to applicants committed to excellence who can contribute to the University's innovative, collaborative, and multidisciplinary initiatives to educate leaders, build healthy communities, and make discoveries that will change the world (see http://www.provost.ku.edu/planning for more information). This position is intended to specifically promote and strengthen the University of Kansas strategic research theme “Sustaining the Planet, Powering the World.”

Available positions can be found on the Chemical & Biomolecular Engineering opportunity website (http://www.che.udel.edu/biz/OppIndex.html), so be sure to check it regularly.
Rheophysics of Thixotropic Pastes:
The Rheology and Microstructure of Systems Containing Surfactants and a Crystallizing Fatty Acid – Abstract

Carrie B. Street

October 2012

Soft solids with crystal networks as the underlying structure appear in a wide variety of areas and applications, including many of our favorite consumer products. Understanding how the microscopic structure is related to the macroscopic properties in these systems poses an interesting and relevant topic for formulators and the scientific community. The goal of this work, to gain a fundamental understanding of the relationships between molecular structure and interactions, crystallization, and macroscopic rheological properties of model system formulations containing surfactants and a crystallizing fatty acid, has been accomplished via a comprehensive study linking molecular composition, formulation, and processing to final properties through the use of a variety of techniques, including rheology, time domain nuclear magnetic resonance (TDNMR), differential scanning calorimetry, X-ray scattering, and small angle neutron scattering (SANS). The model system was developed by examining industrial samples with the properties of interest, namely a crystalline network structure capable of supporting its own weight at rest but able to flow under a relatively low level of applied deformation. The model system was comprised of palmitic acid (PA), sodium dodecyl sulfate (SDS), cocamidopropyl betaine (CAPB), and H₂O or D₂O. PA, the crystallizing component, serves as the main structural component, and the surfactants (SDS and CAPB) allow for the formation of macroscopically homogeneous formulations. The model system solution structure at 70°C directly relates to the final structure at 25°C. Crystallization occurs through a mixed mechanism of diffusion and surface incorporation. The model system formulations are comprised of PA crystals with adsorbed surfactant and water and a mixed PA-surfactant
mesophase. Formulations with sufficient PA and surfactant content cooled from 70°C with shear rates below 100 s⁻¹ form solid crystalline networks with a storage modulus on the order of 10⁵ Pa. Crystal size transitions from long to short plate-like crystals with increase in PA content, a consequence of an increase in supersaturation. Neutralization of the fatty acid by adjustment of the pH to approximately 7 results in the loss of crystal network formation. Adjustment of the pH to approximately 8-9 allows for the faster formation of a crystal network with wide plate-like and fibrillar crystals. TDNMR measurements and studies with varying surfactant concentration demonstrate the important role of a mixed PA-surfactant gel phase in stabilizing the crystal network. SANS studies of the microstructure during formulation further demonstrate the important role of surfactant solution microstructure in the development of a successful formulation. Finally, application of a cell model provides quantification of the development of material properties, as well as further insights into the physical mechanism of crystal network development. The learnings from this study can be used to enhance the design of consumer products with crystalline structural components.