Precipitation and Dissolution: Cadmium Case Study

(Stumm & Morgan, Chapt. 7)

Benjamin; Chapter 8
Hydroxo complexes

- $10^{-4}M \text{ Cd}_T$

- Figure 8.2, pg.369 in Benjamin
Chloride Complexes

- $10^{-4}\text{M } Cd_T$
- Low pH (no OH complexes)
  - Figure 8.5, pg.376 in Benjamin
Mixed OH, Cl complexes

- $10^{-4}\text{M } Cd_T; \{Cl^\text{-}\}=0.5\text{M}$
- Figure 8.6, pg.379 in Benjamin
3D Surface: Cl, OH complexes

- Fig 8.7 in Benjamin

Slice shown in Fig. 8.6
Cd(OH)$_2$ Precipitate

- no \{Cl$^-$\}

- Figure 8.12, pg.401 in Benjamin
Cd(OH)$_2$ (s) with Cl$^-$

- $\{\text{Cl}^-\}=0.5\text{M}$
- Figure 8.13, pg. 403 in Benjamin
Cd limited; no Carbonate

- $10^{-4}\text{M } \text{Cd}_T$
- \(\text{Cd(OH)}_2 (s)\) allowed

- Figure 8.19, pg.421 in Benjamin

Not really “concentration”, more accurately the mass of precipitate per L solution
CdCO$_3$ (s) low C$_T$

$C_T = 10^{-3}$ M

Figure 8.15, pg. 406 in Benjamin
CdCO$_3$ (s) High $C_T$

$C_T=10^{-1}$ M

Figure 8.17, pg.409 in Benjamin
CdCO$_3$ (s) Open

- pCO$_2$ = $10^{-3.5}$
- Figure 8.18, pg.410 in Benjamin
Solid formation

- Open system
Dual Solids

- Figs 8.21 & 8.22

Closed System; $C_T = 10^{-3}M$

Open System

Equilibrium with $\text{Cd(OH)}_2(s)$

Equilibrium with $\text{CdCO}_3(s)$ and $P_{\text{CO}_2} = 10^{-3.46}$
Cd limited; no Carbonate

- $10^{-4} \text{M} \text{Cd}_T$
- $\text{Cd(OH)}_2 (s)$ allowed

- Figure 8.19, pg.421 in Benjamin

Not really “concentration”, more accurately the mass of precipitate per L solution
Cd limited; Closed System

- $10^{-4} \text{M}\ Cd_T$
- $10^{-3} \text{ M}\ CO_3_T$
- $\text{Cd(OH)}_2(s)$ & $\text{CdCO}_3(s)$ allowed

- Figure 8.23, pg.428 in Benjamin

Not really “concentration”, more accurately the mass of precipitate per L solution
3D, 4D, 5D?

- Fig 8.7 in Benjamin
With $S^{-2}$, low pH

Stumm & Morgan, 1996, Figure 7.19a, pg. 405
With $S^{-2}$, high pH

Stumm & Morgan, 1996, Figure 7.19c, pg. 406

Stumm & Morgan, 1996, Figure 7.19d, pg. 406
• To next lecture