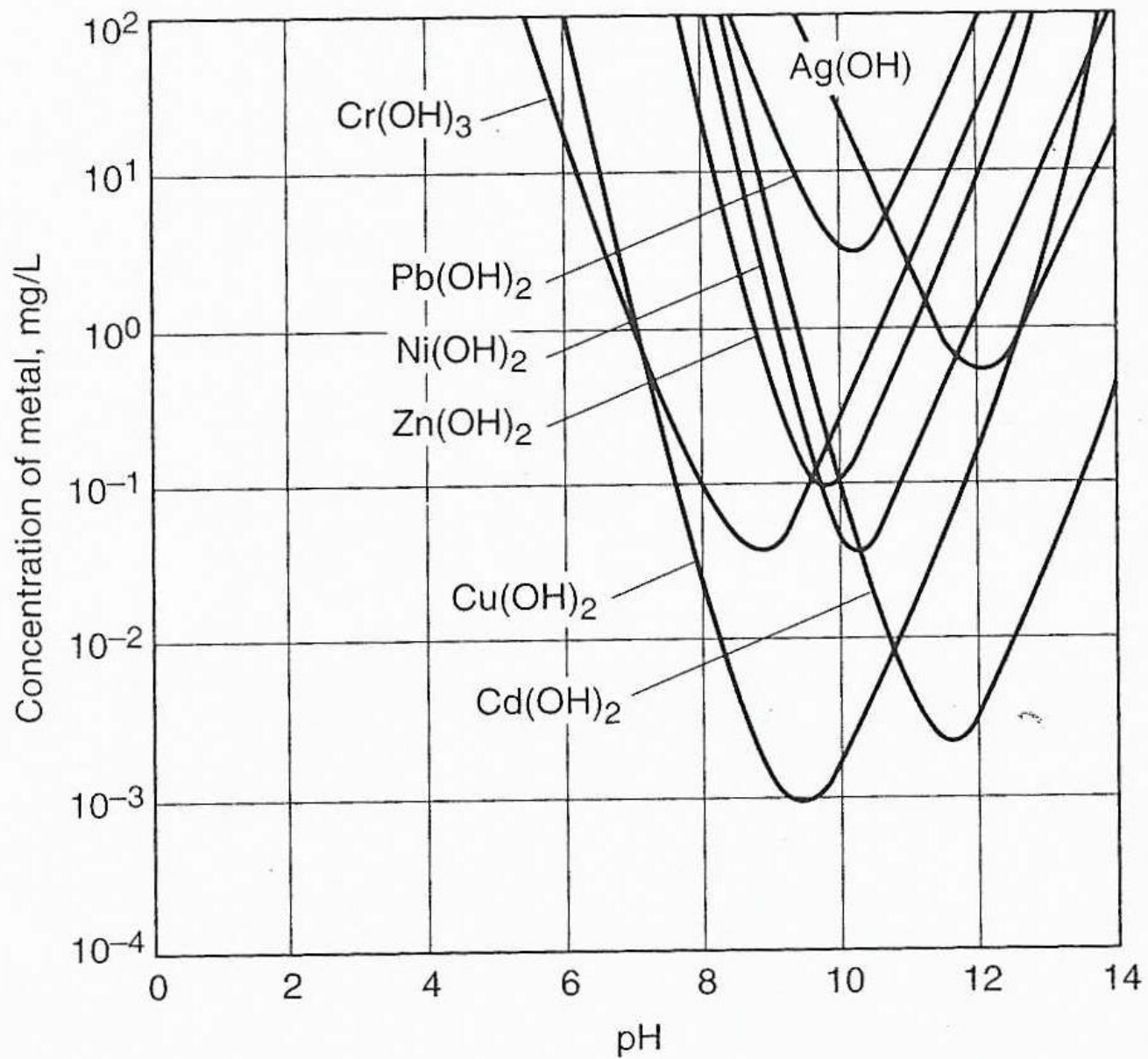


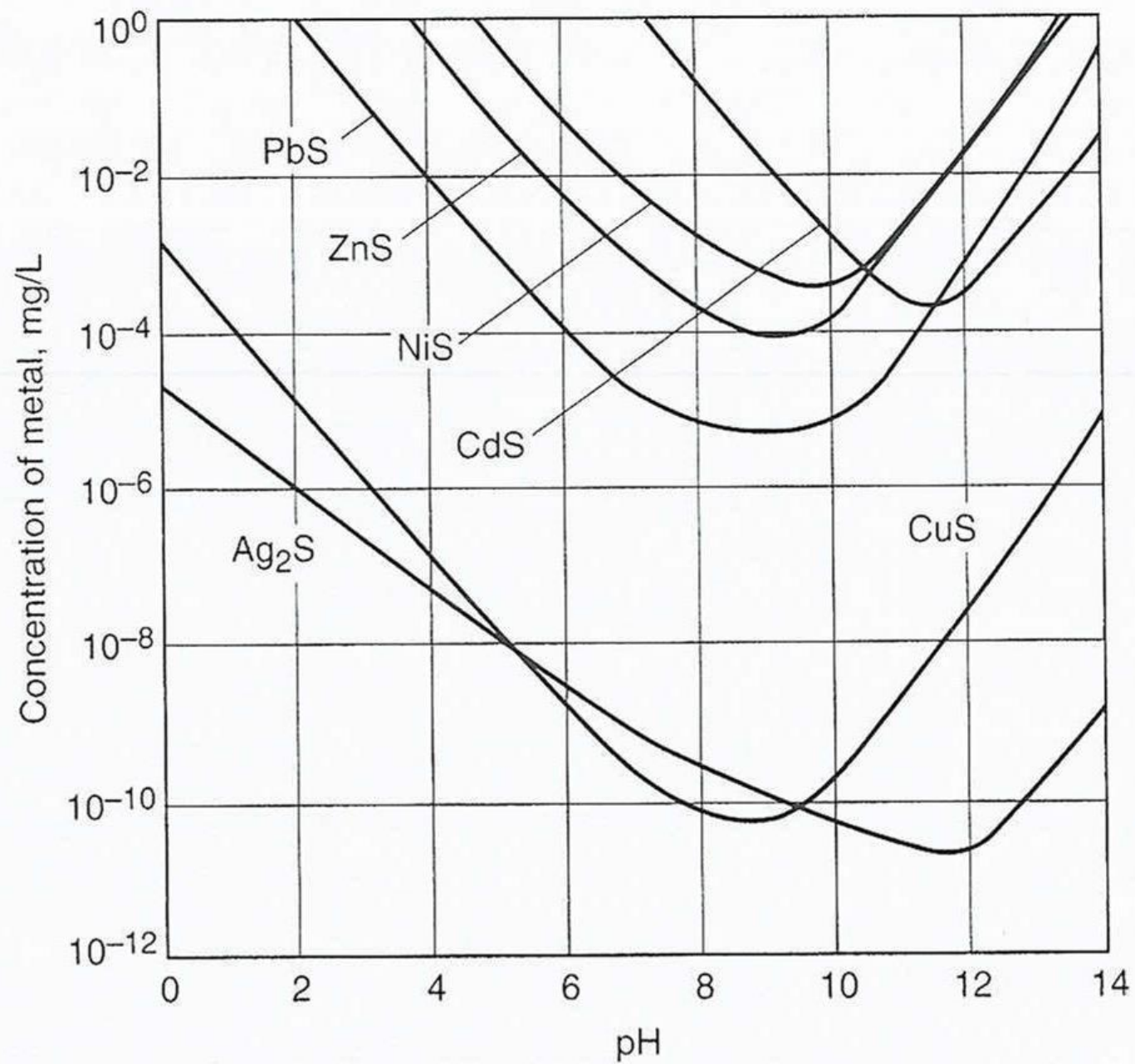
Removal of Heavy Metals by Chemical Precipitation

Chemical precipitation is one of the most common methods of heavy metal removal from wastewater.

- Precipitating anions include S^{2-} , OH^- and CO_3^{2-}
- These anions are pH dependent therefore solubility of ppt is also pH dependent
- Complexing anions such NH_3 , CN^- and organics can hinder ppt.

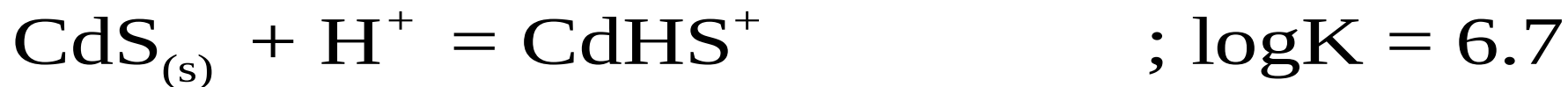
Typical plots of sulfide and hydroxide solubility of various metals as a function of pH follow.





The basis for these plots can be demonstrated with the following equilibrium calculations for the chemical speciation of Cd and S^{2-} .

