ADSORPTION OF DYES FROM INDUSTRIAL WASTE WATER USING BIOCHAR

Submitted By

Yasser Abd EL-Razek Mohamed Roushdy Borghol

B.Sc. of Science (Microbiology/Chemistry), Faculty of Science
Ain Shams University, (2004)

A Thesis Submitted in Partial Fulfillment
Of
The Requirment for the Master degree
In
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Department of Enviromental Basic Sciences
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APPROVAL SHEET

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ABSTRACT

Abstract

Thesis Titels: Adsorption of dyes from industrial waste water using Biochar.

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In this thesis, we studied the adsorption ability of three adsorbents.

Two Biomass residuals have been taken and converted to biochar, in addition to normal commercial coal purchased from the market. The two biomasses were Corn stovers (Cn) and Date Palm Leaf Midrib (DPLM) respectively. The two biomasses have been dried at 100 ^{0}C for One hour, and then carbonated to the biochar in a canister inside a muffle at 450 ^{0}C for two hours.

Activation took place to a part of the prepared biochar and the coal by immersing in a sulphuric acid 10% at 40-50 ^{0}C for one hour.

The physic-chemical properties of the adsorbent have been also accomplished by testing Scanning Electron Microscope SEM, Infra red (FTIR) , X-Ray Diffraction and Zeta-potential measurements.

The results revealed that the absorbents were having high porosity surfaces, all consists of carbon mainly, and the activation process helps the adsorbent to have Sulpahte groups which played a great role in attaching the cationic dye to the negatively charged adsorbent.

The untreated and the treated biochars and coal have been used as an adsorbent to remove industrial dye (Methylene Blue) from water.

A suitable concentration of the dye (0.0001 M) has been prepared at lab and the biochar have been added to it consecutively at different pHs. The results determined the best adsorbent at different pHs which was the treated DPLM biochar at pH 10.

This biochar was used to complete the optimization experiments chemically to inspect for the best adsorbance conditions.

Optimization experiments included detection of the best contact time, dye volume, dye concentration and absorbent dose / dye ratio.

Finally, a real industrial waste water sample was used to detect the ability of the produced biochar. The sample was a mixture of dyes. The TD biochar had a great ability to remove the dye from it. This indicated that the adsorption may have taken place due to ionic attraction forces between the dye and the adsorbent.

At the end, the DPLM activated biochar appeared to have good adsorption ability, which can be used as a good alternative for different adsorption process in the water treatment field.

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Abbreviations

Cn	Corn Stovers
DPLM	Date Palm Leaf Midrib
CHc	Charcoal
Bcn	Corn Stovers Biochar.
Bdp	Date Palm Leaf Midrib Biochar
TBcn	Treated Corn Stovers Biochar
TBdp	Treated Date Palm Midrib Biochar
TCHc	Treated Charcoal
MB	Methylene Blue dye
FTIR	Fourier-transform Infrared spectroscopy
SEM	Scan Electronic Microscope
WQI	Water Quality Index
PI	Pollution Index
IBI	International Biochar Initiative
MI	Metal Index
DBPs	Disinfection By Products
TGA	Thermo Gravimetric Analysis
ATR	Attenuated Total Reflection
NIR	Near Infrared spectroscopy
NOMs	Natural Organic Matters
AgNPs	Silver Nanoparticles
CNT	Carbon Nano Tubes
ZVI	Zero Valent Iron
TD	Treated Date