PREPARATION AND CHARACTERIZATION OF ACTIVATED CARBON FROM CORNCOB AND COCONUT SHELL FOR CATION ADSORPTION

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Introduction:

Activated carbons are good adsorbents that are used for capturing CO2 from flue gas through physical adsorption, waste water treatment due to its porous structure. The extensive use of activated carbon is used now days, due to its large micro porosity, large specific surface area. Activated carbon adsorption also used for treating low concentrations of wastewater streams at extremely low cost. The removal efficiency of Activated carbon is very high for harmful pollutants. As environmental pollution is the major problem now a day's so need of activated carbon is growing day by day. Its texture characteristics and surface properties depend on the raw material and on the method used for its preparation.

Objectives:

1. The synthesis of carbonated coconut shell and corncob.
2. The activation of the coconut shell carbon and corncob carbon.
3. Characterization of activated carbon prepared from coconut shell and corncob.
4. Use activated carbon from coconut shell and corncob in different combinations of mass ratio adsorbents to adsorb Pb2+ ion.
5. The analysis of Pb2+ using UV Spectrophotometry.

Methodology:

The method applied is laboratory experiment method.

Production of adsorbent

1. Raw materials of Corncob and coconut shell
2. Drying and cleaning
3. Washing with distilled water

4. Drying in oven at 110oC for 1 hour
5. Carbonization 350oC for 1 hour
6. Crushing
7. Sieving (100mesh)

Adsorbent activation

Coconut shells carbon soaked in a solution of ZnCl2 15% and corn cobs carbon soaked in a solution of HCl 1M at room temperature for 24 hours. Filter and rinse the residue to make the filtrate neutral, and then dried in an oven at 110°C for 24 hours.

Determination of Pb2+ with calibration curve

Pb (II) solution was 0 µg/L, 2 µg/ L, 4 µg/L, and 8 µg/L each taken 20 ml. Then added 2 mL of dithizone solution, 1 mL of H2SO4 0.5M solution, and 0.06 mL of fluffy resin. Then it was stirred for 20 minutes and analysed using UV-visible spectrophotometry with a wavelength of 483 nm and 558 nm. Then the absorbance difference from the two wavelengths is taken, namely ΔA = A483nm – A558nm. Where the ΔA obtained will be made a standard curve Pb (II) (ΔA vs. concentration).

Determination of Pb (II) species in simulation liquid waste

Liquid waste solution was taken 20 mL, then added 1 mL of H2SO4 0.5 M solution, 2 mL of dithizone solution, and 0.06 mL of resin. Then it was stirred & analysed using a UV-visible spectrophotometer.

Determination of the most effective comparison of adsorbents from coconut shells and corn cobs

Combine activated coconut shell carbon and activated corncob carbon in a row with a ratio of 0:1; 1:0; 1:1; 1:2; and 2:1 into a beaker glass containing 25 mL of Pb (II) simulated solution then input in the stirrer (stirred for 30 minutes). The solution obtained was filtered with Whatman filter paper. The resulted filtrate was taken as much as 5 mL and then diluted it until 50 mL with distilled water in the volumetric flask. Furthermore, taken 20 mL from the resulting filtrate diluted and added with 1 mL of H2SO4 0.5M, 2 mL of dithizone, and 0.06 mL resin then stir it for 20 minutes. The mixture than analysed using UV-visible spectrophotometer.

Results:

Table No:1: Characterization of Activated carbon form coconut shell and corn cob

Charcoal	Moisture content %	Ash content %	Volatile matter %	Fixed Carbon %
Coconut shell	5.9	19	46	40.6
Corn cob	6	25.4	70	10.6

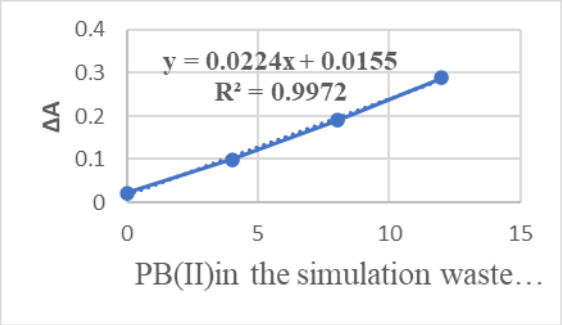
1. Characterization of charcoal is moisture content, volatile matter and ash content in corncob charcoal is more than the coconut shell charcoal.
2. Fixed carbon in coconut shell charcoal is more than the corn cob charcoal.

Charcoal	Specific gravity	Bulk density (g/cm^3)	Particle density (g/cm^3)	Porosity%
Coconut shell	1.6670	0.511	1.031	50.41
Corn cob	0.523	0.200	0.677	70.36

1. Coconut shell carbon has more Specific gravity, bulk density, and Particle density than the Corn cob carbon.
2. Corn cob carbon has more porosity than the coconut shell carbon.

Table No:2 Determination of Pb2+ with calibration curve

Concentration(mg/L)	483nm	558nm	ΔA
0	0.148A	0.169A	0.021A
4	0.133A	0.232A	0.099A
8	0.120A	0.310A	0.19A
12	0.113A	0.402A	0.289A

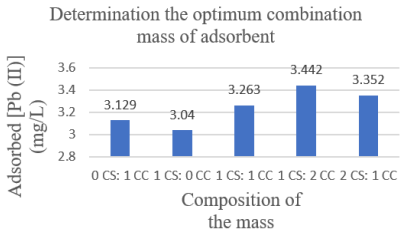


By these experimental results obtained a standard calibration curve with equation y = 0.0224x + 0.0155.

Table No:3 Determination of Pb2+ species in simulation liquid waste

Sample	Pb (II) Calculation	ΔA	Pb (II) Actually
Sample Pb (II)	3.727 mg/l	0.099A	4 mg/l

Table No:4 Determination of the most effective comparison of adsorbents from coconut shells and corn cobs



The optimum combination mass of adsorbent to adsorb Pb (II) metal ions in the simulated liquid waste was 1:2 with adsorbed concentration was 3.442 mg/L, and the percentage of adsorbed as 86.05 %.

Conclusion:

1. The results showed that the adsorbent combination between activated carbon from coconut shell and corn cob can increase the capabilities and effectiveness of the absorption to adsorb Pb (II) ion in the simulations waste.
2. The most optimum ratio from the comparison between coconut shell and corn cob is a ratio of 1:2 with the absorption ability to adsorb Pb (II) ion in the simulations waste is 86.05%.

Scope for future work:

Absorbent made activated carbon from coconut shell combined corn cobs is possible to be more effective in adsorbing Pb2+ ion and other cations in water, besides economical, both materials are also easy to obtain, and can be a useful waste treatment.