Data in Brief 9 (2016) 823–827

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Data on Fe (II) biosorption onto *Sargassum hystrix* algae obtained from the Persian Gulf in Bushehr Port, Iran

Fatemeh Faraji Ghasemi [a], Sina Dobaradaran [a,b,c,*], Alireza Raeisi [d], Abdolhamid Esmaili [b], Mohammad Javad Mohammadi [e], Mozhgan Keshtkar [a], Sara Ghaderi Nasab [a], Farshid Soleimani [a]

[a] *Department of Environmental Health Engineering, Faculty of Health, Bushehr University of Medical Sciences, Bushehr, Iran*
[b] *The Persian Gulf Marine Biotechnology Research Center, The Persian Gulf Biomedical Sciences Research Institute, Bushehr University of Medical Sciences, Bushehr, Iran*
[c] *Systems Environmental Health, Oil, Gas and Energy Research Center, The Persian Gulf Biomedical Sciences Research Institute, Bushehr University of Medical Sciences, Bushehr, Iran*
[d] *The Persian Gulf Tropical Medicine Research Center, The Persian Gulf Biomedical Sciences Research Institute, Bushehr University of Medical Sciences, Bushehr, Iran*
[e] *Department of Environmental Health Engineering, School of Public Health and Environmental Technologies Research Center, Ahvaz Jundishapur University of Medical Sciences, Iran*

ARTICLE INFO

Article history:
Received 13 July 2016
Received in revised form
1 October 2016
Accepted 21 October 2016
Available online 29 October 2016

Keywords:
Biosorption
Bushehr
Iron
Persian Gulf
Sargassum hystrix

ABSTRACT

In this article, we used *Sargassum hystrix* algae as biosorbent for removal of Fe (II) from aqueous solutions that was collected along the Persian Gulf coastline, Bushehr, Iran. The concentration level of remaining Fe (II) in the samples was measured by using flame atomic absorption spectrometry (FAAS, Varian AA240, Australia). The isotherms, kinetics and modeling data of Fe (II) biosorption onto *Sargassum hystrix* were also presented.

* Correspondence to: The Persian Gulf Marine Biotechnology Research Center, Boostan 19 Alley, Imam Khomeini Street, Bushehr, Iran. Fax: +98 7514763448.
E-mail addresses: s.dobaradaran@bpums.ac.ir, sina_dobaradaran@yahoo.com (S. Dobaradaran).

http://dx.doi.org/10.1016/j.dib.2016.10.018

Specifications Table

Subject area	*Chemistry*
More specific subject area	*Biosorption*
Type of data	*Table, figure*
How data was acquired	*Flame Atomic Absorption Spectrometry (FAAS, Varian AA240, Australia)*
Data format	*Raw, analyzed*
Experimental factors	– After collection of algae along the Persian Gulf, it was washed 3 times by urban water and 2 times by deionized water to eliminate dirt and contaminants, then dried, powdered and sieved by using a screen. – The effects of contact times, initial concentrations of Fe (II) and different dosage of biosorbent were examined.
Experimental features	*Sargassum hystrix biomass as low cost biosorbent for removal Fe (II) ions*
Data source location	*Bushehr, Iran*
Data accessibility	*Data is with this article.*

Value of the data

- The data of *Sargassum hystrix* algae for Fe (II) removal from aqueous solution was described.
- Data show that brown algae can be used as low cost biosorbent for removal of other metals from aqueous solution.
- Data of this study can be used to design the bisorption experiments for removal of heavy metals.

1. Data

In this article the data in Table 1 present the isotherm and kinetic equations that used for description of experiments. Calculated values of isotherm and kinetic model parameters were reported in Table 2. Figs. 1 and 2 show data of different isotherm and kinetic models applied in this study. The maximum biosorption efficiency (99.96%) of Fe (II) was obtained at biosorbent dosage of 10 g/L, Fe (II) concentration level of 100 mg/L, and contact time of 120 min. The effects of different parameters on removal efficiency of Fe (II) by biosorbent are shown in Figs. 3 and 4.

Table 1
Isotherm and kinetic equations used in the biosorption of Fe (II) in present study.

Model	Functional form	Ploting
Langmuir	$\frac{C_e}{q_e} = \frac{1}{bq_{max}} + \frac{1}{q_{max}} C_e$	$\frac{C_e}{q_e}$ vs C_e
Freundlich	$\text{Log}\ (q_e) = \text{Log}\ (K_f) + \text{Log}\ C_e$	$\log q_e$ vs $\log C_e$
First-order kinetic	$\text{Log}\ (q_e - q_t) = \log q_e - \frac{K_{1,ads}}{2.303} t$	$\log (q_e - q_t)$ vs t
Second-order kinetic	$\frac{t}{q_t} = \frac{1}{q_e^2 K_{2,ads}} + \frac{1}{q_e} t$	t/q_t vs t
Intraparticle diffusion	$q_t = k_d\ t^{0.5} + C$	q_t vs $t^{0.5}$

