Going Nonlinear to Study Adsorption Processes at Solid/Liquid Interfaces

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Over the last decades, significant advances have been made in the study of adsorption processes at mineral-water interfaces. In particular, surface enhanced infrared (IR) techniques, and, more recently, non-linear vibrational sum-frequency spectroscopy (VSFS) has provided novel insights into structure and dynamics of these interfaces. The driving forces behind adsorption at mineral substrates are as diverse as the set of commonly encountered adsorbates, which range from simple inorganic ions, to organic molecules from the smallest to the largest polymers. Electrostatics, cooperative processes, self-assembly into mesoscopically ordered aggregates, and species chemical interactions all play an important role. In this presentation I will describe our recent studies measuring the structure and dynamics of film growth on a mineral surface with sequential measurements of both the interfacial water and the adsorbate structure upon assembly. Particular consideration is given to organic adsorbates including surfactants, because of their eminent technological importance for the modification of surface properties and their omnipresence in the environment.