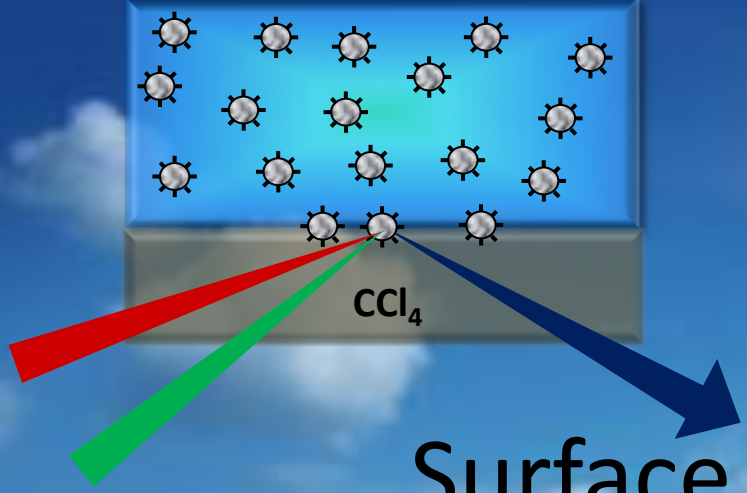
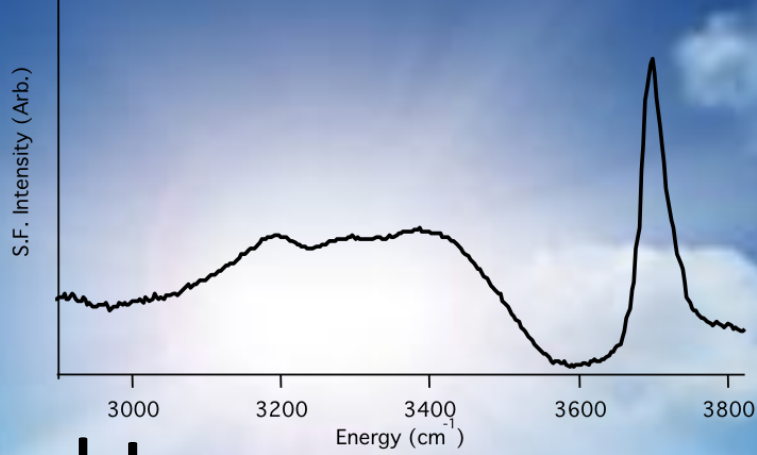
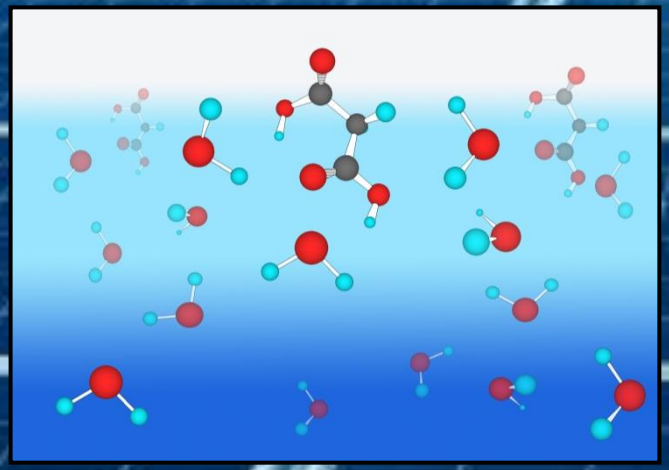
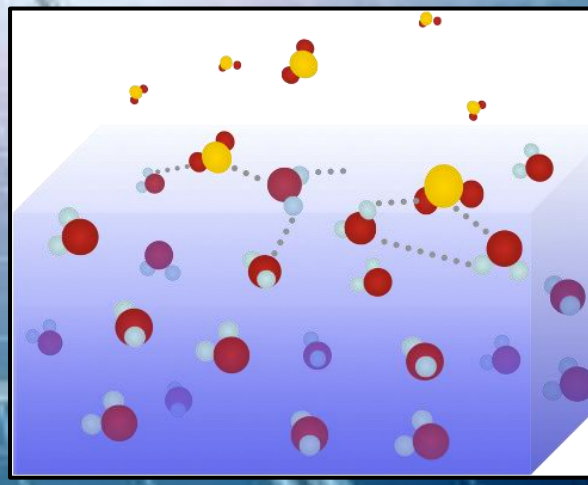




