

# Adsorption of Selected Synthetic Organic Compounds in Aqueous

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## Introduction

Synthetic organic chemicals (SOCs) are organic compounds that

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**Instrumentation:** The instruments used were HI83099 COD and multiparameter photometer, HI 839800 COD reactor, COD test kits, COD standard reagents and set of titration equipment

The COD was measured using Standard methods for water and wastewater Analysis, Part D5220, APHA (1995). The COD measurement instruments were supplied through an IFS Grant [Grant No: W5574-1] by the International Foundation for Science (IFS) Sweden [4,5].

**Carbonization of Biomass:** The dried Nipa palm biomass from the fronds were carbonized by taking about  $25 \pm 0.01$  g of the Nipa palm leaves biomass (< 110 mesh size) was introduced into a clean and pre-weighed crucible containing 25 ml of distilled water in a 1:1 ratio to form a paste. The paste was transferred to a clean and pre-weighed crucible and placed in a muffle furnace (Carbolite Sheffield England, LMF4) and was heated gradually to  $550^\circ\text{C}$  for 10 min. The mixture was allowed to remain at this temperature in the oven for 2 hrs, after which it was poured from the crucible into a bowl containing some ice block crystals. The excess water was drained and the samples were sun dried.

The carbonized sample was washed, using 10% HCl to remove surface ash, followed by hot water wash and rinsing with distilled water to remove residual acid. The solids were then sun dried, followed by oven drying at  $100^\circ\text{C}$  for one hour and then weighed. The dried sample was sieved through a  $106\text{-}\mu\text{m}$  mesh Tyler sieve and the fractions <  $106\text{ }\mu\text{m}$  were collected for use. This is the carbonization step which produced the physically carbonized carbon (PCC). The sealed oven provided an oxygen-deficient condition under which the biomass was thermally decomposed to porous carbonaceous materials and hydrocarbon compounds [6].

**Activation of Biomass:** The activated carbons were prepared by a one-step pyrolysis method. The activated carbons produced were called (i) Acidic reagent activated carbon (AAC) and (ii) Basic reagent activated carbon (BAC)

**Acidic Reagent Activated Carbon (AAC):**  $25 \pm 0.001$  g Nipa palm leaves biomass was placed in a beaker containing 25 ml of 10% (3.27 M)  $\text{H}_3\text{PO}_4$  solution. The content of the beaker was thoroughly mixed and heated to form a paste. The paste was transferred to a clean and pre-weighed crucible and placed in a furnace and was heated gradually to  $500^\circ\text{C}$  for 10 min. After activation, the mixture was allowed to cool to room temperature and weighed [7]. The pyrolyzed carbons were washed, using 10% HCl to remove surface ash, followed by rinsing with distilled water to remove residual acid until a neutral pH was achieved. The sample was then dried in an oven at  $110^\circ\text{C}$  overnight. The final product was ground and sieved through a  $106\text{ }\mu\text{m}$  mesh Tyler sieve. Fractions <  $106\text{ }\mu\text{m}$  were collected and kept in an air-tight container for use. Washing was complete when a pH of  $7 \pm 0.5$  was ascertained.

**Basic Reagent Activated Carbon (BAC):**  $25 \pm 0.001$  g Nipa palm leaves biomass was placed in a beaker containing 25 ml of 10% KOH solution. The 0.9 M standard solution was made by adding 49.93 grams of KOH into 1000ml distilled water. The content of the beaker was thoroughly mixed and heated to form a paste. The paste was transferred to a clean and pre-weighed crucible and placed in a furnace and was heated at  $500^\circ\text{C}$  for 10 min. After activation, the mixture was allowed to cool to room temperature and weighed. The pyrolyzed carbons were washed, using 10% HCl to remove surface ash, followed by rinsing with distilled water to remove residual acid until a neutral pH was achieved.

The sample was then dried in an oven at  $110^\circ\text{C}$  overnight. The final product was ground and sieved through a  $106\text{ }\mu\text{m}$  mesh Tyler sieve. Fractions <  $150\text{-}\mu\text{m}$  were collected and kept in an air-tight container for use. Washing was complete when a pH of  $7 \pm 0.5$  was ascertained [8].

**COD Reduction of SOC Solutions:** The chemical oxygen demand (COD) concentrations play an important role in the use and re-use of wastewater. COD reduction from solutions of known concentrations (mg/L) of DMABA, kerosene and n-propanol was investigated using PCC, AAC, BAC and CAC under optimum conditions. The process conditions used were 12.3 grams of carbon, 17.62 cm bed height, ambient temperature, pH = 6.5 and flow rate 15 ml/min. The COD concentration decreased significantly in the treated SOC solution as compared to the raw SOC solution (Table 1).

## Result

The results showed that the physically activated carbons (PCC),

86 % reduction in total nitrogen (Tot-N).

### Acknowledgment

None

### Conflict of Interest

None

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