

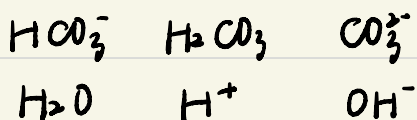
酸式盐



质量守恒 $[\text{HCO}_3^-] + [\text{CO}_3^{2-}] + [\text{H}_2\text{CO}_3] = C_0 = [\text{Na}^+]$

电荷守恒 $[\text{Na}^+] + [\text{H}^+] = [\text{OH}^-] + [\text{HCO}_3^-] + 2[\text{CO}_3^{2-}]$

或得失质子守恒



$\Rightarrow [\text{H}_2\text{CO}_3] + [\text{H}^+] = [\text{CO}_3^{2-}] + [\text{OH}^-] \quad (*)$

$K_{a1} = \frac{[\text{HCO}_3^-][\text{H}^+]}{[\text{H}_2\text{CO}_3]}$

$K_{a2} = \frac{[\text{CO}_3^{2-}][\text{H}^+]}{[\text{HCO}_3^-]}$

代入(*)式 $\frac{[\text{HCO}_3^-][\text{H}^+]}{K_{a1}} + [\text{H}^+] = \frac{K_{a2}[\text{HCO}_3^-]}{[\text{H}^+]} + \frac{K_w}{[\text{H}^+]}$

$[\text{H}^+] = \sqrt{\frac{K_{a2}[\text{HCO}_3^-] + K_w}{\frac{[\text{HCO}_3^-]}{K_{a1}} + 1}}$

近似1: $[\text{HCO}_3^-] \approx C_0$

$[\text{H}^+] = \sqrt{\frac{K_{a2}C_0 + K_w}{\frac{C_0}{K_{a1}} + 1}}$

近似2: $K_{a2}C_0 \geq 20K_w$

$[\text{H}^+] = \sqrt{\frac{K_{a1}K_{a2}C_0}{C_0 + K_{a1}}}$

近似3: $C_0 \geq 20K_{a1}$

$[\text{H}^+] = \sqrt{K_{a1} \cdot K_{a2}}$