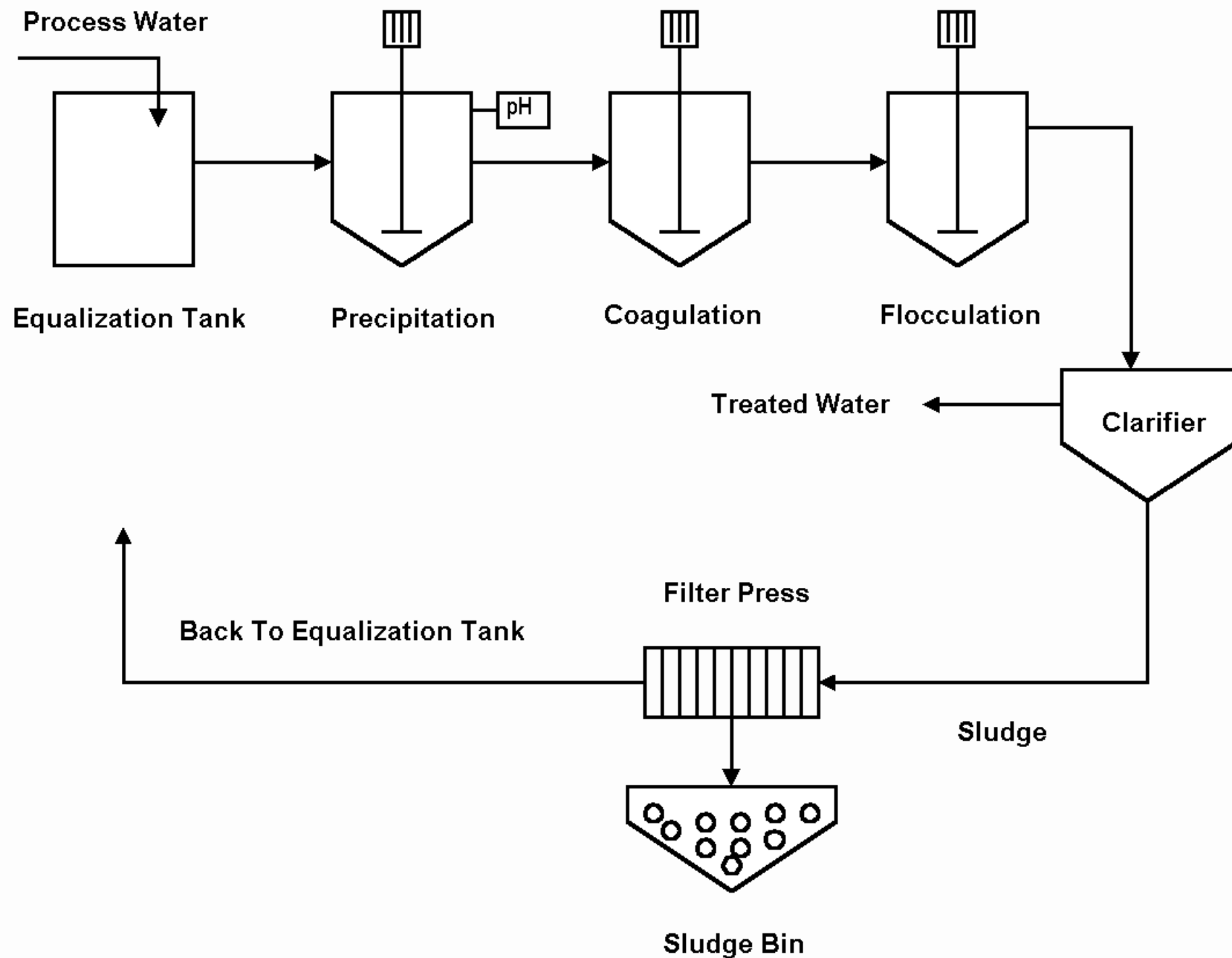
Similar calculations are used for OH^- and CO_3^{2-} speciation.



$$\frac{[\text{Cd}^{2+}][\text{HS}^-]}{[\text{H}^+]} = 10^{-13.36}$$

$$\frac{[\text{CdHS}^+]}{[\text{H}^+]} = 10^{6.7}$$

$$\frac{[\text{H}^+][\text{HS}^-]}{[\text{H}_2\text{S}_{(\text{aq})}]} = 10^{-13.36}$$



Metal	Achievable effluent concentration, mg/L
Arsenic	0.05
	0.005
Barium	0.5
Cadmium	0.05
	0.05
	0.008
Copper	0.02–0.07
	0.01–0.02
Mercury	0.01–0.02
	0.001–0.01
	0.0005–0.005
	0.001–0.005
Nickel	0.12
Selenium	0.05
Zinc	0.1