

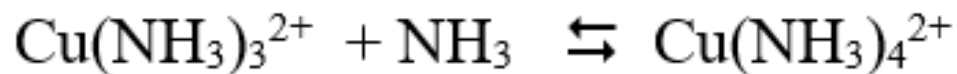
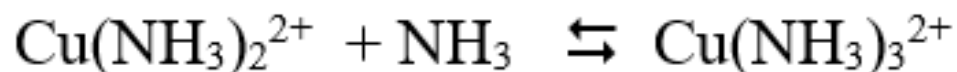
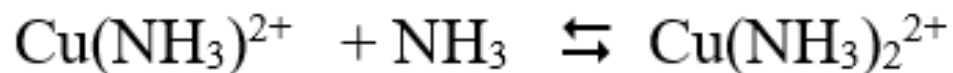
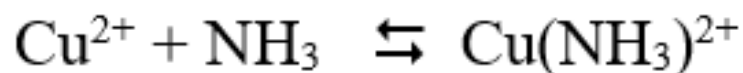


Constantes de formación acumuladas y parciales.

Química Analítica 1.

Profesor. M. en C. Everardo Tapia Mendoza

Constantes de formación Y disociación por pasos



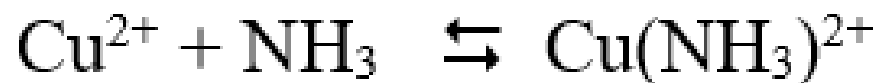
$$Kf_1 = \frac{[\text{Cu}(\text{NH}_3)^{2+}]}{[\text{Cu}^{2+}][\text{NH}_3]}$$

$$Kf_2 = \frac{[\text{Cu}(\text{NH}_3)_2^{2+}]}{[\text{Cu}(\text{NH}_3)^{2+}][\text{NH}_3]}$$

$$Kf_3 = \frac{[\text{Cu}(\text{NH}_3)_3^{2+}]}{[\text{Cu}(\text{NH}_3)_2^{2+}][\text{NH}_3]}$$

$$Kf_4 = \frac{[\text{Cu}(\text{NH}_3)_4^{2+}]}{[\text{Cu}(\text{NH}_3)_3^{2+}][\text{NH}_3]}$$

Constantes de formación acumuladas



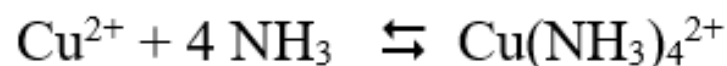
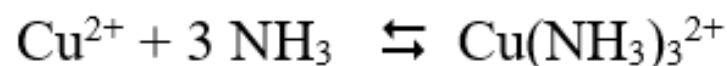
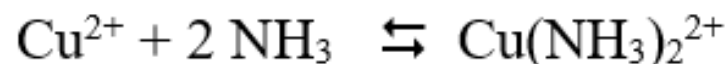
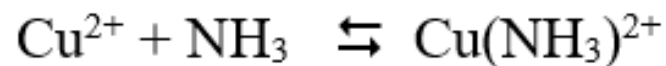
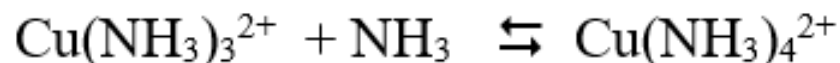
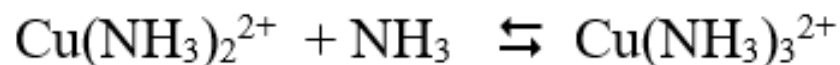
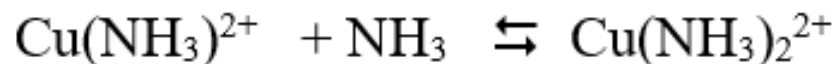
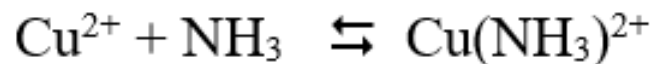
$$\beta_1 = \frac{[\text{Cu}(\text{NH}_3)^{2+}]}{[\text{Cu}^{2+}][\text{NH}_3]}$$

$$\beta_2 = \frac{[\text{Cu}(\text{NH}_3)_2^{2+}]}{[\text{Cu}^{2+}][\text{NH}_3]^2}$$

$$\beta_3 = \frac{[\text{Cu}(\text{NH}_3)_3^{2+}]}{[\text{Cu}^{2+}][\text{NH}_3]^3}$$

$$\beta_4 = \frac{[\text{Cu}(\text{NH}_3)_4^{2+}]}{[\text{Cu}^{2+}][\text{NH}_3]^4}$$

