NSF's ChemMatCARS

Science Highlights in Liquid Interface Scattering

Mark Schlossman
Co-PI, NSF's ChemMatCARS
PI, Second Beamline Project
University of Illinois at Chicago

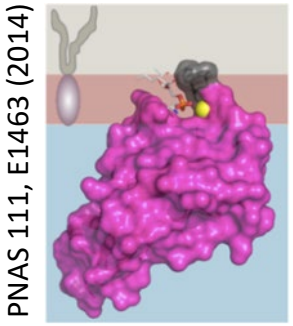
Ka Yee C. Lee
Co-PI, NSF's ChemMatCARS
University of Chicago

NSF's ChemMatCARS Liquid Surface/Interface Science

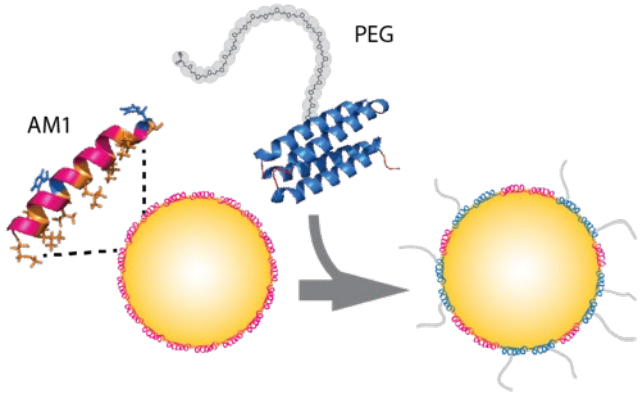
NSF's ChemMatCARS UCHICAGO

World's Leading Synchrotron X-ray Facility for Studying Liquid Surfaces and Interfaces

Largest range of techniques and scientific breadth of user community



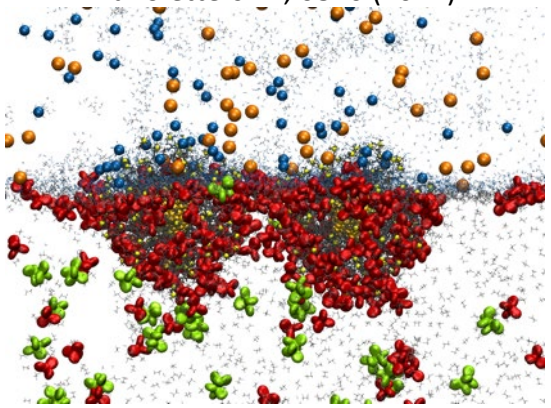
Life Processes



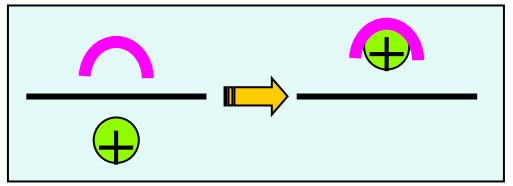
Interfacial Complexation
for
Emulsions, Films and Coatings

X-rays are the leading probe of liquid interfaces on the nanoscale

Nanoletters 14, 6816 (2014)

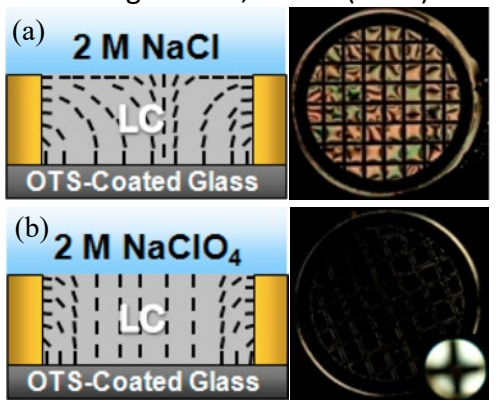


Directed Assembly
for
Functional Interfaces



Metal Ion Extraction
for
Chemical Separations

Langmuir 28, 12796 (2012)