q_e is the mass of Fe (II) biosorbed per unit weight of the biosorbent (mg/g), q_{max} is the monolayer biosorption capacity, b is the Langmuir constant related to the free energy of biosorption equilibrium concentration level of Fe (II) in solution (mg/L) after biosorption and K_f is the Freundlich capacity factor and a measure of biosorption capacity, $1/n$ is the equilibrium concentration level of Fe (II) in solution (mg/L) after biosorption, q_t (mg/g) is the amount of biosorbed Fe (II) on algae at equilibrium and time t (min), C is the intercept and k_1 (1/min), k_2 (g/mg min) and k_d (mg/g $\text{min}^{0.5}$) are the rate constants of pseudo-first order, pseudo second order kinetic and intraparticle diffusion model.

Table 2
Isotherm and kinetic parameters for Fe (II) biosorption onto *Sargassum hystrix* algae.

Isotherms and kinetics models	Parameter	Value
Langmuir	b (L/mg)	0.194
	R_L	0.507
	q_{max} (mg/g)	0.894
	R^2	0.993
Freundlich	K_f (mg/g)	0.121
	$1/n$	2.425
	R^2	0.933
First-order kinetic	$q_{e\ cal}$(mg/g)	10.18
	$q_{e\ exp}$(mg/g)	19.59
	K_1 (1/min)	0.117
	R^2	0.999
Second-order kinetic	$q_{e\ cal}$ (mg/g)	196.07
	$q_{e\ exp}$(mg/g)	10.18
	K_2 (g/mg min)	0.032
	R^2	0.118
Intraparticle diffusion	K_d	3.323
	C	57.902
	R^2	42.15

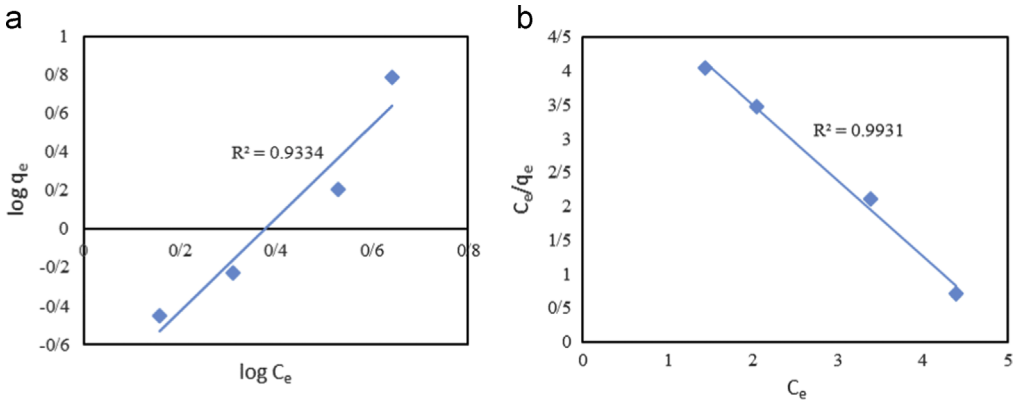

Fig. 1. (a) Freundlich, (b) Langmuir isotherms investigation of Fe (II) biosorption by *Sargassum hystrix* algae.

2. Experimental design, materials and methods

The brown algae *Sargassum hystrix* was used as biosorbent, was obtained along the northern part of the Persian Gulf in Bushehr seaside region. The collected algae was washed 3 times by urban water and 2 times by deionized water to eliminate dirt and contaminants, next dried in oven (at 105 °C for 24 h) and eventually powdered and sieved by using a screen (Mesh no: 25). $FeCl_3.6H_2O$ was used for preparing Fe (II) solutions. Fe (II) solutions were prepared at 5, 10, 20, 50, and 100 mg/L concentration from a stock solution (1000 mg/L). At each experiment, 100 ml of Fe (II) solution with special initial concentration of Fe (II) was agitated at 120 rpm. The effects of 6 contact times (5, 10, 25, 45, 60, and 120 min), 5 initial concentrations of Fe (II) (5–100 mg/L) and different dosage of biosorbent (0.1–10 g/L) were studied in the batch runs. Flame atomic absorption spectrometry (FAAS, Varian AA240, Australia) [1–4] was used to investigate the remaining concentration of Fe

