

Accepted Manuscript

Title: Preparation of high surface area activated carbon from waste-biomass of sunflower piths: Kinetics and equilibrium studies on the dye removal

Authors: Mustafa Baysal, Kaan Bilge, Bengisu Yılmaz, Melih Papila, Yuda Yürüm



PII: S2213-3437(18)30092-7
DOI: <https://doi.org/10.1016/j.jece.2018.02.020>
Reference: JECE 2212

To appear in:

Received date: 5-10-2017
Revised date: 15-1-2018
Accepted date: 12-2-2018

Please cite this article as: Mustafa Baysal, Kaan Bilge, Bengisu Yılmaz, Melih Papila, Yuda Yürüm, Preparation of high surface area activated carbon from waste-biomass of sunflower piths: Kinetics and equilibrium studies on the dye removal, Journal of Environmental Chemical Engineering <https://doi.org/10.1016/j.jece.2018.02.020>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Preparation of high surface area activated carbon from waste-biomass of sunflower piths:
Kinetics and equilibrium studies on the dye removal

Mustafa Baysal¹, Kaan Bilge^{1}, Bengisu Yılmaz¹, Melih Papila¹, Yuda Yürüm¹*

¹Sabancı University, Faculty of Engineering and Natural Sciences, Materials Science and NanoEngineering Program, Istanbul, Turkey

*Corresponding author: kaanbilge@sabanciuniv.edu

Highlights

- Use of waste sunflower pith as a precursor for activated carbon for the first time.
- High surface area AC prepared by NaOH and KOH ($2690 \text{ m}^2 \text{ g}^{-1}$ and $2090 \text{ m}^2 \text{ g}^{-1}$).
- Microstructure of the SP in its natural form are shown by micro-computed tomography.
- Carbonization leads to SP into thin, separated carbon flakes of 200 nm thickness.
- Meso and micropores in the N-SPAC lead to a high MB adsorption (965.349 mg/g)

Abstract

Sunflower pith (SP), a vast agricultural waste is herein used as a precursor material for highly porous low density activated carbon production. Porosity and flake-like microstructure of the SP in its natural form are shown by micro-computed tomography (Micro-CT). Carbonization process turns the SP into thin, separated carbon flakes of 200 nm thickness. Two types of alkaline based chemical activation with KOH and NaOH are performed to yield SP based activated carbon (AC), K-SPAC and N-SPAC, respectively. Microstructural changes upon carbonization and activation process are elaborated by RAMAN, FTIR and SEM analyses. BET Surface area of the NaOH-activated N-SPAC was calculated as $2690 \text{ m}^2/\text{g}$ and was higher than KOH-activated K-SPAC with $2090 \text{ m}^2/\text{g}$. Maximum adsorption capacity of N-SPAC was calculated as 965 mg/g whereas it was 580 mg/g for K-SPAC. Adsorption kinetic studies for N-SPAC revealed that at a low initial concentration of dye (500 mg/L), the pseudo first-order kinetic model was predictive. On the other hand, at high initial MB concentration (1000 mg/L), the results indicate that the adsorption kinetics follow the Elovich model with intraparticle diffusion as one of the rate-determining steps.

In conclusion, overall results suggest that thanks to its highly porous microstructure, the SP is an alternative renewable AC precursor choice for dye removal applications.

Keywords: Sunflower pith, Char, Activated Carbon, CTscan, Adsorption

Download English Version:

<https://daneshyari.com/en/article/6663970>

Download Persian Version:

<https://daneshyari.com/article/6663970>

[Daneshyari.com](https://daneshyari.com)