UNIVERSITY OF DELAWARE

CENTER FOR NEUTRON SCIENCE

UNIVERSITY OF DELAWARE ENGINEERING

WEDNESDAY | OCT 25 | 9:00 AM | 366 CLB

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TECHNICAL UNIVERSITY OF MUNICH IN GARCHING, GERMANY

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STRUCTURE-PROPERTY RELATIONSHIPS IN COMPLEX STRUCTURED MATERIALS: INSIGHTS FROM RHEOLOGY, SCATTERING, AND MECHANISTIC MODELING

BIO:

Dr. Koduvayur A. Ramya is a postdoctoral researcher at the Forschungs-Neutronequelle Heinz-Maier-Leibnitz (FRM II), Physics Department E13 of the Technical University of Munich in Garching, Germany. Her project is funded by the Global Neutron Scientists (GNeuS) fellowship, a Marie Skłodowska-Curie Actions COFUND programme which aims at building the next generation of neutron scientists. Currently, she is pursuing her GNeuS secondment at the NIST Center for Neutron Research in Gaithersburg, Maryland, USA for 3 months, since August 14, 2023. In the past, she has served as the Scientist – Products & Process at Almora Botanica UK Ltd. focussed on skin-care cosmetics R&D, followed by a short postdoc at the Ingénierie des Matériaux Polymères (IMP) laboratory, Institut National des Sciences Appliquées de Lyon, France, under collaboration with Industries specialising in Bitumen applications (Colas, and Soprema). She completed her Integrated Masters & Ph.D. from the Department of Chemical Engineering at the Indian Institute of Technology Madras, Chennai, Tamilnadu, India. Therein, she worked in the Polymer Engineering and Colloid Sciences laboratory. She holds a Bachelor of Technology degree in Chemical Engineering from SASTRA University, Thanjavur, Tamilnadu, India.

ABSTRACT:

Structured materials are formed by the organization of polymers, colloids, or supramolecular assembly. They exhibit rich and diverse rheological response at large deformations by virtue of structural complexity. The first part of my talk will provide an overview of the response features of two broad classes of structured materials namely, networked systems/ gels, and soft glasses, during oscillatory shear. They were characterized in terms of the type of crosslinking, presence of additional constituents, or changes in temperature/pH. Waveform analysis was utilized to interpret local structural mechanisms contributing to their viscoelasticity, yielding, and thixotropy, either individually or simultaneously. The specific mechanistic hypotheses unraveled include chain stretching, cage dynamics, structural kinetics, and transient fibrillar network dynamics. Novel phenomenological modifications or combinations of constitutive models were utilized to capture the distinct response features of each material system.

The second part of my talk will deal with more realistic systems such as the biomacromolecules Mucins, and Dairy gels. Apart from rheology, scattering techniques such as SAXS, SANS, and USANS will be shown to be essential for probing their colloidal-scale aggregation, and the inherent structural hierarchy over length-scales many orders in magnitude.

Reference:

https://www.researchgate.net/publication/365342406_Mechanistic_Study_of_Relaxation_Proces ses_in_Structured_Materials_using_Oscillatory_Rheology

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