Relación



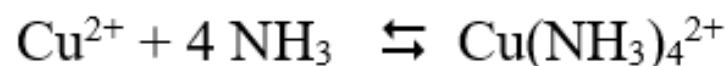
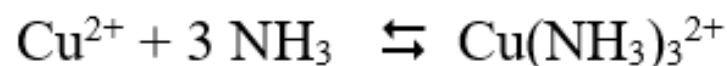
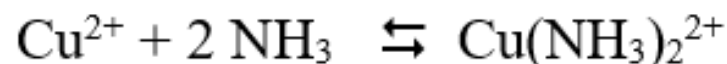
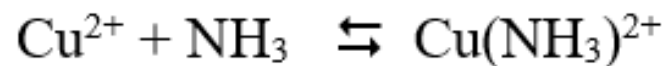
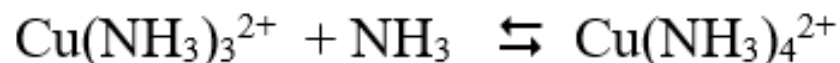
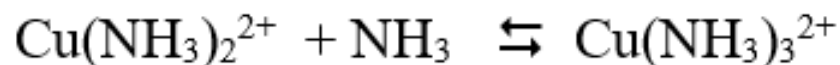
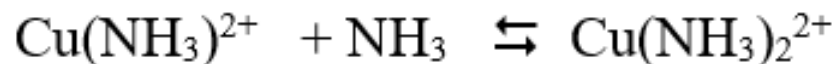
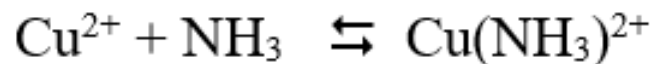
$$\beta_1 = Kf_1$$

$$\beta_1 = \frac{1}{Kd_1}$$

$$\log \beta_1 = \log (1) - \log(Kd_1)$$

$$\log \beta_1 = pKd_1$$

Relación



$$\beta_2 = Kf_1 Kf_2$$

$$\beta_2 = \frac{[\text{Cu}(\text{NH}_3)_2^{2+}]}{[\text{Cu}^{2+}][\text{NH}_3]} \times \frac{[\text{Cu}(\text{NH}_3)^{2+}]}{[\text{Cu}(\text{NH}_3)^{2+}][\text{NH}_3]}$$

$$\beta_2 = \frac{1}{Kd_1 Kd_2}$$

$$\beta_2 = \frac{\beta_1}{Kd_2}$$

$$\log \beta_2 = \log \beta_1 - \log(Kd_2)$$

$$\log \beta_2 = \log \beta_1 + pKd_2$$

$$pKd_2 = \log \beta_2 - \log \beta_1$$

Resolución

2. Considere las constantes de formación acumuladas de los complejos amino-cobre (II) ($\log \beta_1 = 4.13$, $\log \beta_2 = 7.61$, $\log \beta_3 = 10.48$ y $\log \beta_4 = 12.59$).

- Escriba la ecuación de cada reacción acumulada, así como la expresión de la constante de equilibrio.
- Escriba las ecuaciones asociadas a los pK_d y su expresión de la constante de equilibrio.
- Obtenga el valor de pK_d individual y asigne a cada paso los valores.

$$\log \beta_1 = pK_{d_1} = 4.13$$

$$pK_{d_2} = \log \beta_2 - \log \beta_1 = 7.61 - 4.13 = 3.48$$

$$pK_{d_3} = \log \beta_3 - \log \beta_2 = 10.48 - 7.61 = 2.87$$

$$pK_{d_4} = \log \beta_4 - \log \beta_3 = 12.59 - 10.48 = 2.11$$