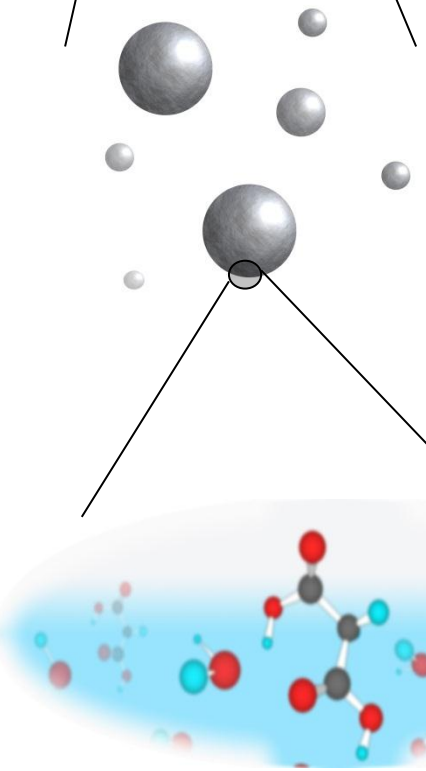
Surface Studies and Laser Spectroscopy with Geri Richmond and Friends

A brief presentation by
Brandon Schabes



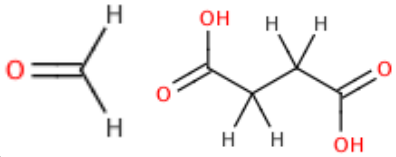


Air/Water Studies: Modeling Behavior at Aerosol Interfaces



How do soluble organics orient at the surface?

- Aerosol aging
- Surface chemistry
- Gas-phase pollutant uptake and absorption
- pH dependence



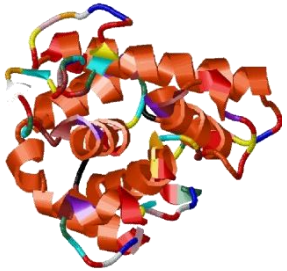
SO_2 Uptake:
Acid Rain
Climate Change

How do salts affect gas uptake?

How do organics and salts affect uptake?

Oil-water studies: Model for a variety of molecular processes.

Polyelectrolytes



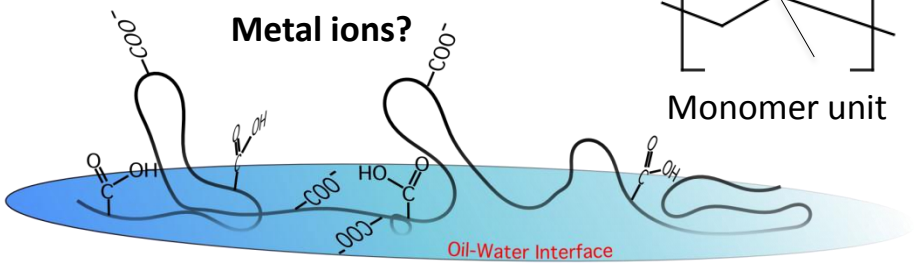
Proteins:
Cellular adsorption

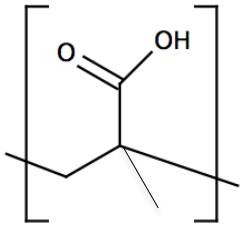
Humic acids:
Water remediation

Flooding & flocculent:
oil recovery

What factors affect polyelectrolyte adsorption to an oil/water interface?