Structured Liquids
for Analyte Sensing

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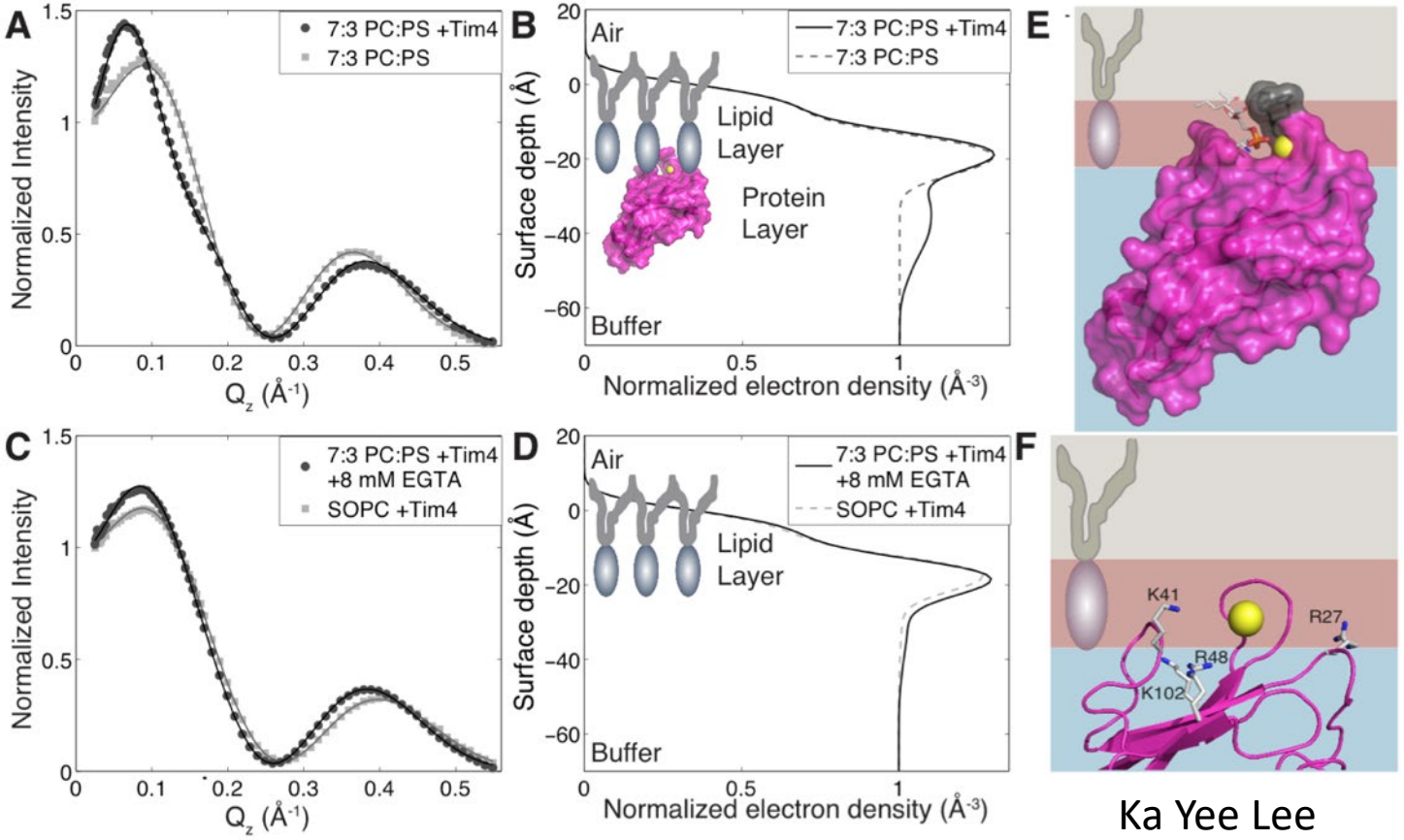
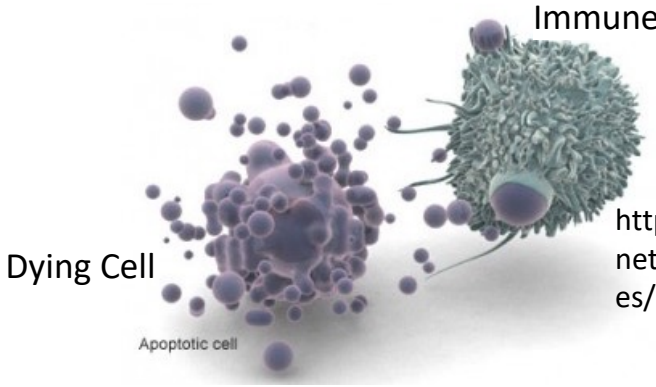
Life Processes:
Protein-Lipid Interactions

