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# A
# Apêndice

## A.1
## Efeito de $K_1$

Nas figuras A.1 e A.2 evidenciamos o efeito do valor da constante de equilíbrio $K_1$ no inchamento teórico calculado para as concentrações de NaCl 1 M e 0,01 M.

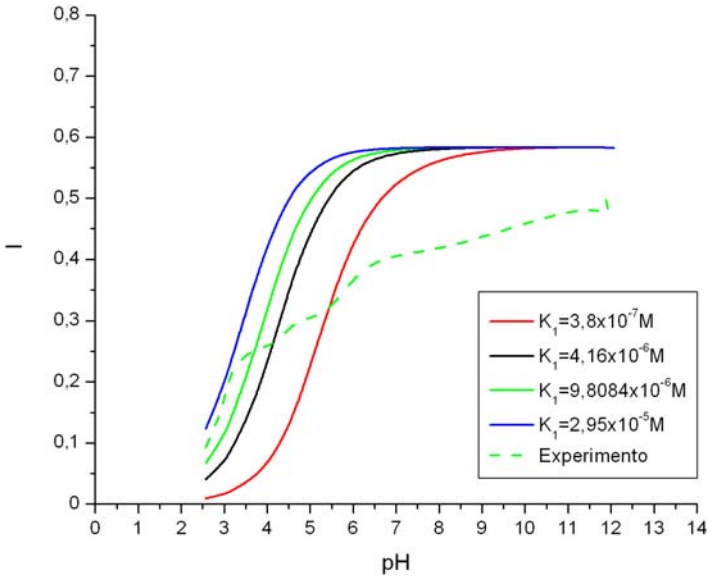


Figura A.1: Efeito do valor de $K_1$ no Inchamento. NaCl 1 M, $E_s$=2,5 MPa, $K_2$=0,8482 $M^{-1}$, $\delta$=1×10$^{-9}$ m, $As$=1600 $m^2/g$.

Em ambas curvas notamos que o aumento de $K_1$ conduze a maiores valores de inchamento na faixa de $pH \approx 2$ a $pH \approx 7$. Sendo $K_1$ a constante de equilíbrio que favorece as reações desprotonação, tal aumento de inchamento é associado a um aumento da densidade de carga superficial nessa faixa de pH onde são observados os maiores inchamento relativos no experimento (ver figura 6.3).

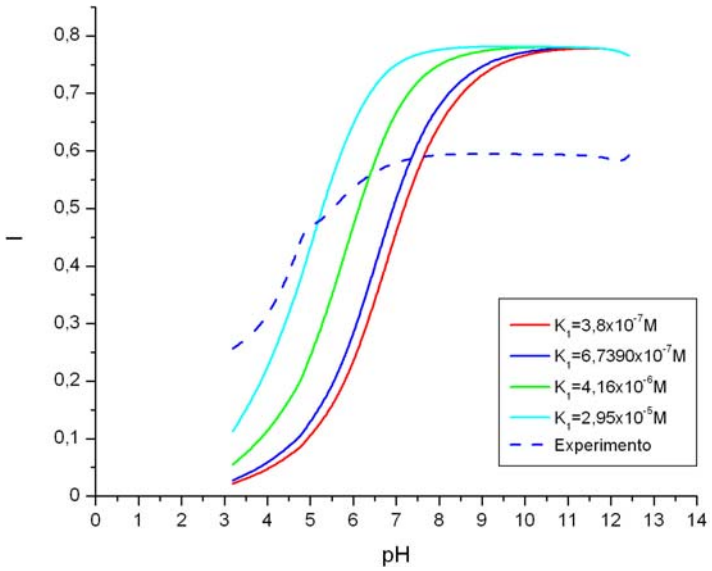


Figura A.2: Efeito do valor de $K_1$ no Inchamento. NaCl 0,01 M, $E_s$=2,5 MPa, $K_2$=0,6987 $M^{-1}$, $\delta$=1×$10^{-9}$ m,$As$=1600 $m^2$/g.

## A.2
## Efeito de $K_2$

Nas Figuras A.3 e A.4 apresentamos o efeito da mudança de $K_2$ sobre as curvas de inchamento teórico para NaCl 1 M e 0,01 M. Em ambas curvas observamos que ao contrário de $K_1$, o incremento de $K_2$ ocasiona a diminuição do inchamento teórico. Associamos tais resultados ao aumento da sorção de sódio nos sítios ativos da resina. Tal fenômeno é traduzido na diminuição da densidade de carga superficial e consequëntemente em menores valores de inchamento.