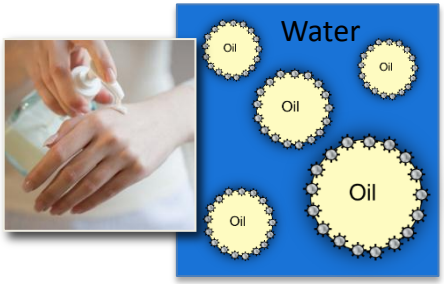
Molecular weight?
Charge Density?
Specific isomer?
Solution pH?
Metal ions?



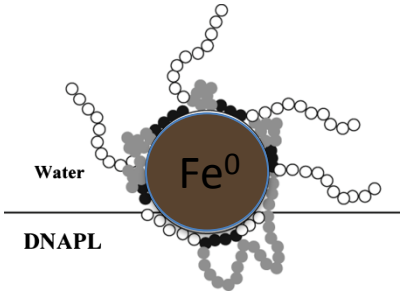


Monomer unit

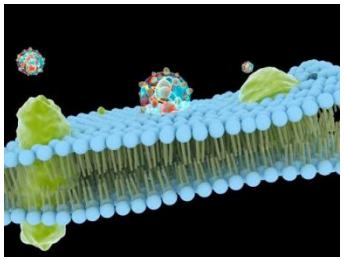
Surface Modified Nanoparticles



Nanoparticle self-assembly
& emulsion stabilization

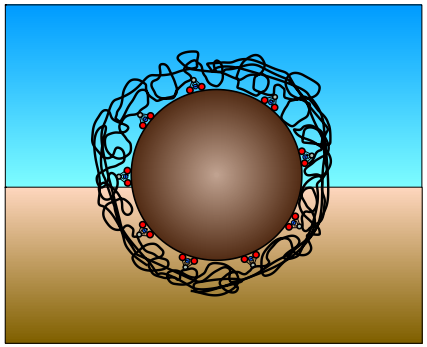


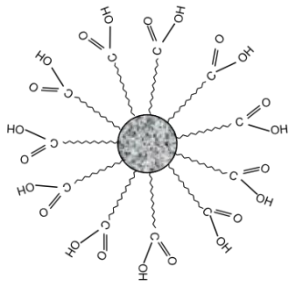
Water remediation



Targeted drug delivery

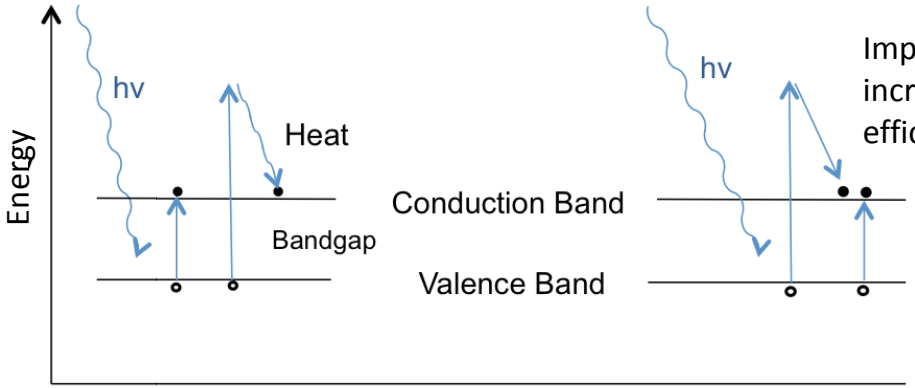
Under what conditions do polyelectrolyte and surfactant modified nanoparticles adsorb to and orient at an oil/water interface?



