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Data Article

# Characterization, kinetic, and isotherm data for Cr (VI) removal from aqueous solution by *Populus alba* biochar modified by a cationic surfactant

Maryam Shahverdi [a], Esmaeil Kouhgardi [a], Bahman Ramavandi [b,*]

[a] *Environmental Department, Bushehr Branch, Islamic Azad University, Bushehr, Iran*
[b] *Environmental Health Engineering Department, Faculty of Health, Bushehr University of Medical Sciences, Bushehr, Iran*

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ABSTRACT

*Populus alba* is fast and auto- growing tree which profoundly accessible in around the world. The usage of the wastes of this tree would be admirable from environmental and solid waste management point of view. Thus, herein, this data set presents a facile method for providing an adsorbent from wastes of *P. alba* tree. The prepared adsorbent was modified by the cationic surfactant of $(C_{16}H_{33})N(CH_3)_3Br$ and applied to remove Cr (VI) from aqueous solution. The characterization data of the modified adsorbent were analyzed using FTIR and SEM methods. The information regarding kinetics, isotherms, and thermodynamics of chromium ions adsorption were listed. The data implied that the maximum adsorption capacity of adsorbent to uptake Cr (VI) from aqueous solution was obtained 52.63 mg/g. The acquired data indicated that the adsorption of Cr (VI) by the adsorbent prepared from *P. alba* is an promising technique for treating Cr-bearing wastewaters.



* Corresponding author.
*E-mail addresses:* ramavandi_b@yahoo.com, b.ramavandi@bpums.ac.ir (B. Ramavandi).

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**Specifications Table**

| | |
|---|---|
| Subject area | *Environmental Engineering* |
| More specific subject area | *Adsorption* |
| Type of data | *Table, image, figure* |
| How data was acquired | – *The uptake of Cr (VI) by the adsorbent ($q_e$) was determined based on the subtraction of the initial and final concentration of adsorbate.*<br>– *Fourier transform infrared (FTIR) spectroscopy (Shimadzu 4300), scanning electron microscopy (SEM, Hitachi, SU 70) was used for determine the characteristics of the adsorbent.*<br>– *The Cr (VI) concentration measurement was performed by an atomic absorption spectroscopy (AAnalyst 200 Perkin-Elmer).* |
| Data format | *Analyzed* |
| Experimental factors | – *The Populus alba biochar (PAB) was prepared from waste of P. alba tree at 350 °C.*<br>– *The PAB was modified by $(C_{16}H_{33})N(CH_3)_3Br$ to produced MPAB*<br>– *Data of MPAB were acquired for Cr (VI) removal from aqueous solution.* |
| Experimental features | *P. alba biochar for Cr (VI) adsorption from wastewater* |
| Data source location | *Bushehr University of Medical Sciences, Bushehr, Iran* |
| Data accessibility | *Data are accessible with the article* |

**Value of the data**

- Compare to methods reported in the literature, this data set report a facile and low cost method for Cr (VI) removal from aqueous solution using the *Populus alba* biochar amended by a cationic surfactant.
- The isotherm, kinetic, and thermodynamic data will be informative and useful for predicting and modeling the adsorption capacity and mechanism of chromium removal by the adsorbent from *P. alba*.
- The acquired data will be advantageous for the scientific community wanting to scale up and design an adsorption column with *P. alba* biochar as medium for the removal of Cr (VI)- containing waters or wastewaters.

## 1. Data

The FTIR of the fresh MPAB at wave numbers from 400 to 4000 $cm^{-1}$ are given in Fig. 1. The SEM image of prepared adsorbent from *Populus alba* is also illustrated in Fig. 1. The kinetics, isotherms, and thermodynamic parameters were estimated using models listed in Table 1. The data of isotherms and kinetics for adsorption of chromium ions onto MPAB is presented in Tables 2 and 3. Fig. 2 is depicted the comparison data for Cr (VI) adsorption by the MPAB and PAB.

## 2. Experimental design, materials and methods

### 2.1. Materials

All chemical used in this data article such as $K_2Cr_2O_7$, $(C_{16}H_{33})N(CH_3)_3Br$, $HNO_3$, and NaOH was purchased from Merck Co. Ltd. The double distilled water was used for preparing working solutions.