For the past decades, the electric double layer model was the conceptual framework to interpret many surface chemical phenomena. But we pointed out in this paper that the chemical interactions of solutes with natural surfaces has to be considered in addition to those of the electric double layer. While the surface in the electric double layer model is assumed to be a structureless continuum (like an electrode), the basic concept in the surface functional groups, e.g., OH-groups, formed on all natural inorganic and organic hydrous solids. These functional groups contain the same donor atoms as found in functional groups of many soluble ligands and thus interact coordinatively with protons and metal ions. A most significant advance was made by Laura Sigg of the Institute for Water Resources and Water Pollution Control, who showed that the concept could be extended to the interaction of hydrous metal oxides with ligands, i.e., the metal loss in the surface layer of the oxide—acting as Lewis acids—can replace their coordinated OH-groups by ligand exchange reactions with ions or weak acids. She also showed that the energy-related relations that the tendency to form (isomers) complexes in solution can be correlated to the tendency to form corresponding surface complexes.

A concerted effort of three of my PhD students, C. Furter, G. Furter, and E. Wiedend, was very successful in demonstrating the applicability of the surface complex formation model to surface reactivity. They derived—by considering surface coordination, lattice statistics, and activated complex theory—a unifying kinetic law for the surface controlled reactions such as dissolution (and weathering of minerals) to surface catalyzed redox reactions and to many photocatalytic surfaces. The newest developments on the dependence of surface reactivity on surface structure are reviewed in a recent contribution to Coordination Chemistry (1990). That surface complexation has come of age is demonstrated by two recent books.

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