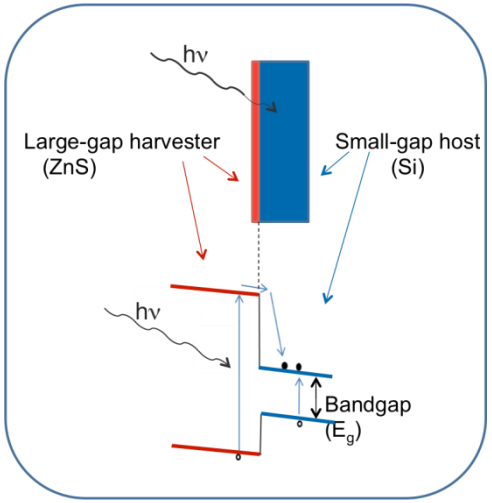


More efficient heterojunction solar cells

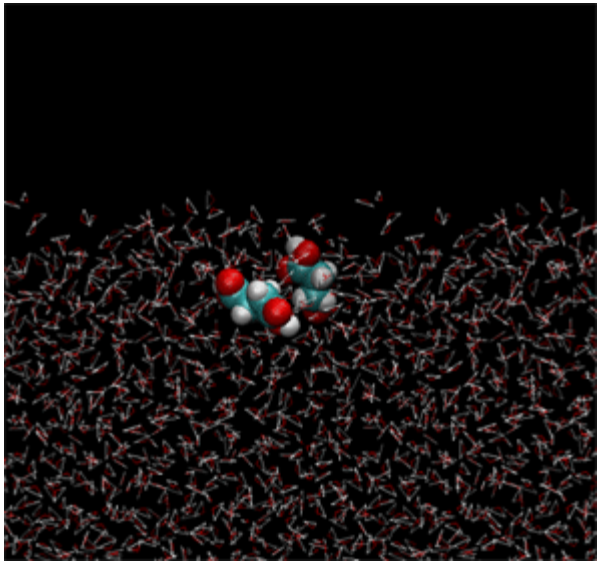
Goal: Fabricate and analyze semiconductor material combinations that will promote impact ionization at heterojunctions.



Impact ionization increases quantum efficiency!



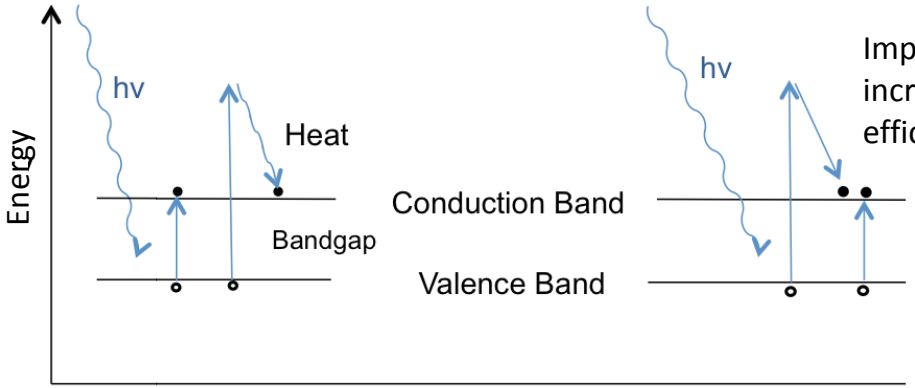
Molecular dynamics corroborate air/water spectra



- Combination of classical dynamics and density functional theory
- Predicts minutiae of molecular orientation at interface
- Generates vibrational sum frequency spectra
  - Compare with experimental spectra

More efficient heterojunction solar cells

Goal: Fabricate and analyze semiconductor material combinations that will promote impact ionization at heterojunctions.