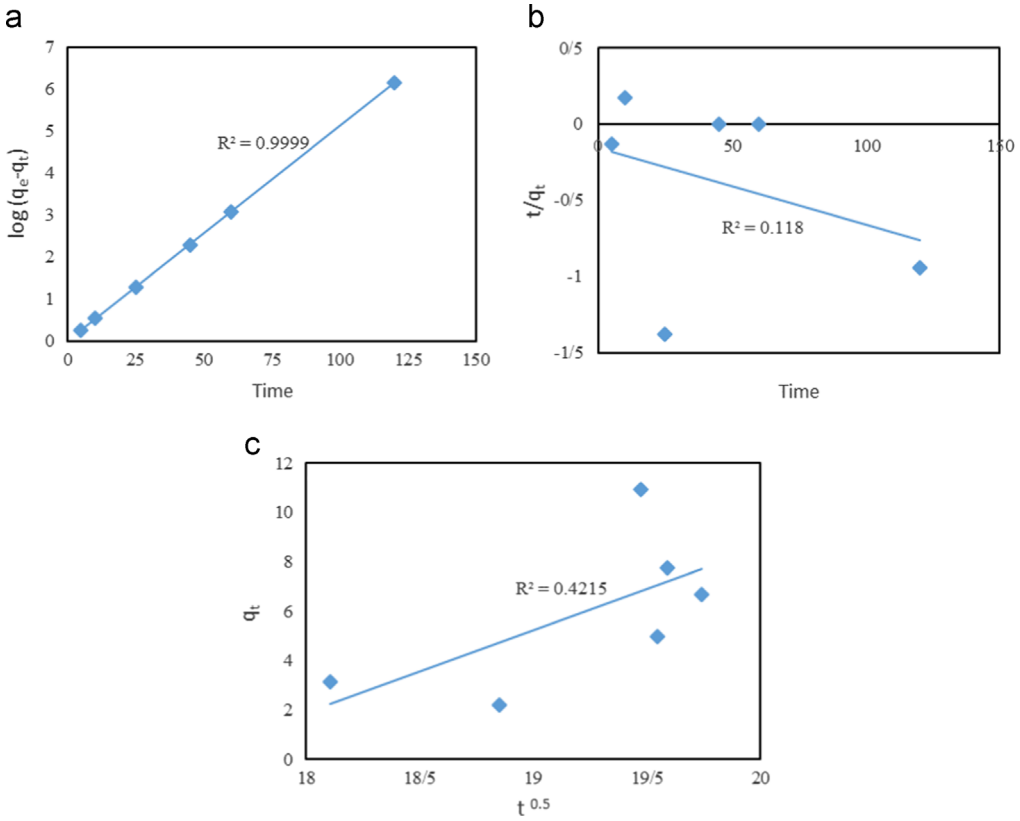

Fig. 2. (a) Pseudo-first-order model, (b) Pseudo-second-order model, and (c) intraparticle diffusion kinetic model of Fe (II) biosorption onto *Sargassum hystrix* algae.

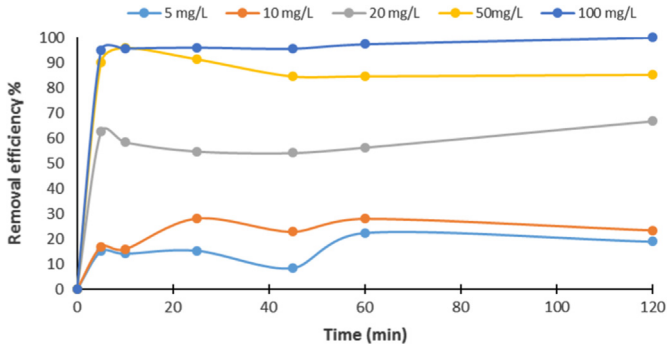

Fig. 3. Fe (II) biosorption as a function of initial Fe (II) concentration (pH: 7; biosorbent dose; 10 g/L).

(II) in the aqueous solution after each run. Following equation [5,6] was applied to calculate the removal efficacy during experiments.

$$R = \frac{(C_i - C_e)}{C_i} \times 100$$

where R is the removal efficacy, C_i and C_e are the levels of Fe (II) before and after the experiment in any time (mg/L).

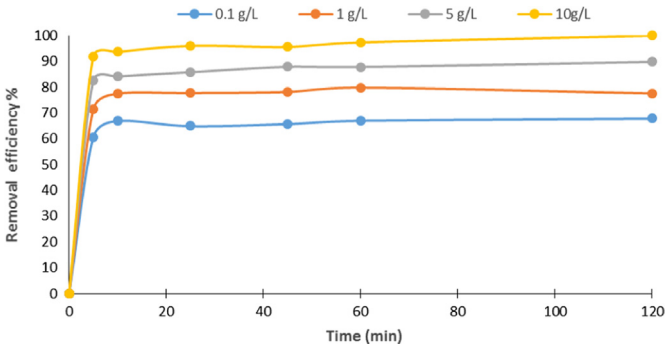

Fig. 4. Fe (II) biosorption as a function of biosorbent dose (pH: 7; initial Fe (II) concentration; 100 mg/L).

Acknowledgements

The authors are grateful to Bushehr University of Medical Sciences for their financial support (Grant no 20/71/1864) and the laboratory staff of the Environmental Health Engineering Department for their cooperation.

Transparency document. Supporting information

Transparency data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2016.10.018.

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