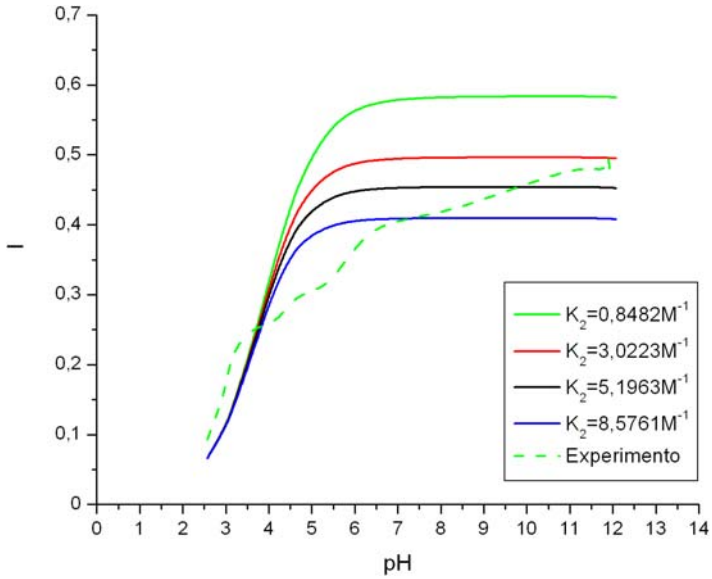


Figura A.3: Efeito do valor de $K_2$ no Inchamento. NaCl 1 M, $E_s$=2,5 MPa, $K_1$=6,739×$10^{-7}$ M, $\delta$=1×$10^{-9}$ m, $As$=1600 $m^2$/g.

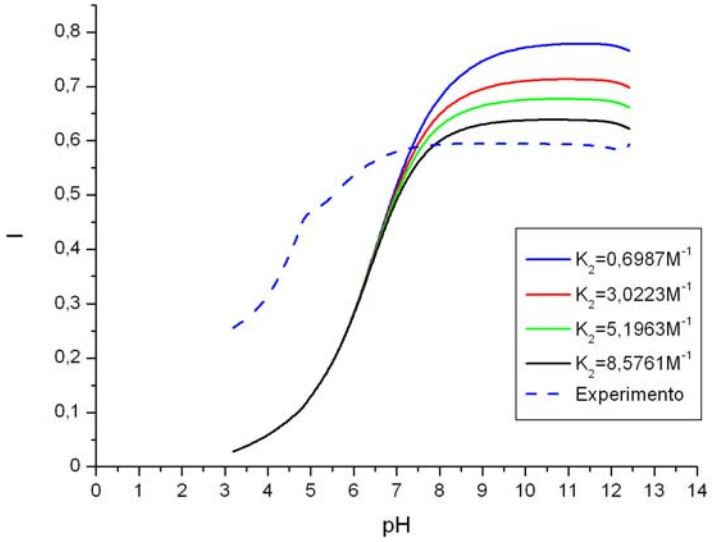


Figura A.4: Efeito do valor de $K_2$ no Inchamento. NaCl 0,01 M, $E_s$=2,5 MPa, $K_1$=9,8084×10$^{-6}$ M, $\delta$=1×10$^{-9}$ m, $As$=1600 m$^2$/g.

## A.3
## Efeito de $E_s$

Nas figuras A.5 e A.6 apresentamos o efeito do aumento do módulo de Young sobre o inchamento teórico para as concentrações de NaCl 1 M e 0,01 M. Em ambos casos observamos que o inchamento diminui com o aumento do módulo de Young. O resultado típico de matérias modelados mediante a lei de Hook é justificado, devido a que o aumento força elástica é traduzido na diminuição do espaçamento entre as placas $H$ para satisfazer o balanço de forças dado pela equação (6-10a).

