CEE 680 Spring 2020

Water Chemistry

Homework Set #7

1. Nickel forms a series of complexes with aqueous ammonia. Draw a set of alpha curves (vs log[NH_3]) for the Nickel Ammonia system. Use the following stability constants (determined from Smith & Martel; Vol.4, pg.40). Include also an n-bar curve.

$\log K_1 = 2.72$
$\log K_2 = 2.17$
$\log K_3 = 1.66$
$\log K_4 = 1.12$
$\log K_5 = 0.67$
$\log K_6 = -0.03$

2. Determine the species composition of a solution containing 10 mM total nickel and 30 mM total ammonia. Assume that the solution is buffered at pH 10.3. Then discuss the assumptions you might have made, and how changes in pH might affect this system.

3. Using MINEQL (and a graphics or spreadsheet package) prepare a Log Concentration vs pH graph for the copper NTA problem solved in class. But this time assume a total concentration of 10^{-3} M for copper and $10^{-2.7}$ M for NTA. Show the same three species I plotted on my graph, and use the same axis range. Are there differences between your graph and mine? Explain. Prepare a second graph, but this time show other important soluble species and label them.

(Note: for this problem, I would refer you to your earlier notes on MINEQL as well appropriate sections in the Version 4.5 MINEQL. Treat this as a pH titration of a system containing Cu and NTA. Note that since we're imposing a pH, it will remain as a Type III species. MINEQL treats a pH variable run as a "titration" where the "logK of pH" is allowed to vary over a fixed range (0-14). Allow MINEQL to form all of the species for which it has equilibrium constants. Save the "Multi", and "S2" files so that you can import them into your favorite graphics or spreadsheet package. I used a Lotus 123 format, which can be easily imported into Sigmaplot.)

Assigned: 10 Apr 2020
Due: 17 Apr 2020