Removal of chlorophenols from water using low-cost agricultural wastes
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Introduction
Aromatic compounds belong to a group of general environmental pollutants from industry. The existence of their even low concentrations can be a trouble to the use or reuse of water. Industrial sources of pollutants such as phenolic resin production (400 mg/L), refineries (50 mg/L), shale dry distillation (200 mg/L) and naphthenaline acid production (12 mg/L), etc. generate large quantities of phenols\textsuperscript{[1]}. In addition, phenolic derivatives are largely used as intermediates in the production of plastics, colors, pesticides, insecticides etc. Phenols cause distasteful taste and odor of drinking water and can exert negative effects on different biological processes. Phenol and its derivatives also show mutagenic effect by unbinding of the DNA helix, inhibition of DNA synthesis in the human Syrian hamster embryo (SHE) cells, induction of gene mutations, chromosome aberrations, and aneuploid formations (phenol, catechol)\textsuperscript{[2]} A connection has been also established between the presence of chlorophenols and development of the non-Hodgkin lymphatic system neoplastic changes\textsuperscript{[3]} As a result, the elimination or destruction of phenols from wastewaters is of great importance. There are many billion kilograms of agricultural waste products in Egypt. These materials are considered a significant waste disposal problem. They are often used as foodstuff, energy fuel, or compost, etc. But many are treated as waste. So it is promising to develop the other ways in order to utilize these by-products. Agricultural waste materials are economic and eco-friendly due to their unique chemical composition, availability in abundance, renewable, low in cost and more efficient, and are seem to be viable option for heavy metal, organics and dye remediation\textsuperscript{[4]}

Methods
- Chemical Activation method for the preparation of the activated carbon form rice husk, using phosphoric acid.
- Standard Spectrophotometric method for measuring the chlorophenols, using a UV/visible spectrophotometer.
- The removal percentage, removal%, were calculated by the following equations:

\[
\% \text{ Removal} = \frac{C_0 - C_e}{C_0} \times 100
\]

where \(C_0\) and \(C_e\) are the initial and equilibrium concentrations of the chlorophenols (mg/L), respectively.

Flow Chart of the Preparation of activated carbon

Pre-Treatment (Washing-Drying-milling-Sieving-Extracting)

Impregnation in \(H_3PO_4\) for 48 h

Washing, filtration then drying

Pyrolysis in closed atmosphere at 500°c for 90 min

Results

Conclusions and outlook
- The Results showed that maximum removal of the chlorophenols compounds was at pH 3.8 with recovery in the range 85.04% and equilibration was achieved after 180 min contact time.
- The results reached by this project work can be used for determination of optimum conditions for removal of chlorophenols in aqueous solutions by activated carbon prepared from agricultural wastes.
- Chlorophenols always exist in various industrial effluents like textile industries, Sewage water and water treatment plants. This work can be used in the design of adsorption columns for removing them.

References


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Funded by:
www.uni-due.de/zwu/iwathec