processes and the formation and dissociation of organic complexes, while the calculation of the equilibrium composition in the bulk medium has to take into account the slow processes as well. At the cell surface the reaction with surface ligands and subsequent internalisation is modeled by a Michaelis-Menten-type flux condition.

086. SORPTION OF ORGANIC COMPOUNDS TO SOIL ORGANIC MATTER: A NEW CONCEPT OF MECHANISM AND ITS POSSIBLE IMPLICATIONS FOR KINETICS. J.J. Pignatello, The Connecticut Agricultural Experiment Station, P.O. Box 1106, New Haven CT 06504

The widely-accepted solid-phase dissolution (partition) model of sorption is challenged by recent studies of both polar and apolar compounds showing that SOM has a non-uniform sorption potential. This is manifested in nonlinearity over a wide concentration range, competitive effects in bisolute systems, and evidence from gas adsorption studies that SOM has a large "internal surface". It is proposed that SOM acts as a dual-mode sorbent, in analogy to glassy polymers. In the dual-mode model, dissolution and hole-filling processes take place concurrently. The holes are postulated to be nanometer-size voids (unrelaxed free volume) within the 3D matrix where sorbate molecules undergo an adsorption-like interaction with the humic strands that make up the walls. The presence of such voids is revealed as internal nanoporosity on comparison of N2 isotherms at 77 K with CO2 isotherms at 273 K. Hole-filling is a significant component of total sorption of 1,3-dichlorobenzene and atrazine in a peat soil (30-70%, depending on compound and conc.). The influence of SOM properties and the strong correlation between nanoporosity and nonideal organic sorption behavior reinforces the validity of the model. Hole-filling is slower than dissolution.

087. A THREE-DOMAIN MODEL FOR SORPTION BY SOILS AND SEDIMENTS. W.J. Weber, Jr., W. Huang and E.J. LeBoeuf, Department of Civil and Environmental Engineering, Environmental and Water Resources Engineering, The University of Michigan, Ann Arbor, MI 48109-2125

A three-domain model is advanced to describe the sorption of hydrophobic organic contaminants (HOCs) by heterogeneous soils. It is hypothesized that soil and sediment particles comprise three primary sorption domains; i.e., an exposed mineral domain (I), a highly amorphous organic matter domain (II), and a relatively condensed organic matter domain (III). Experiments conducted in our laboratory have revealed that sorption by Domains I and II are nearly linear, relatively fast, and completely reversible. Conversely, sorption by the condensed organic matter Domain III is nonlinear, very slow, and only partially reversible. We have observed for a natural humic acid a transition from a condensed or "glassy" state to a highly amorphous or "rubbery" state as temperature increases to above 43 degrees C. The three-domain model appears to afford the possibility of predictions of equilibrium and rate phenomena for the sorption and desorption of HOCs by soils and sediments based upon relatively simple measurements of certain physical properties of these natural sorbents.

088. EVIDENCE FOR DIFFERENT SOIL SORPTION MECHANISMS FOR THE NEUTRAL AND CHARGED FORMS OF PENTACHLOROPHENOL. J. P. DiVincenzo. Department of Chemistry, Middle Tennessee State University, Murfreesboro, TN 37132 and D.L. Sparks, Department of Plant and Soil Sciences, University of Delaware, Newark, DE 19716.

Ionizable organic chemicals present a unique environmental concern due to the extensive physicochemical differences between the two species. Pentachlorophenol (PCP) has a pKa (4.75) within an environmentally relevant pH range. Therefore it can exist in either the charged (ionized) or neutral (protonated) form within the environment. Equilibrium and kinetic studies suggest important differences between the two species in soil. The neutral form remains relatively available to diffuse out from the soil over long periods of time. The charged species shows a much greater resistance to desorption. Differences in isotherm behavior suggest a partitioning mechanism for the neutral PCP and a more site specific reaction for the charged species. Temperature studies and thermodynamic calculations support these findings.