Textural and chemical properties of activated carbon prepared from tropical peat soil by chemical activation method

ABSTRACT

Activated carbon (AC) was produced via phosphoric acid (H3PO4) and zinc chloride (ZnCl2) chemical activation methods at 500 °C for 3 h. Tropical peat soil was used as a carbon precursor. The effects of activating agent concentrations on the microstructure and chemical properties of activated carbon were studied. Activated carbon with a high BET (Brunauer-Emmett-Teller) specific surface area (SBET) and a high total pore volume (Vpore) was produced using a 30% H3PO4 chemical activation method. The SBET and Vpore of the activated carbon at this condition were 1974 m2/g and 1.41 cm3/g, respectively. However, the activated carbon prepared using ZnCl2 activation only had a SBET of 794 m2/g and a Vpore of 0.11 cm3/g. The nitrogen adsorption-desorption isotherms of both activated carbons exhibited a combination of Type I and Type II isotherms, due to the simultaneous presence of micro- and mesopores structures. The microcrystallinity of the activated carbons was characterized using an X-ray diffractometer and a Raman Spectroscopy, respectively. The activated carbon produced using H3PO4 activation had higher crystalline properties than the activated carbon prepared using ZnCl2 activation. Thus, this article demonstrates the potential of tropical peat soil as a precursor of AC production.

Keyword: Chemical activation method; Phosphoric acid; Zinc chloride; Tropical peat soil; Activated carbon; Surface chemistry; Thermal energy storage