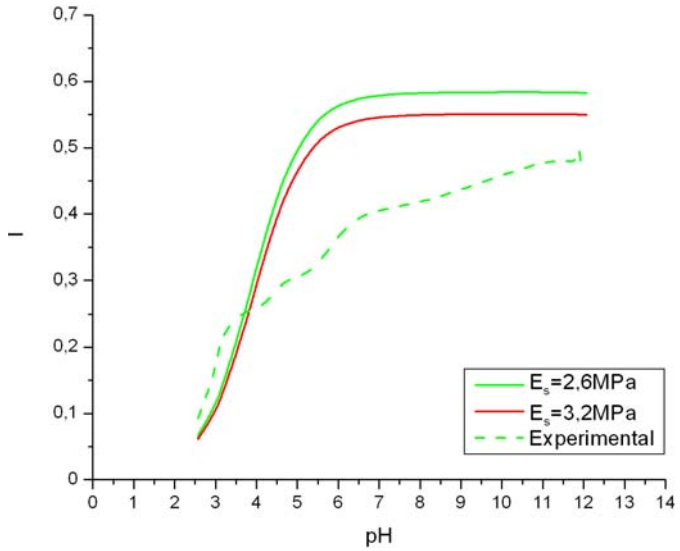


Figura A.5: Efeito do valor do módulo de Young no Inchamento - NaCl 1 M. Valores de $K_1$ e $K_2$ obtidos por HYPERQUAD, $\delta$=1×10$^{-9}$ m, $As$=1600 m$^2$/g.

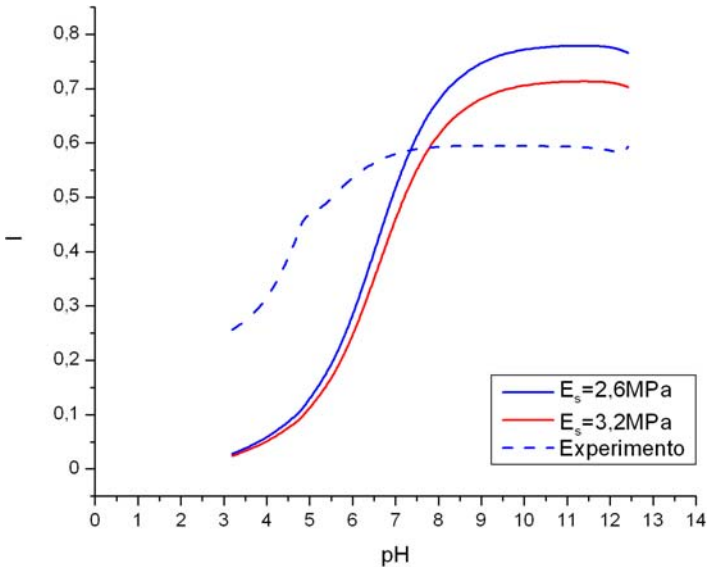


Figura A.6: Efeito do valor do módulo de Young no Inchamento - NaCl 0,01 M. Valores de $K_1$ e $K_2$ obtidos por HYPERQUAD, $\delta$=1×10$^{-9}$ m, $As$=1600 m$^2$/g.



## A.4
## Efeito de $As$

Nas figuras A.7 e A.8 apresentamos os inchamentos teóricos em função do pH para 1 M e 0,01 M obtidos para dois valores de $As$. Fisicamente a diminuição do valor da área superficial pode ser descrita como se a carga total da resina for re-distribuída em uma área menor. A maior proximidade entre os grupos ativos carregados na superfície, produz maiores repulsões eletrostáticas entre eles, assim como maiores interações com as espécies iônicas na camada difusa, o que é traduzido em ambas curvas no aumento dos valores de inchamento.

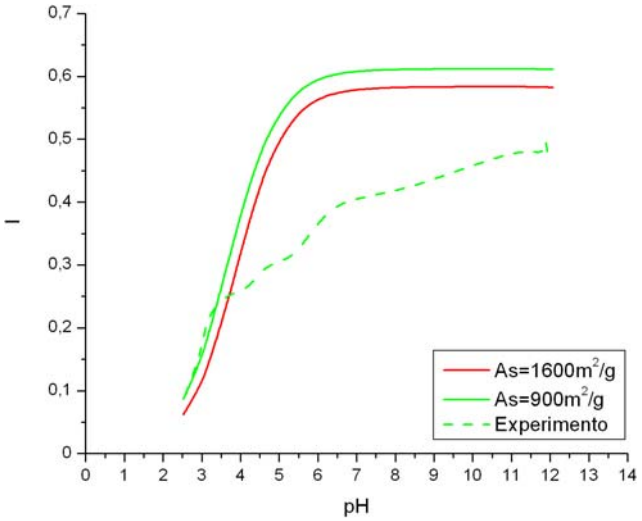


Figura A.7: Efeito do valor da área superficial no Inchamento - NaCl 1 M. Valores de $K_1$ e $K_2$ obtidos por HYPERQUAD, $E_s$=3,2 MPa, $\delta$=1×10$^{-9}$ m.

