ENVIRONMENTAL FORENSICS

Principles & Applications

Robert D. Morrison

CRC Press
Boca Raton London New York Washington, D.C.

TABLE 1.7
Henry's Law Constant for Selected Chlorinated Solvents

Compound	Henry's Law Constant (atm-m^3/mol)
Trichloroethylene (TCE)	0.00937
Tetrachloroethylene (PCE)	0.0174
Carbon tetrachloride (PCM)	0.0298
Chloroform (TCM)	0.00358
Dichloromethane (DCM)	0.00212
1,2-Dibromomethane (EDB)	0.000680
cis-1,2-Dichloroethylene (1,2-DCE)	0.000374
trans-1,2-Dichloroethylene (1,2-DCE)	0.000916
1,1,1-Trichloroethane (TCA)	0.0167

1.3.3 Henry's Law Constant (K_H)

The Henry's Law constant (K_H) (also known as the air-water partition coefficient) is the ratio of the partial pressure of a compound in air to the concentration of that compound in water at a given temperature. The Henry's Law constant is, therefore, a measure of the propensity of a compound to volatilize when moving through the soil. As the Henry's Law value increases, the concentration of the contaminant in the soil vapor phase increases. Compounds with high Henry's Law constants (PCE, Freon-11, Freon-113, and vinyl chloride) are more amenable to soil gas surveys and remediation via vapor extraction than compounds with low values. Values for Henry's Law constants are usually expressed in units of moles per cubic meter for air to moles per cubic meter for water (atm-m^3/mol). As a rule of thumb, compounds with a Henry's Law constant greater than 10^{-3} atm-m^3/mol and a molecular weight less than 200 g/mol are considered volatile (U.S. EPA, 1996). A compound with a Henry's Law constant less than about 5×10^{-5} atm-m^3/mol is considered soluble and tends to remain in water (Olson and Davis, 1990).

The Henry's Law constants for TCE and PCE are 0.00937 and 0.0174 atm-m^3/mol, respectively, and Table 1.7 lists the Henry's Law constants for selected chlorinated solvents (Montgomery, 1992; Pankow and Cherry, 1996).

Values for Henry's Law constants can also be expressed in dimensionless form as:

$$K_H' = K_H/(RK) \qquad \text{(Eq. 1.1)}$$

where

K_H' = dimensionless Henry's Law constant.
K_H = Henry's Law constant (atm-m^3/mol).
R = ideal gas constant (8.20575×10^{-5} atm-m^3/mol – K).
K = temperature of water (degrees K).