# Structure and Dynamics in the Surface Chemical Bond

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An understanding of surface chemical reactions relies on an understanding of the surface chemical bond. Ranging from rather weak bonds not unlike macromolecular interactions in polymeric and biological systems, to chemisorption interactions that are clearly covalent in nature, the surface chemical bond is not a single or a simple entity. We illustrate here the complexity of this surface chemical bond, using two examples of general studies of the structure and reaction dynamics of molecule-surface interactions taken from our recent work.

The first example focuses on the process of molecular self-assembly at well characterized surfaces. The use of molecular beam scattering as well as scanning probe microscopy, coupled with electron spectroscopic and microscopic methods, provides information about the formation and energetics of chiral and achiral organic monolayers and designed nanostructured surfaces. Implications for the understanding of homochirality in biological systems, and applications in organic electronic device design are mentioned.

The second example uses the tools of surface science, coupled with optical pulse shaping methods, to address the quantum control of surface chemical dynamics. Carefully designed self-assembled monolayer samples along with surface sum frequency generation as a feedback signal, have been used to optimize selective bond manipulation at the surface. Possible applications to heterogeneous catalysis and electronic device preparation will be presented.