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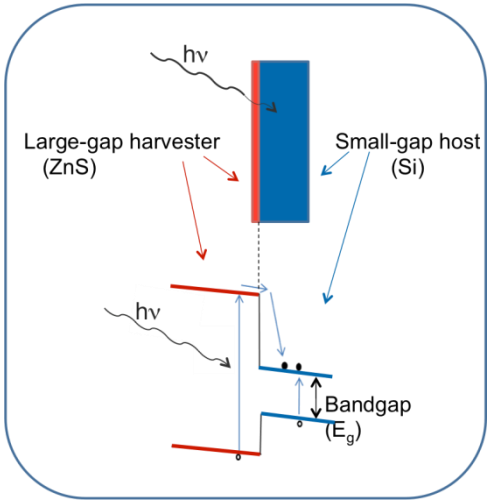
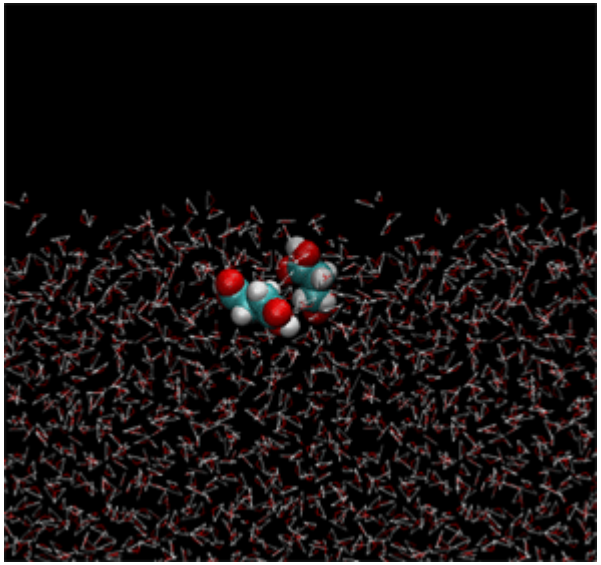


Molecular dynamics corroborate air/water spectra

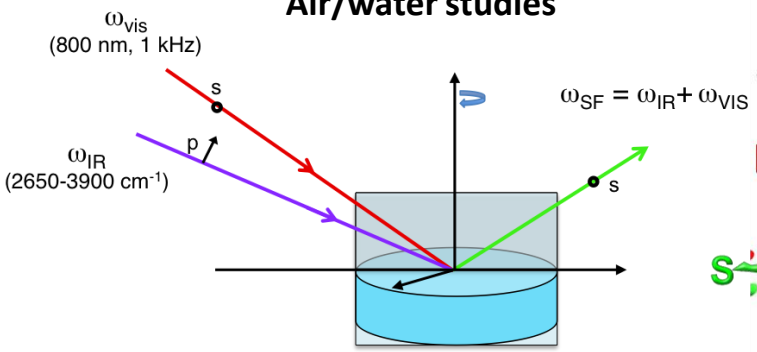


- Combination of classical dynamics and density functional theory
- Predicts minutiae of molecular orientation at interface
- Generates vibrational sum frequency spectra
  - Compare with experimental spectra

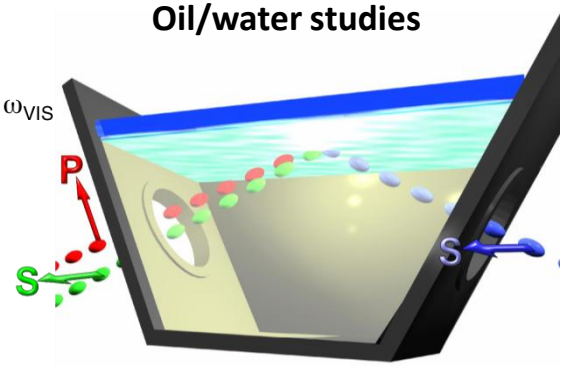
Experimental Techniques

Sum frequency spectroscopy: Vibrational spectra of interfacial molecules.

