3D Reconstruction and Atomic Concentration Profile of a ZVI Tip

such as electrical double layer (EDL) structure, interfacial dielectric constants, surface charge densities, adsorption constants, free energies of interaction, and properties such as

Changes in atomic concentration of Fe, Cr, and O with depth in the ZVI films as a function of depth. The films were analyzed using 2D SHG mapping techniques to determine the distribution of iron and its oxidized state in the ZVI films. The SHG signals were collected as a function of depth, revealing the iron content and its distribution within the ZVI film.

Geochemistry

Investigating Electrochemical Double Layer Structure with Nonlinear Optics

Second harmonic generation (SHG) is one of the most important nonlinear optical properties arising from the electronic dipole moment of molecules. The SHG process is sensitive to interfacial properties such as electrical double layer (EDL) structure, interfacial dielectric constants, surface charge densities, adsorption constants, free energies of interaction, and other properties such as the EDL structure.

Atmospheric Chemistry

Surfaces of Secondary Organic Aerosol (SOA) Particles

This work is driven by the need to increase the level of scientific understanding of how aerosol particles impact the Earth’s climate system. To pursue this objective, we focus on the secondary organic aerosol (SOA) properties and their role in the atmospheric processes. We aim to develop a better understanding of the atmospheric processes that affect the properties and evolution of SOA particles in the atmosphere.

a-Pinene-Catalyzed Oxidation Products

SOA formation and growth in the atmosphere are key processes in determining the chemical composition and physical properties of aerosol particles. The study of SOA formation and growth is essential for understanding the impact of aerosols on climate and air quality.

Energy Conversion in Metallic Nanolayers

Current efficiencies for electric power generation from nanostructured systems are low, but as a result of the unique electrical and optical properties of nanomaterials, they have the potential to surpassable energy conversion efficiencies. In our lab, we use SHG to study the physical properties of materials and their potential applications in energy conversion.

Biological and Synthetic Membranes

Understanding the role of biological membranes in cellular processes is crucial for the development of new therapeutic strategies. Our lab uses SHG to study the structural and functional properties of biological membranes and their interactions with synthetic membranes.

Funding

NSF Environmental Chemical Sciences Program, NSF Chemical Sciences, Dynamics, and Mechanisms Program, NSF Center for Chemical Innovation (CCI), DOE Basic Energy Sciences (BES), DOE Environmental Molecular Science Laboratory (EMSL), and Pacific Northwest National Laboratory (PNNL).