Interfacial Structure, Dynamics and Reactivity of Advanced Materials Examined with Molecular Beam Scattering, Scanning Probe Imaging, and Numerical Simulations

Steven J. Sibener

1The James Franck Institute and Department of Chemistry, The University of Chicago, Gordon Center for Integrative Science, 929 East 57th Street, Chicago, IL 60637 USA

This presentation will examine current forefront topics in interfacial structure, dynamics, and reactivity. Notable advances are occurring in our atomic-level view of such issues, driven by synergies between scattering measurements, local scanning probe imaging, numerical simulations and theory. Emphasis is increasingly aimed at examining how local structures kinetically form on the atomic level [1-3], and how relative reactivity and physical properties depend on local ensemble configuration. Another trend is the examination of more complex interfaces including structural evolution on multiple length-scales. Examples of this include self-assembling molecular systems [4], polymers [5,6], and hierarchical functional materials [7,8]. Due to the aforementioned developments, we are gaining rigorous atomic-level insight into the dynamical processes which govern a wide-range of heterogeneous phenomena, such as reaction dynamics and catalysis [9], collisional energy transfer [10], materials growth and erosion, self-organization, and interfacial metallurgy. This presentation will illustrate the above using recent research from our laboratory. It is with the greatest pleasure that I acknowledge as part of this award address all past and present members of the Sibener Group whose beautiful science contributed to these accomplishments.