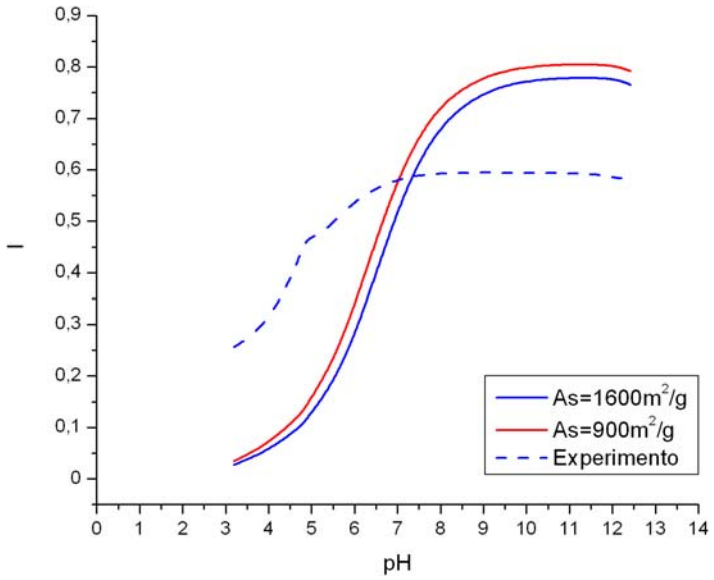


Figura A.8: Efeito do valor da área superficial no Inchamento - NaCl 0,01 M. Valores de $K_1$ e $K_2$ obtidos por HYPERQUAD, $E_s$=3,2 MPa, $\delta$=1×10$^{-9}$ m.

## A.5
## Efeito de $\delta$

Nas figuras A.9 e A.11 apresentamos as curvas de $H$ em função do pH construidas com dois valores de $\delta$ para as concentrações de NaCl 1 M e 0,01 M. Como observado nos resultados numéricos das figuras A.9 e A.11 a diminuição do $\delta$ é compensada através da diminuição do espaçamento entre as placas para satisfazer o balanço de forças (equação 6-10a). Devido à ordem de grandeza dos valores de $H$ e $\delta$, o inchamento calculado através da equação (6-10b) será maior para o menor valor de $\delta$, como mostrado nas figuras A.10 e A.12.

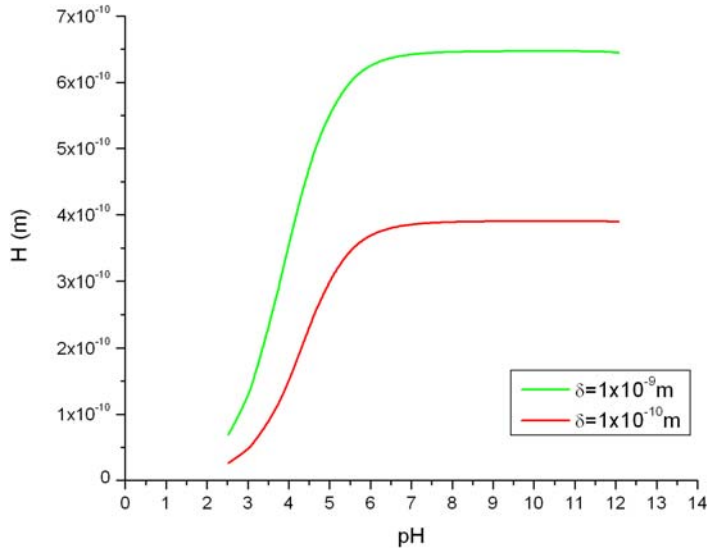


Figura A.9: Efeito do valor da espessura da placa no $H$ - NaCl 1 M. Valores de $K_1$ e $K_2$ obtidos por HYPERQUAD, $E_s$=3,2 MPa, As=900 m$^2$/g.

