CMET/CNS Seminar

UNIVERSITY OF DELAWARE

Annekathrin Mütze

Institute of Food Process Engineering

ETH Zurich

DATE:
July 24, 2014
TIME:
10:00 am
LOCATION:
366 CLB

Annekathrin Mütze is a PhD in the Institute of Food Process Engineering at the ETH Zurich (Switzerland). She is working for Prof. Erich J. Windhab and Dr. P. Fischer. After finishing her education to a pastry chef, she completed her Diploma of Food Process Engineering at Technical University of Dresden (Germany). Her diploma thesis was a collaboration between the TU Dresden and the ETH Zurich with focus on Interfacial Rheology of Proteins. Anne's current research focuses on Spatio-temporal instabilities in viscoelastic surfactant solutions. Her research interests include the detection and understanding shear bands with SANS, SALS, imaging, and their specific rheological behavior.

"On the appearance of vorticity and gradient shear bands in wormlike micellar solutions of dierent CPCl/salt systems"

Wormlike micellar salt/surfactant solutions (X-salicylate, cetylpyridinium chloride) are studied with respect to the applied shear stress, concentration, temperature, and composition of the counterions (X = lithium, sodium, potassium, magnesium, and calcium) of the salicylate salt solute to determine vorticity and gradient shear bands. A combination of rheological measurements, laser technique, video analysis, and rheo-small-angle neutron scattering allow for a detailed exploration of number and types of shear bands. Typical flow curves of the solutions show Newtonian, shear thinning, and shear-thickening flow behavior. In the shear-thickening regime, the solutions show vorticity and gradient shear bands simultaneously, in which vorticity shear bands dominate the visual effect, while gradient shear bands always coexist and predominate the rheological response. It is shown that gradient shear bands change their phases (turbid, clear) with the same frequency as the shear rate oscillates, whereas vorticity shear bands change their phases with half the frequency of the shear rate.

Furthermore, with increasing molecular mass of the counterions the number of gradient shear bands increases, while the number of vorticity shear bands remains constant. The variation of temperature, shear stress, concentration, and counterions results in a predictable change in the rheological behavior and therefore allows adjustment of the number of vorticity shear bands in the shear band regime.