

Problem Set 2

Kd AND PUMP AND TREAT TECHNOLOGY Chapter 2 Related Problems

For those taking CEE 5680 and CEE 6680:

1.(a) Prepare two (2) appropriate sorption isotherm plots, and use them for calculating a K_d value and R^2 , and for calculating a K_f value and R^2 for the following results for pentachlorophenol (PCP) distribution between water and soil. The results below are for an aquifer material with an organic carbon content of 0.4 percent.

Solution phase PCP concentration (mg/L)	Aquifer phase concentration (mg/Kg)
0.117	0.523
0.119	0.535
0.118	0.542
1.366	3.283
1.347	3.377
2.747	4.873
2.751	5.196
4.075	6.541
4.005	6.756
4.069	6.837
5.501	8.628
5.591	8.705
5.425	7.907
6.476	10.104
6.305	9.775
6.415	9.732

- (b) State the two equations of the lines relating sorbed chemical to chemical in solution, one using the K_d term and one using the K_f (Freundlich) term with the exponential value.

For those taking CEE 6680 (Graduate Credit) – also do the following two problems:

2. This question addresses sorption as discussed in Chapter 2. Although the value of the freundlich exponential term, $1/n$, is often one with nonpolar species, sometimes the value can be greater or less than 1. Show: (1) a plot of $\log C_s$ versus $\log C_w$, for a constant $K_f = 3.0$, with values of $1/n$ of 0.2, 0.5, 0.8, 1.0, 3.0 and 5.0, and (b) a linear-linear plot of C_s versus C_w values obtained in (1) above.

3. Application of problems 1 and 2 to estimates of chemical sorbed to soil/aquifer material. If the assumption is made that the value of $1/n=1$, and the value of $1/n$ is actually greater than 1, will an estimate of sorption underestimate or overestimate sorption? **Explain Why**