K_d Test Method

The values of K_d are used to predict the mobility and transport of contaminants through soils. Higher values of K_d represent soils in which the particular contaminant is less likely to leach into the groundwater or runoff into surface water, as it is tightly bound to soil particles and will not easily move through the soil. Contaminants are more likely to leach from soils with low adsorption coefficients, posing contamination risks for ground and surface water. The values of K_d are dependent on various soil properties such as organic matter content and pH, as well as the type and concentration of contaminant, and can thus vary over a range of at least eight orders of magnitude.

The K_d is usually a measured parameter that is obtained from laboratory experiments. The 5 general methods used to measure K_d values include the slurry (batch) laboratory method, the column laboratory method, field-batch method, field modeling method, and K_d method.

The most typical method for measuring values of K_d is the slurry (batch) equilibrium method. In this method, a contaminant is added to a mixture of water and soil and the concentrations in the soil and aqueous phases are measured after the system reaches equilibrium. The column laboratory method is the second most common method of measuring K_d and includes observing contaminant movement in water flowing through a soil column and the use of thin-layer chromatography.

Though it is recommended to obtain K_d values through a laboratory analysis, it is also possible to obtain K_d values through literature sources for K_{oc}, the organic carbon-water partition coefficient. $\mathbf{K_d = f_{oc} \times K_{oc}}$, where f_{oc} is the fraction of organic content in soil. The f_{oc} can be determined from a laboratory analysis of clean soils from the site. Values for f_{oc} typically range from 0.03 to 0.00017 mg/mg.

Source:

Davis, Mackenzie L. and Susan J. Masten. Principles of Environmental Engineering and Science. New York: McGraw-Hill, 2004.

Selected references for literature data for $\mathbf{K_{oc}}$:

Suthersan, Suthan. Remediation Engineering Design Concepts. Lewis Publishing. 1997. pp 325-338.

Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals. Wiley and Sons. 2001.