cell signaling, recognition, and bio-catalysis



Ka Yee Lee



http://www.apoptosis-networks.eu/media/images/article1/max/19.jpg

Key issues addressed at ChemMatCARS:

- Lipid composition provides a molecular basis for immune recognition of dying cells (K Y Lee)

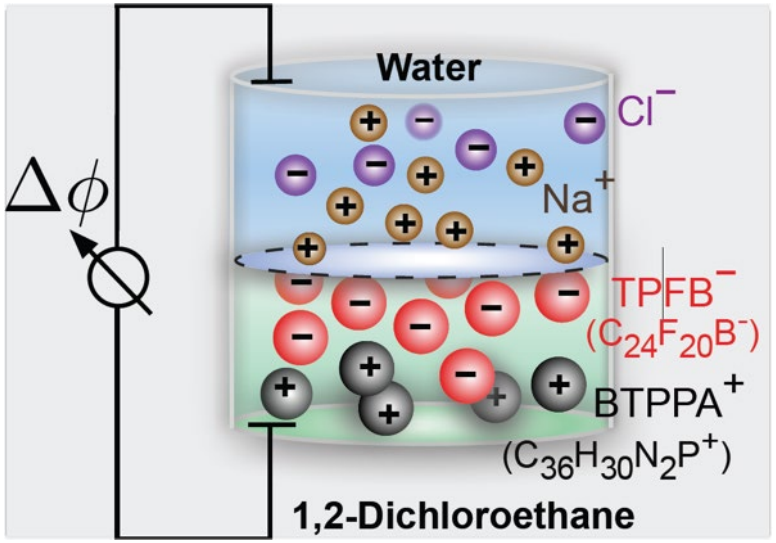
Related work is investigating:

- Anti-microbial peptides (DeWolf, Gidalevitz)
- Crop protection – herbicide/surfactant (Paige)
- Models of gram-negative bacterial membranes (Holt)
- Lung surfactants (Lee/Zasadzinski)

NSF's ChemMatCARS Liquid Surface/Interface Science

Electric Field Effects at Liquid Interfaces

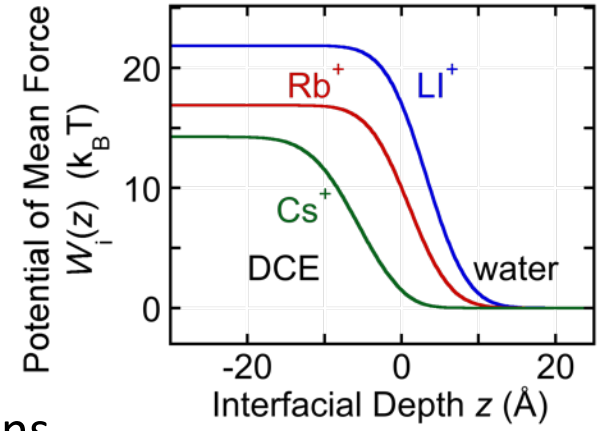
many energy, complex fluids, and biomaterials processes controlled by interfacial electric fields



***In situ* studies of interfaces in liquid-liquid electrochemical cells**

Voltage-Tunable Order at Ionic Liquid Interfaces

Naoya Nishi



Ion interactions at interfaces

Mark Schlossman

Key issues addressed at NSF's ChemMatCARS:

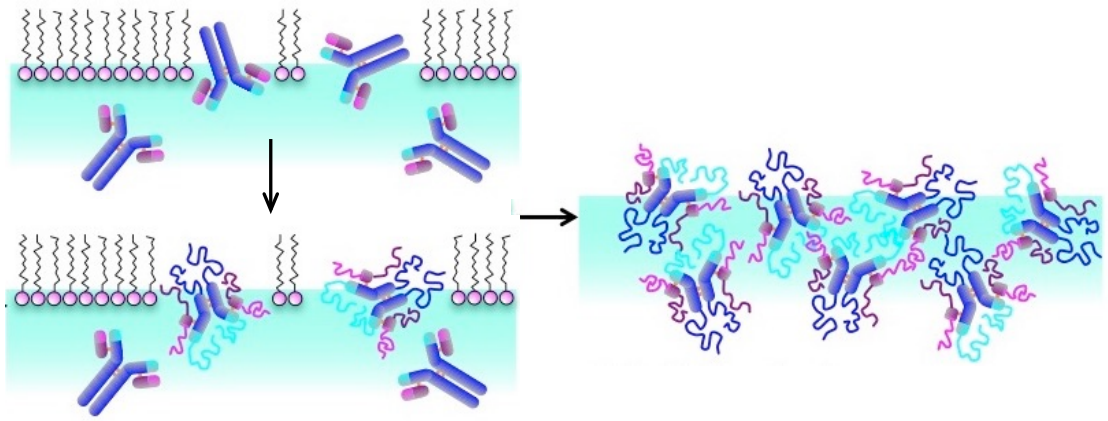
- Basic experiment/theory approach to interfacial ion distributions
- Role of ion-solvent interactions and ion-ion correlations
- Extension to voltage-tunable assemblies of lipids, nanoparticles

NSF's ChemMatCARS Liquid Surface/Interface Science

Functional Soft Interfaces

nanoscale machines, optical response, directional ion/electron transfer, cargo delivery

