

1. Adsorption Separation of Immunoglobulin G using Modified Dextran (adapted from Belter, Cussler, & Hu, pg 153).

The equilibrium between immunoglobulin G and a modified dextran (the adsorbent) can be described by the Langmuir isotherm. Dextran will adsorb up to 7.8×10^{-6} moles of immunoglobulin G per cm^3 of adsorbent and the Langmuir constant, K_L , is 1.9×10^{-5} moles/liter. The adsorbent density is 1 gram of adsorbent per cm^3 of adsorbent and the void fraction of a column packed with this adsorbent is 0.40.

- a) What is the total adsorption capacity of a column packed with modified dextran if the feed concentration of immunoglobulin G is 2×10^{-5} moles/liter? (use column data from b))
- b) What is the mean retention time for immunoglobulin G in a column of diameter equal to 5 cm with a feed flow rate of 1 liter per minute, feed concentration of 2×10^{-5} moles/liter, and a length of 1 meter?
- c) How many columns would have to be employed to recover immunoglobulin G from a feed tank of 10,000 Liter volume assuming the same feed concentration?

2. Travel Distance of Solutes A and B in a Chromatographic Column.

Problem 11.6 of the text, parts a and b. Assume that $C_A = 0.10$ mg/ml and $C_B = 0.05$ mg/ml in the liquid phase of the column at equilibrium with the adsorbed solute.

3. Determining Time to Elute a Solutes A and B from a Chromatographic Column.

Problem 11.7 of the text

Due Fri. 16 Nov., 2007.