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// : // :

$$\frac{q}{(q_{max})} = \frac{K_d}{1 + K_d} \left( \frac{C}{C_0} \right)^{pH}$$

WHO, 1996; Eckenfelder, 2000; Lester,1987; Lee and )

.( Lin,1999; Canningham,1997

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(Forster,1997 Danahy, )

(1996)

(Norton et al.,2004)

( )

/ /  
(WHO,1996)

Gupta et al.,2000; Volesky, 1990; )

(Volesky, 2001; Volesky, 1987; Gadd,1978

Norton )

Gadd and Griffiths,1978; Volesky, 1987; Volesky, )

(et al.,2004; Volesky, 2001

(1990

)

(

(Tung, 1988)

(Volesky, 1990)

(Volesky, 1990)

(... pH )

(Volesky, 1990; Wase and Forster,1997)

/

)

/ Wase and)

(...

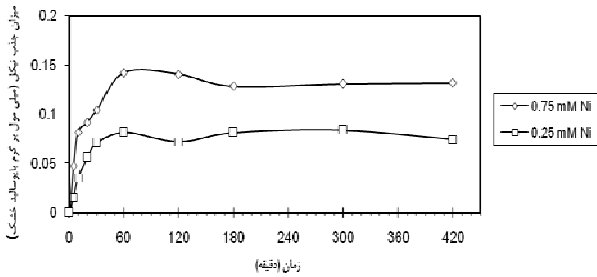
/  
pH /

/ / /  
pH (+)  
(Eaton, et al. 1998)

/ / pH  
( )  
/ / pH ( / )

UNICAM )

(919



/ /

pH

/ : ( )

pH

/ / ( )

/ /

pH

pH

/ /

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( ) Norton .

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pH

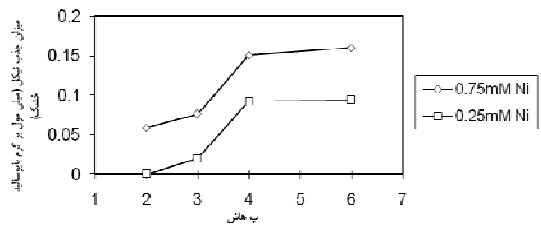
pH

/ /

Antunes . ( / ) (K<sub>2ads</sub>) q=0) (t=t t=0) ( ) (q=q<sub>e</sub>) ( )

Yan and . (2003) Viraraghavan  $\frac{dq}{dt} = k_{1ads} (q_e - q)$  ( )  
 $\log(q_e - q) = \log q_e \frac{k_{1ads}}{2.303} t$  ( )

pH ( ) pH ( ) :q<sub>e</sub>  
 pH / / pH ( ) :q  
 pH / pH :K<sub>1ads</sub>  
 pH (t) (log(q<sub>e</sub>-q))  
 pH (Antunes, et al, 2003)



pH : ( )  
 / /  
 (2004) Norton

) ( ) (q=q<sub>e</sub> q=0) (t=t t=0)

$$\frac{dq}{dt} = k_{2ads} (q_e - q)^2 \quad ( )$$

$$\frac{t}{q} = \frac{1}{k_{2ads} q_e^2} + \frac{1}{q_e} t \quad ( )$$

K<sub>2ads</sub>

/ (K<sub>2ads</sub>) (q<sub>e</sub>) (g/mg.min) (t) (t/q) (Antunes et al, 2003)

/ pH

(1999)

Mameri

pH

(2000) Kaewsarn .

/ pH

pH

pH . pH

(2004)

Norton

(1999)

Mameri .

(2002) Weng .

pH

( )

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pH

pH

( )

(Yan and Viraraghavan, 2003)

(Mameri et al, 1999)

(COOH)

( )

(Norton et al., 2004)

(McCabe, et al., 1982)

( )

( )

/

/

( )

$$\frac{C_{eq}}{q_{eq}} = \frac{K_d}{q_m} + \frac{1}{q_m} C_{eq} \quad ( )$$

(q<sub>eq</sub>)                      (C<sub>eq</sub>)

(K<sub>d</sub>) .

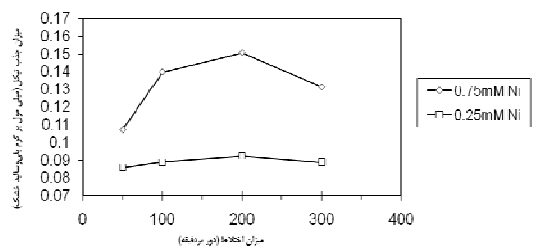
( AWWA, 1990;Liu et al., 2004)

(q<sub>eq</sub>)

( )

(C<sub>eq</sub>)

$$q_{eq} = K_F (C_{eq})^{1/n} \quad ( )$$



( )

/ /

pH

pH

pH

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( $q_{max}$ )

( $q_{max}$ )

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( $K_d$ )

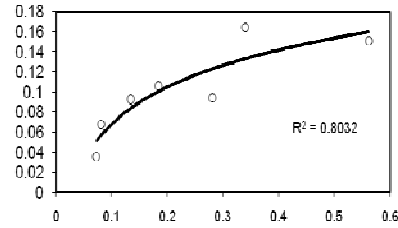
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میزان جذب نیکل (میلی مول در گرم بائوسوربانت خشک)



غلظت تعادلی فلز باقیمانده (میلی مول بر لیتر)

نیزوزیم جذب نیکل

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