

BSyE 452/552

Problem set 4

1. (BAE 452/552) Results from a sorption experiment are shown in Table 1.

C_d ($\mu\text{g L}^{-1}$)	C_s (mg g^{-1})
5	8
10	11.5
15	16
20	17
25	18
30	19
35	20

- Fit the data with the Langmuir isotherm. Display the resulting isotherm along with the data.
- Fit the data with the Freundlich isotherm. Display the resulting isotherm along with the data.
- Which of the two isotherm models fits the data best?
- Provide an estimate for the linear partition coefficient. Does the data fit a linear isotherm model?

2. (BAE 452/552) In this problem, you are asked to determine the adsorbed and solution concentration of nitrogen (N) in a Palouse silt loam (found near the Moscow area). The soil has a gravimetric soil moisture content of 39.2%, a bulk density of $1,350 \text{ kg m}^{-3}$, and a porosity of 50%. The total nitrogen in this silt loam consists of 75% organic N and 25% NH_4^+ -N.

Given in the table below are the adsorption isotherm data for adsorption of NH_4^+ -N on the Palouse silt loam:

Adsorbed concentration of NH_4^+ -N ($\mu\text{g g}^{-1}$ of soil)	Solution concentration of NH_4^+ -N (mg L^{-1} of soil solution)
15	2.3
25	5
43	12
78	21
120	37
170	58

- Determine the Freundlich isotherm relationship for adsorption of NH_4^+ -N on the silt loam.
- Estimate the concentration of total NH_4^+ -N (mg L^{-1}) in the silt loam soil using the Figure by Parker (1946) in the handout with session 11.
- Determine the adsorbed concentration of NH_4^+ -N and the solution concentration of NH_4^+ -N in the silt loam soil.