CEE 680 Spring 2020

Water Chemistry

Homework #8

1. Prepare a complete Log C vs pH diagram for a system containing pure water and an excess of α-aluminum hydroxide, also known as Gibbsite (25ºC and I=0). Use the equilibrium constants from Stumm & Morgan (see table below). Show how you determined the equations for each of the lines.

2. Determine the pH of this solution.

3. Determine the pH of a 0.1 mM solution of alum (aluminum sulfate).

Equilibrium Data

Species	Equilibrium	Log K	
		Benjamin[1]	Stumm & Morgan[2]
Al^{+3}	$Al(OH)_3(s) = Al^{+3} + 3OH^-$	-33.23	-33.5
$AlOH^+$	$Al^{+3} + OH^- = Al(OH)^{+2}$	9.01	9.0
$Al(OH)_2^+$	$Al^{+3} + 2OH^- = Al(OH)_2^+$	17.90	18.7
$Al(OH)_3^o$	$Al^{+3} + 3OH^- = Al(OH)_3^o$	26.00	27.0
$Al(OH)_4^-$	$Al^{+3} + 4OH^- = Al(OH)_4^-$	33.00	33.0
$Al_3(OH)_4^{+5}$	$3Al^{+3} + 4OH^- = Al_3(OH)_4^{+5}$		42.1
$Al_{13}O_4(OH)_{24}^{+7}$	$13Al^{+3} + 32OH^- = Al_{13}O_4(OH)_{24}^{+7} + 4H_2O$		349.3

Assigned: 22 Apr 20
Due: 29 Apr 20

[1] Table 8.7 for Kso, Table 8.2 for hydroxide complexes
[2] Table A6.1 in 3rd edition, following page 324; or pgs 241 and 242 in the 2nd edition