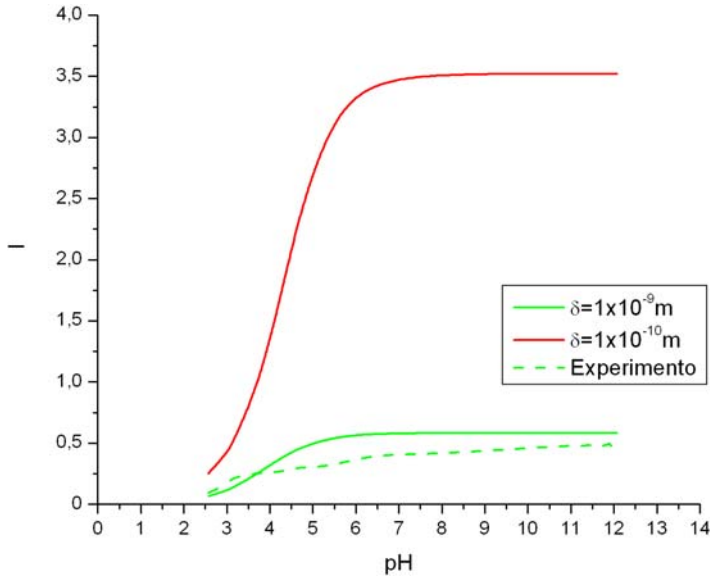


Figura A.10: Efeito do valor da espessura da placa no Inchamento - NaCl 1 M. Valores de $K_1$ e $K_2$ obtidos por HYPERQUAD, $E_s$=3,2 MPa, As=900 $m^2/g$.

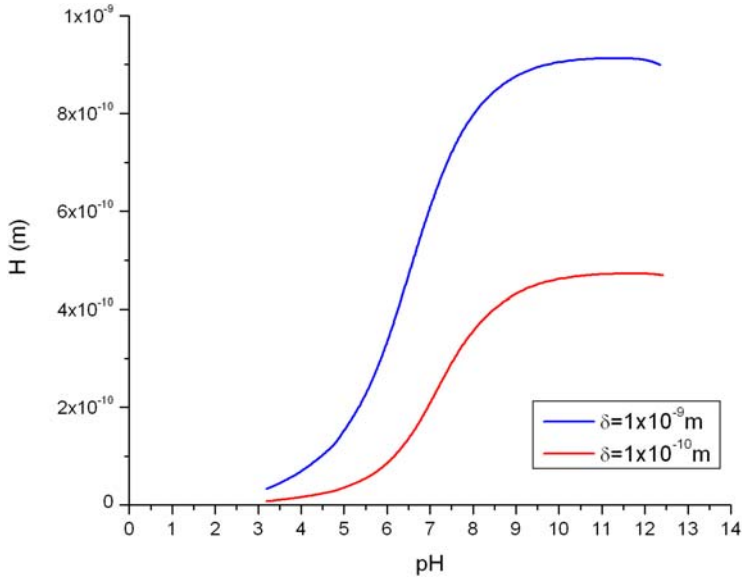


Figura A.11: Efeito do valor da espessura da placa no $H$ - NaCl 0,01 M. Valores de $K_1$ e $K_2$ obtidos por HYPERQUAD, $E_s$=3,2 MPa, As=900 $m^2/g$.

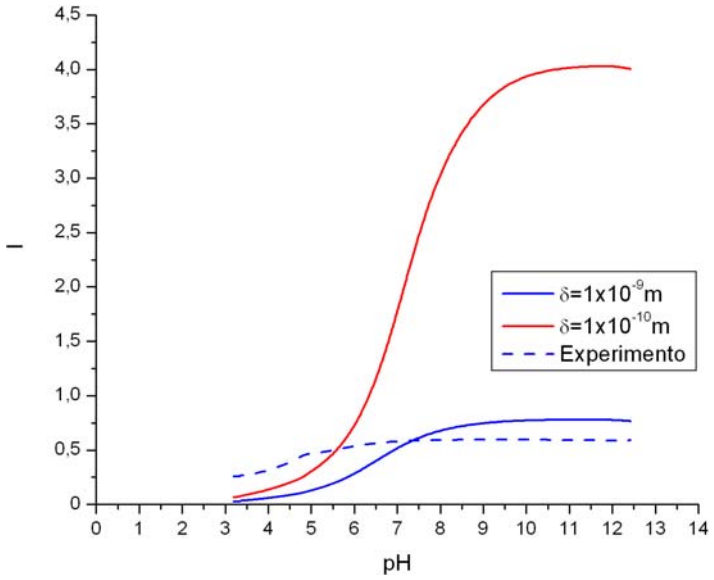


Figura A.12: Efeito do valor da espessura da placa no Inchamento - NaCl 0,01 M. Valores de $K_1$ e $K_2$ obtidos por HYPERQUAD, $E_s$=3,2 MPa, As=900 $m^2/g$.