Data Article

Experimental data for aluminum removal from aqueous solution by raw and iron-modified granular activated carbon

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ABSTRACT

This dataset deals with the modification of granular activated carbon (GAC) with $FeCl_3$ under basic conditions (pH $\approx$ 12) for removal of aluminium (Al) from aqueous solution. The structural properties and operational parameters including Al ion concentration (2.15 and 10.3 mg/L), pH solution (2–10), adsorbent dosage (0.1–5 g/L), and contact time (0–10 h) was investigated for raw and modified GAC. This dataset provides information about Al removal by GAC and modified GAC at conditions including: pH = 8, contact time = 6 h, initial Al concentration = 2.15 mg/L. The characterization data of the adsorbents was analysed by Fourier transform infrared (FTIR) spectroscopy, scanning electron microscopy (SEM) and Brunauer, Emmett and Teller (BET) test. The data showed that Freundlich isotherm with and Pseudo second order kinetic model were the best models for describing the Al adsorption reactions. The acquired data indicated that the

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maximum adsorption capacity of GAC and modified GAC to uptake Al ($C_0 = 10.3$ mg/L) was 3 and 4.37 mg/g respectively.

Specifications Table

Subject area	Environmental Engineering
More specific subject area	Adsorption
Type of data	Table, image and figure
How data was acquired	– GAC was oxidized by nitric acid and concentrated sulphuric acid. Then it was modified by $FeCl_3 \cdot 6H_2O$ under basic condition according to a designed procedure. – Experiments were conducted according to a designed procedure of analytical test and were investigated in order to perform an analysis of adsorption process. All adsorption tests were done in batch mode. – Fourier transform infrared (FTIR) spectroscopy (Shimadzu 4300), scanning electron microscopy (SEM, Hitachi, SU 70) and Brunauer, Emmett and Teller (BET) tests were used to determine the characteristics of the adsorbent. – The aluminium concentration was measured by DR5000 Spectrophotometer (Method 8012) that was adapted from Standard Methods for the Examination of Water and Wastewater.
Data format	Raw and analysed
Experimental factors	Studying variables including pH, contact time, Al concentration, adsorbent dosage and characterisation of raw and modified GAC which were investigated for Al removal by adsorption.
Experimental features	– Characterization data of raw and modified GAC obtained from FTIR, BET and SEM are given. – Optimization of Al adsorption onto raw and modified GAC adsorbent by modification.
Data source location	Saveh University of Medical Sciences.
Data accessibility	The data presented in this article is not published anywhere else.

Value of the data

- The data are beneficial for determination of the isotherm and kinetic for predicting and modelling the adsorption capacity and mechanism of Al removal by the iron-modified GAC.
- These data show the efficacy of modified GAC in comparison to raw GAC on Al removal.
- The dataset will be useful for Al removal from aqueous solution.

1. Data

Presented data in this article comprise the characterization of raw and modified GAC (in this paper modified GAC under basic condition nominated as BGAC) with analytical methods like FTIR, SEM, BET and iron content, as well as experimental data including studying different variables (pH, contact time, Al concentration and adsorbent dosage), isotherm and kinetic. One of the best available technologies for