

Preparation and characterization of activated carbon from *Typha orientalis* leaves

Abstract

Background

In this study, activated carbon (AC) was prepared from *Typha orientalis* or commonly known as cattail leaves using physical and chemical activation phosphoric acid (H_3PO_4), as dehydrating agent. A two-stage process was used, i.e., semi-carbonization stage at 200 °C for 15 min as first stage followed by second stage activation, at 500 °C for 45 min. The precursor material with the impregnated agent was exposed straight away to semi-carbonization and activation temperature using a laboratory scale muffle furnace (Carbolite RHF 1500, England) under static condition in a self-generated atmosphere.

Results

The best condition in AC production was based on chemical activation which is AC2 with 2 M of H_3PO_4 . AC2 has the highest removal efficiency, 97.4 % in 4 ppm concentration of Pb(II) and percentage yield of 62.73 % could be reached. The pH of the AC was controlled in the range 5–6. From Fourier transform infrared spectroscopy, functional groups such as hydroxyl group, lactone group, and carboxyl group were obtained. These were clearly illustrated by scanning electron microscopy micrographs that porous structure was progressively developed with sponge-like structure.

Conclusions

The Pb(II) adsorption results were best fitted in the Langmuir isotherm for equilibrium data while the adsorption kinetic fitted to the pseudo-second order model. The maximum Brunauer, Emmett and Teller surface area of the best produced AC was found to be around 1,238 m²/g. The maximum adsorption capacity was found to be 7.95 mg/g.