

## Preparation, Characterization and study of equilibrium adsorption of Activated Carbon Obtained Jute sticks

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### ABSTRACT

Jute sticks are agricultural waste products. It is the by- product of the jute industry. Therefore, jute sticks are very cost- effective and our main raw material in the project. Our main purpose is to produce activated charcoal by chemically treating jute sticks. Activated charcoal has many applications including water body treatment, sewage treatment, air purification, organic solvent clarification, medicinal use and more. Activated charcoal acts as a good adsorbate due to the presence of large surface area and micropores. Therefore, we pre- treated the jute sticks with potassium hydroxide (KOH) (ratio of jute sticks with potassium hydroxide =2.5: 1) and pyrolysed the sample at 280°C for 2hr and the obtained charcoal is grinded. Then, the physio- chemical properties of the activated charcoal are determined by calculating the bulk density, moisture content, ash content, volatile matter content, fixed carbon content, pH, methylene blue number and iodine number. From methylene blue number, maximum 87.67% removal of dye was possible. And the activated charcoal has maximum iodine number 764.80 mL/g. For the isotherm study, we chose methylene blue as model dye. Now the obtained data of equilibrium study were fitted into Langmuir, Freundlich, Temkin and Dubinin–Radushkevich (DRK) isotherms. These data were obtained by varies both the concentration of methylene blue and amount of charcoal, accordingly. Of the four adsorption isotherm, the R<sup>2</sup> value of Langmuir isotherm model was the highest. The maximum monolayer coverage (Q<sub>0</sub>) from Langmuir isotherm model is calculated and the values range from 28.571 mg/g - 142.874 mg/g, the separation factor (RL) indicating a favorable sorption experiment, range from 0.0422- 0.6089. From Freundlich Isotherm model, the sorption intensity (n) which indicates the adsorption is normal when the minimum amount of charcoal is 50mg (0.05g); below this minimum amount of charcoal the value of 1/n indicates cooperative adsorption. The heat of adsorption(s) process are determined from Temkin Isotherm model varies from 26.961 J/mol – 3.023 J/mol and the mean free energies are calculated from DRK isotherm model range from 4.0825 KJ/mol – 1.291 KJ/mol indicating a physisorption process.

**Keywords:** Freundlich Isotherm model, physisorption process, Activated charcoal.

