Capacidad amortiguadora de los sistemas nivelados $H^+/H_2O/OH^-$

$$[H^+] = C_A$$

$$\frac{d[H^+]}{C_A} = 1$$

$$[H^+] = 10^{-pH}$$

$$\frac{dpH}{d[H^+]} = (10^{-pH}) - 2.3$$

$$-\frac{dC_A}{dpH} = \left[\frac{dC_A}{d[H^+]}\right]\left[\frac{d[H^+]}{dpH}\right] = -2.3[H^+]$$

$$\frac{dC_A}{dpH} = \beta = 2.3[H^+]$$

$$K_w = [H^+][OH^-]$$

$$[H^+] = \frac{K_w}{[OH^-]} = \frac{K_w}{C_B}$$

$$\log[H^+] = -14 - \log C_B$$

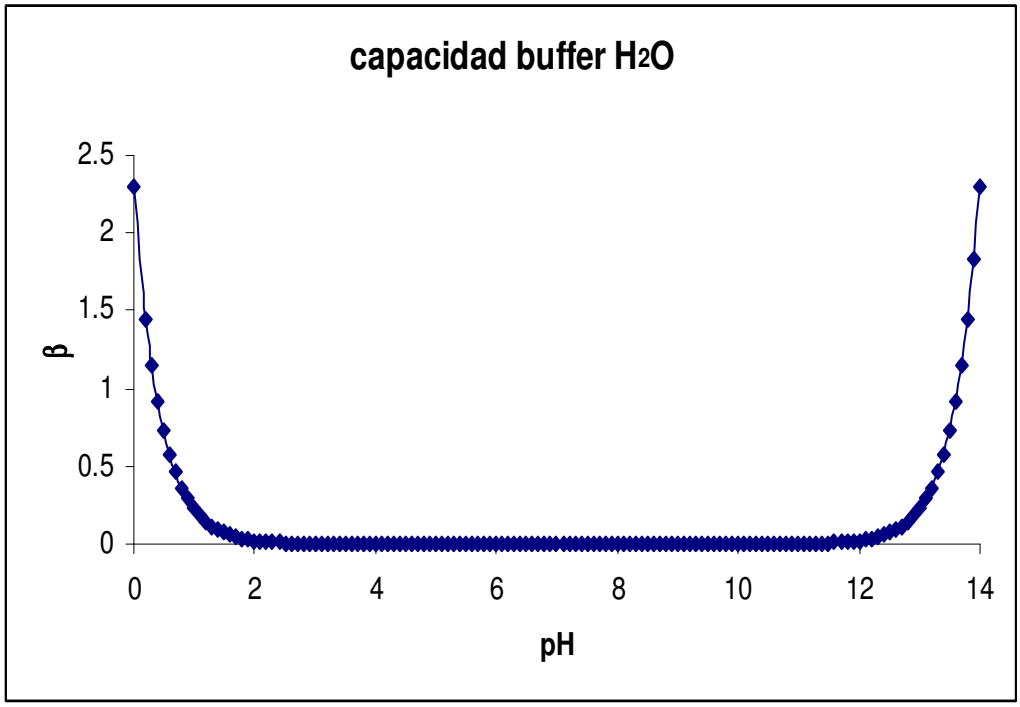
$$-\log[H^-] = pH = 14 + \log C_B$$

$$\frac{dpH}{dC_B} = \frac{0.43}{C_B}$$

$$\frac{dC_B}{dpH} = \beta = 2.3C_B = 2.3[OH^-]$$

$$\beta = 2.3([H^+] + [OH^-])$$

$$\beta = 2.3(10^{-pH} + 10^{-14+pH})$$



Capacidad amortiguadora de los sistemas no-nivelados HA/A $^-$

