



学术报告通知

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题目: Opportunities for Studying Liquid Interfaces at Synchrotrons

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主持人: 王黎明 副研究员

报告摘要:

Liquid interfaces provide a dynamic platform for the assembly of soft materials. A known molecular composition can be added to the interface, the surrounding environment can be controlled (pH, ionic content, temperature, viscosity, interfacial electric potential), the interfacial density varied, and molecular species can be added to the neighboring bulk phases to bind to or chemically interact with the assembly in a controlled manner. The dynamic re-organization of the interfacial assembly in response to these perturbations provides a paradigm for materials interactions that mimic similar dynamic structure in bio-systems. Understanding the fundamental microscopic structure of liquid interfaces, and molecular films confined to these interfaces, is essential to address many technological issues faced by the world, including those in energy, health and the environment. Synchrotron X-ray surface scattering techniques are the tool of choice for structural investigations of liquid surfaces and interfaces by virtue of their sensitivity to atomic and molecular length scales and their ability to distinguish the surface structure from that of the bulk. In this talk I will first present an overview of the liquid surface science program at ChemMatCARS (Sector 15 of the Advanced Photon Source, USA) with a few examples highlighting the work on: (1) phospholipid recognition in structural immunology; (2) liquid surface-enabled directed assembly of molecules and nanoparticles for tailored functionality; and (3) metal ion extraction at the liquid/liquid interface vital to environmental and radioactive waste cleanup. I will then describe a suite of techniques that are used in liquid surface scattering at our facility, including both established ones, such as X-ray reflectivity, grazing-incidence X-ray diffraction or grazing-incidence small-angle X-ray scattering, and off-specular scattering), as well as some newly developed ones, such as time-resolved measurements on the sub-minute time scale, surface fluorescence spectroscopy, resonant or anomalous surface scattering, and high energy pair-distribution function measurements. These techniques have been indispensable in the investigation of the fundamental science of soft interfaces and in the study of model systems for natural processes important in physical, chemical, biological, and technological systems.

个人简介:

Prof. Lin is a Research Professor at the University of Chicago, and the Executive Director for ChemMatCARS, Sector 15, at the Advanced Photon Source, Argonne National Laboratory, USA. ChemMatCARS is a National User Facility dedicated to synchrotron research in chemistry and materials sciences. Lin received her PhD in Physics in 1990 with Prof. Pulak Dutta at Northwestern University, studying structural phase transitions of molecular monolayers at the liquid-vapor interface using synchrotron X-ray liquid surface scattering. She was a postdoc with Professor Stuart Rice between 1990-1994 at the University of Chicago, working on the formation and dynamics of diblock copolymer micelles at the liquid-vapor interface with laser dynamic light scattering. Lin has been with ChemMatCARS since 1994, serving first as a research beamline scientist for the liquid surface/interface scattering facility, and then as the Executive Director for ChemMatCARS. Lin's current research is focused on the investigation of the structures and mechanical properties of self-assembled nanoparticle membranes.