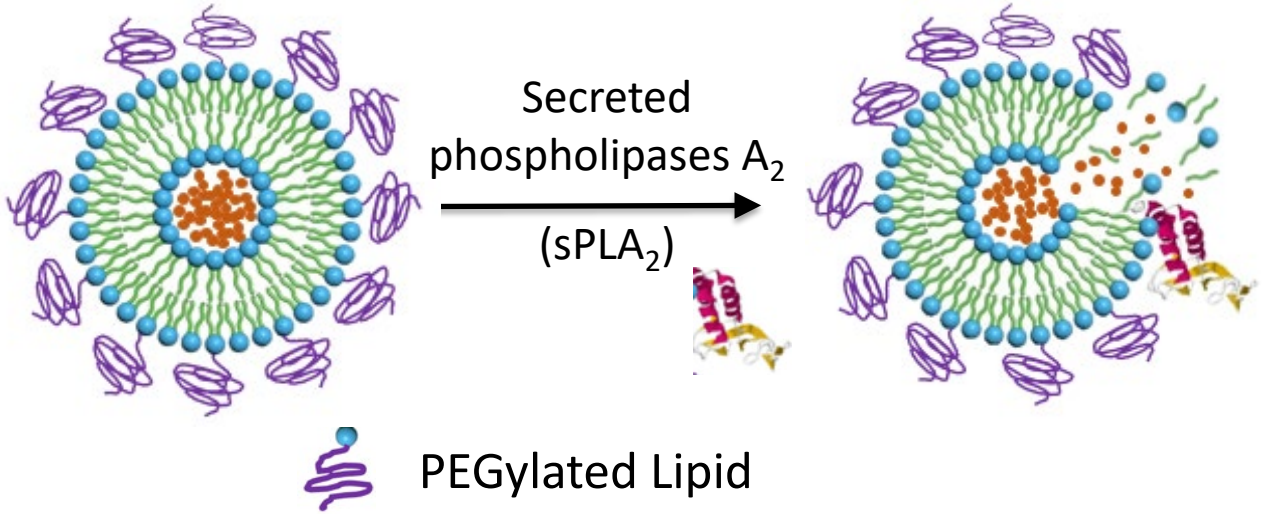
Self-Assembling Protective Surfaces



Protective Layers for Manufacturing and Storage of Therapeutics

Raymond Tu

Artificial Dense Granules



PEGylated Lipid

Programmable cargo delivery

Ying Liu

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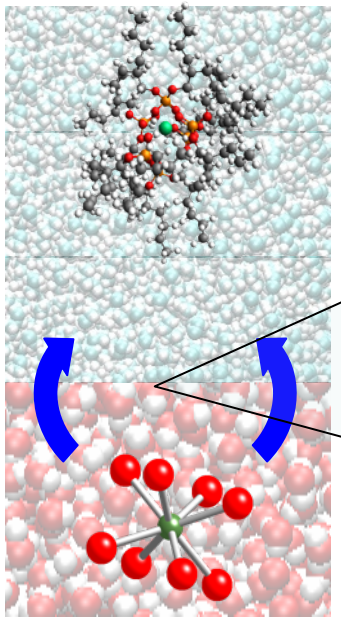
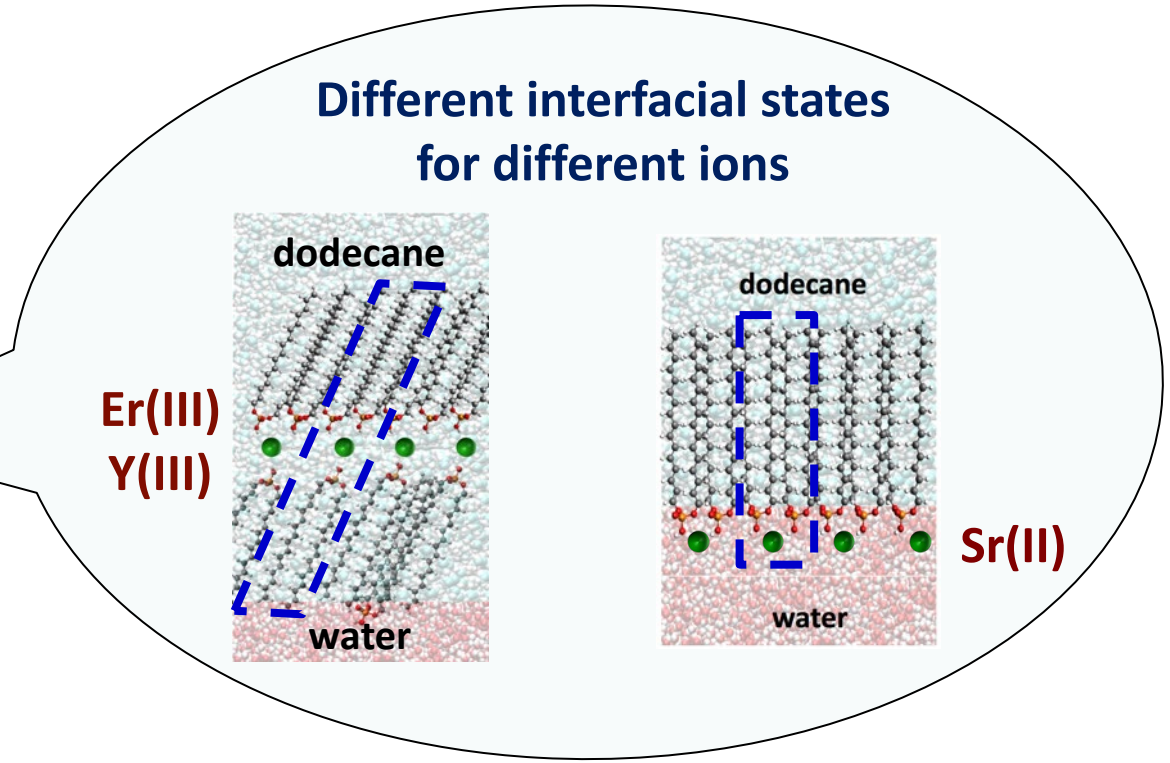
Separations: Follow the Transport of Ions across Interfaces

water purification, toxic/radioactive metal cleanup, rare earth & base metal production

ions in reverse micelles in oil

hydrated ions





Several Groups Investigate Separations:

Pulak Dutta

Mark Schlossman

Ahmet Uysal

Role of Liquid Interfaces:

- Separation of metal ions occurs at liquid interfaces (established industrial processes: solvent extraction)
- Electrostatic effects enhanced at liquid interfaces (dielectric boundary)
- Interfacial ordering of extractants enhances formation of metal ion-extractant complexes