$$Ka = \frac{[H^+][A^-]}{[HA]}$$

$$Ka = \frac{[H^+]C_B}{Co - C_B}$$

$$Ka(Co - C_B) = [H^+]C_B$$

$$KaCo - KaC_B = [H^+]C_B$$

$$[H^+]C_B + KaC_B = C_B(Ka + [H^+]) = KaCo$$

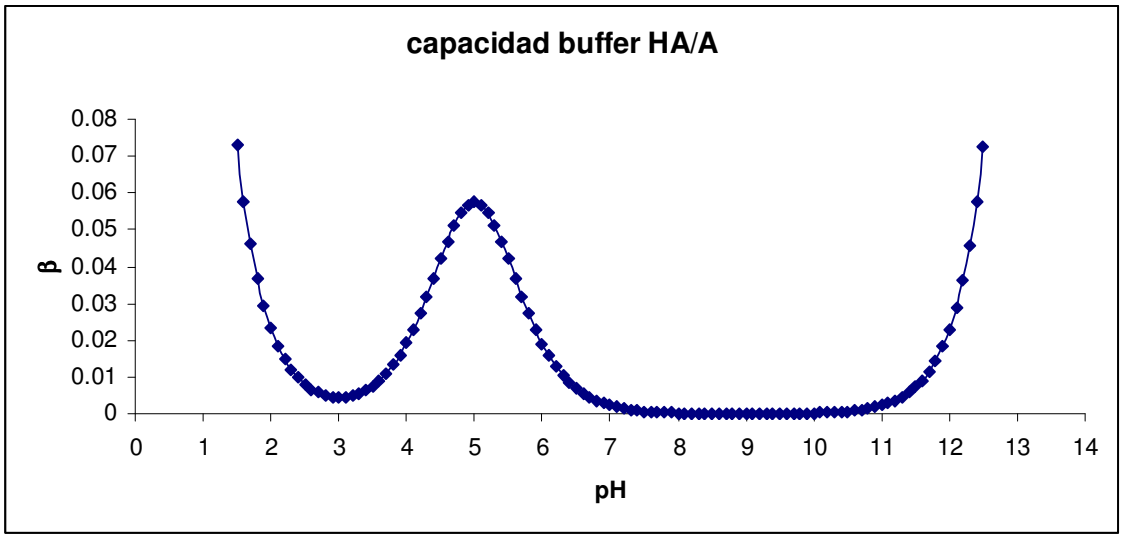
$$C_B = \frac{KaCo}{(Ka + [H^+])}$$

$$\frac{dC_B}{d[H^+]} = -\frac{KaCo}{(Ka + [H^+])^2}$$

$$\frac{dC_B}{dpH} = \beta = \left(\frac{dC_B}{d[H^+]}\right)\left(\frac{d[H^+]}{dpH}\right) = \left(\frac{-KaCo}{(Ka + [H^+])^2}\right)(-2.3[H^+])$$

$$\frac{dC_B}{dpH} = \beta = \frac{2.3KaCo[H^+]}{(Ka + [H^+])^2}$$

$$\frac{dC_B}{dpH} = \beta = 2.3\left[[H^+] + \frac{KaCo[H^+]}{(Ka + [[H^+]])^2} + [OH^-]\right]$$



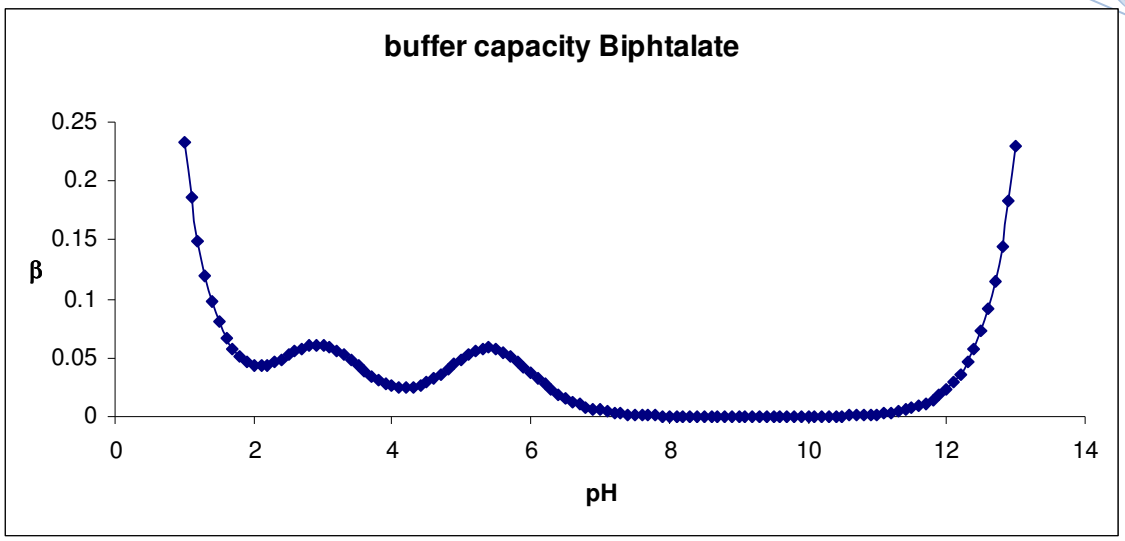
Capacidad amortiguadora de los sistemas nivelados polipróticos: H_iA:

$$\frac{dC_B}{dpH} = \beta = 2.3\left([H^+] + \Sigma_{i=1}^{n} \frac{Ka_i Co[H^+]}{(Ka_i + [H^+])^2} + [OH-]\right)$$

Caso del biftalato de potasio:

$$\left(\frac{\delta(n_{agr}/Vo}{\delta pH}\right) = \beta = 2.3Co\sum_{i=1}^{n=2} \frac{Ka_i[10^{-pH}]}{[Ka_i + 10^{-pH}]^2}$$

$$\beta = 2.3(0.2M)\left[\left[\frac{10^{-6.4-pH}}{[10^{-6.4} + 10^{-pH}]^2} + \frac{10^{-10.3-pH}}{[10^{-10.3} + 10^{-pH}]^2}\right] + [10^{-pH}] + [10^{-14+pH}]\right]$$



Capacidad amortiguadora del $Pb^{2+}/Pb(OH)_{2\downarrow}$

$$Ka = \frac{\left[H^+\right]^2}{\left[Pb^{2+}\right]} = 10^{-13}$$

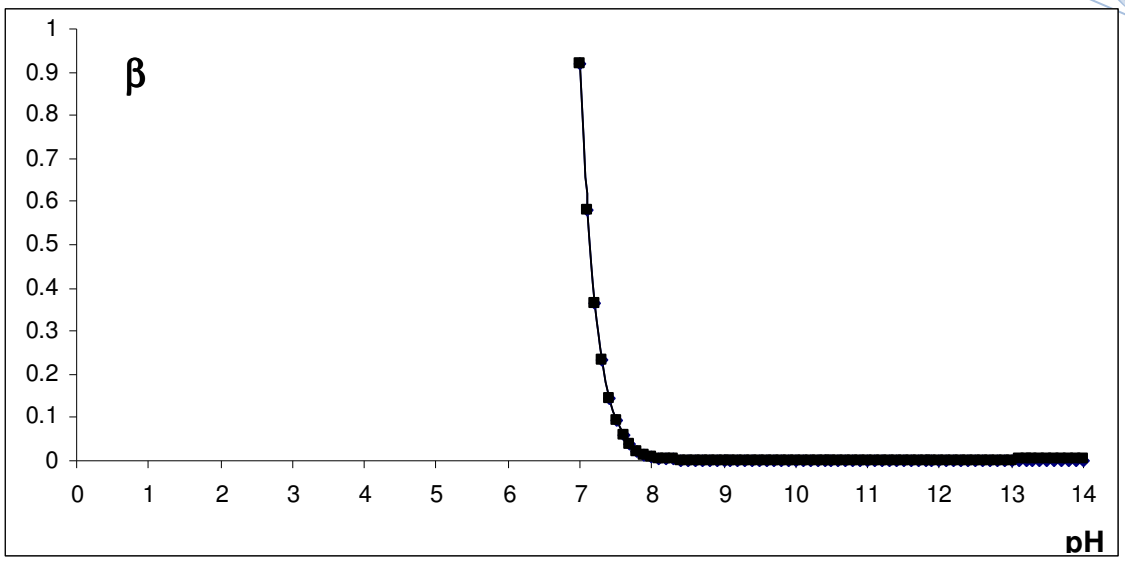
$$Ka = \frac{\left[H^+\right]^2}{Co - \frac{1}{2}C_B} = \frac{\left[H^+\right]^2}{Co - 0.5C_B}$$

