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Data Article

Experimental dataset on acid treated eggshell for removing cyanide ions from synthetic and industrial wastewaters

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ABSTRACT

The data current in this article are associated to the efficacy of acid treated eggshell as eggshell membrane (ESM) as an adsorbent for eliminating cyanide ion from synthetic and industrial wastewaters. This article describes the effects of selected factors such as pH (3–11), contact time (5–60 min), cyanide ion concentrations (50–150 mg/L), ESM dose (0.25–2 g/L), and solution temperature (20–50) on the removal cyanide ion from aqueous solution. The maximum cyanide ion removal obtained at a solution pH of 9–11. The kinetic data agreed with the pseudo-second-order kinetic. The equilibrium adsorption data at different temperatures well set through Langmuir equation. FTIR and thermodynamic data describe main adsorption phenomenon in cyanide ion onto ESM could be the ion exchange and chemisorption.

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Specifications Table

Subject area	Environmental engineering
More specific subject area	Environmental technology and waste management

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Type of data	Table, image, and figure
How data was acquired	The capability of eggshell membrane to adsorb cyanide ions was conducted using a series of batch tests in a shaker- incubator instrument.
Data format	Analysis
Experimental factors	Monitoring cyanide ions concentrations under various levels of initial target concentration, pH, adsorbent mass temperature, and reaction time for achieving the optimal conditions to remove cyanide ion from wastewater using eggshell membrane.
Experimental features	Cyanide ion adsorption by eggshell membrane and introduce low -cost and applied waste material in wastewater treatment
Data source location	Chemistry laboratory water and wastewater, Hamadan University of Medical Sciences, Hamadan, Iran.
Data accessibility	Data are accessible in the article

Value of the data

- The data presents a low -cost adsorbent make from waste material of eggshell membrane.
- The isotherm, kinetic and thermodynamic data will be useful and valuable for expecting and modeling the adsorption capacity and mechanism of cyanide ion elimination via the adsorbent. The attained data will be beneficial for the methodical and engineering community that needing to scale up and design an adsorption column with eggshell membrane as bed for the elimination of cyanide ion from water or wastewater.

1. Data

SEM data for eggshell membrane with different magnification were shown in Fig. 1a, b. Fig. 2a, b displayed EDX spectra data of the fresh eggshells and ESM. Fig. 3 indicated experimental data for point of zero charge (pHzpc) of ESM. Fig. 4 depicted data for the FTIR spectrum of ESM before and after cyanide loaded. Data of the influence of solution pH on cyanide ion removal by ESM is shown in Fig. 5. In Fig. 6 the profile of cyanide removal data as a function of ESM dosage indicated. Fig. 7 demonstrated data of intraparticle diffusion model plot for the adsorption of cyanide onto ESM through different concentrations. Fig. 8 showed the profile of cyanide ion removal data as a function of solution temperature. The parameters obtained from pseudo- first -order model parameters with different initial cyanide ion concentrations are tabulated in Table 1. The parameters obtained from pseudo-second-order model parameters with different initial cyanide ion concentrations indicated in Table 2. The parameters obtained from intraparticle diffusion model with different initial cyanide ion concentrations exhibited in Table 3. In Table 4 the data regarding to Langmuir, Freundlich, Dubinin–Radushkevich and Temkin adsorption isotherm parameters are presented. Thermodynamic data for adsorption of cyanide ion on ESM indicated in Table 5. Table 6 described the quality of electroplating plant wastewater before and after treatment with the ESM.

2. Experimental design, materials and methods

2.1. Materials

In this work, fresh eggshells used were obtained from local confectionary shop. The eggshells were initially washed with tap water and then dried at 105 °C. The dried eggshells were grinded to size 0.5–0.6 mm. To prepare ESM, the eggshells were occupied in the hydrochloric acid (%0.5) for 35 min [1]. The obtained ESM were washed with distilled water and washed ESM was dried in the oven at 80 °C. The stock of cyanide solution (1.0 g CN^-/L) was prepared by dissolving required quantity of

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