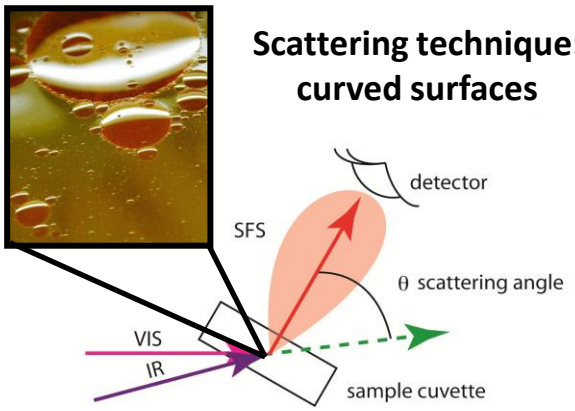
Air/water studies



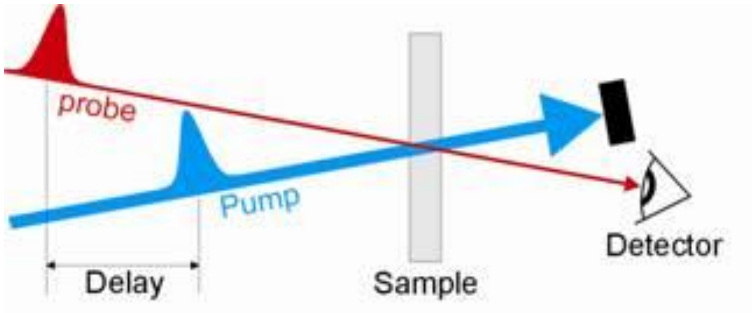
Oil/water studies

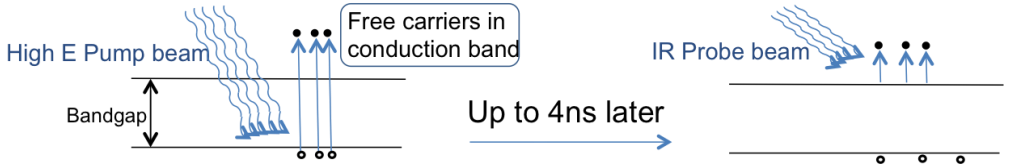


Scattering technique: curved surfaces

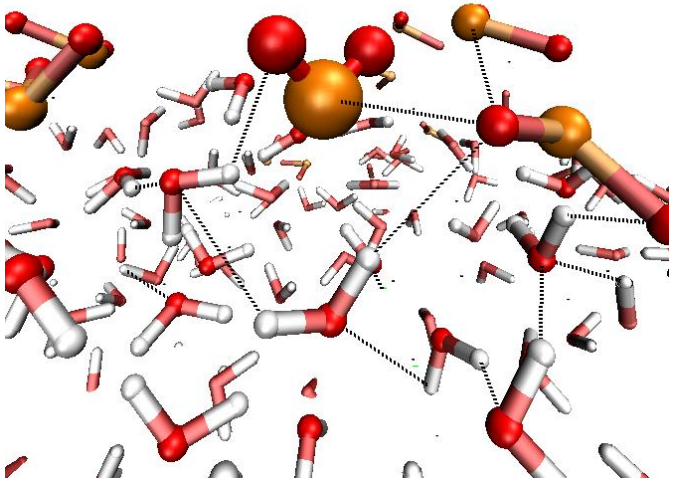


Pump-probe experiment for solar cell research





Molecular Dynamics Simulations



Simulations of interfaces are performed to generate computational descriptions of experimental observations.

Other techniques: FTIR, interfacial tension, dynamic light scattering

Pat Blower

Dr. Katy Plath

Ellen Robertson

Dr. Fred Moore

The Richmond Lab

Feel free to ask questions. Jet Meitzner will represent us at the poster session!

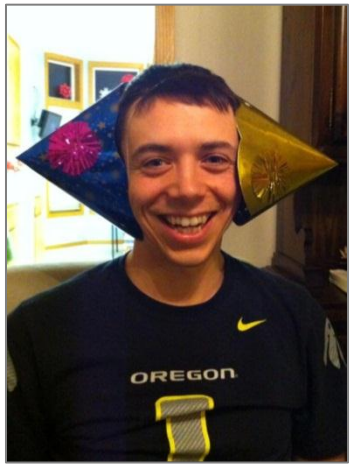
Dr. Stephanie Ota

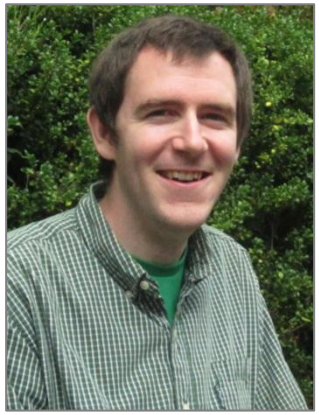
Brandon Schabes

Laura McWilliams

Brock Tillotson

Jet Meitzner





Dr. Nick Valley

Dr. Jennifer Hensel