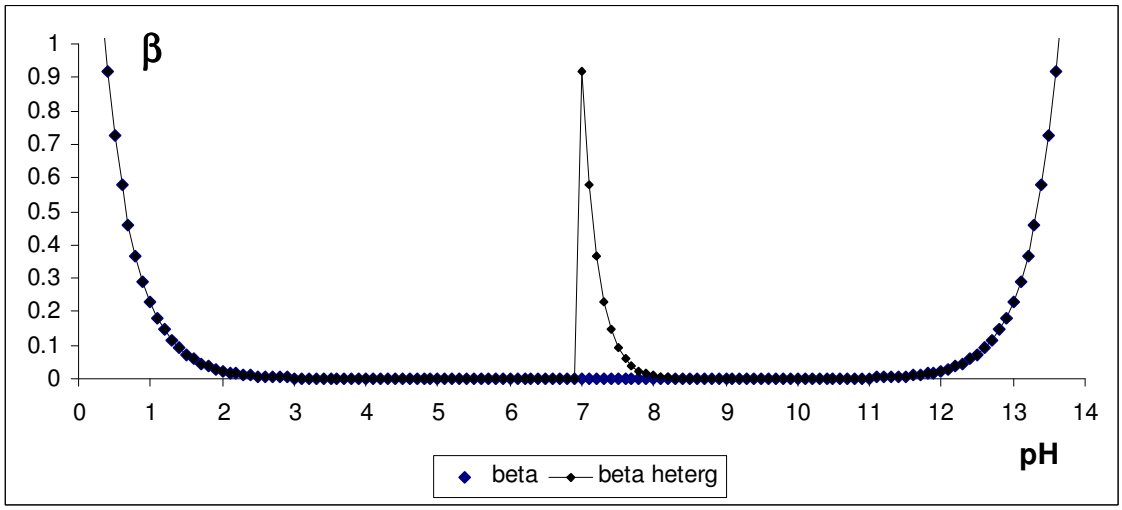
$$KaCo - 0.5KaC_B = \left[H^+\right]^2$$

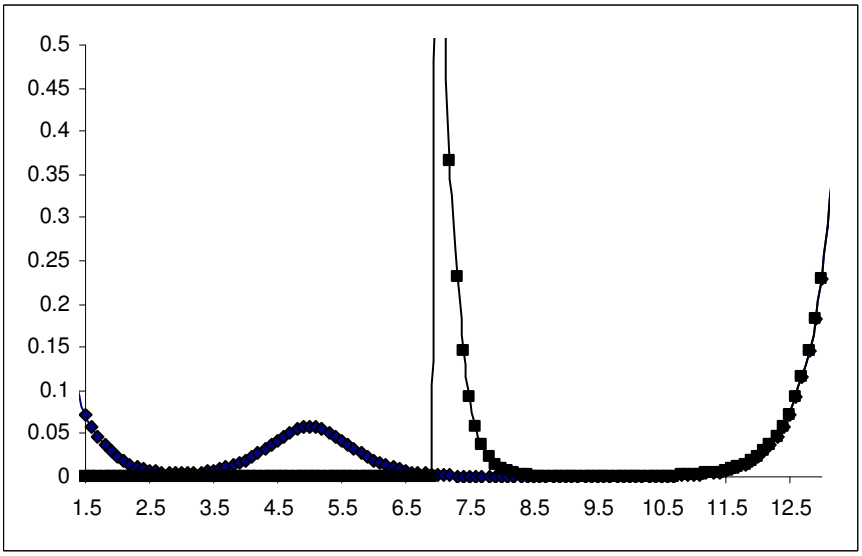
$$KaCo - \left[H^+\right]^2 = 0.5KaC_B$$

$$C_B = \frac{KaCo - \left[H^+\right]^2}{0.5Ka}$$

$$\left(\frac{dC_B}{d\left[H^+\right]}\right) = \beta = \frac{9.2\left[H^+\right]^2}{Ka}$$


β
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
pH


β
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
pH
beta
beta heterg


0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5