KINETICS OF THE GAS-PHASE BROMINATION OF ACTIVATED CARBON

The properties of carbon materials (CMs) are determined by their porous structure and chemical characteristics of the surface, which could be significantly changed as a result of chemical modification. Bromination of the surface and subsequent nucleophilic substitution of bromine on various N-, S- and O-containing groups are promising method for modifying the CMs. In the present work the kinetics of bromination of activated carbons (ACs) by vapor of Br_2 in the temperature range of 200–500°C was investigated. The given technique was chosen because it does not lead to parallel oxidation of the ACs surface.

For the study it was used two types of activated carbons: SAC (fruit stones activated carbons, raw material is fruit pits) and SCN (spherical nitrogen-containing activated carbons, raw materials are poly(vinylpyridine) resin*) with the surface area of 1350 and 1100 m^2/g and the total pore volume of 0.45 and 0.41 cm^3/g, respectively. The bromination of ACs (batch with 50 mg) was performed using thermogravimetric flow system both under nonisothermal and isothermal conditions. According to the difficulty of the kinetic analysis of unisothermal dependencies, it was carried out the kinetic studies for isothermal conditions at 200°C (slight chance of physical sorption of Br_2), 300, 400 and 500°C (maximum number of chemisorbed bromine).*

According to the study, the gas-phase bromination of ACs is an effective method of modifying and provides grafting of bromine up to 20–25 mass.% (2,5-3,1 mmol/g). The optimal temperature range of the bromination for produce chemisorbed bromine is 300–500°C. In this temperature range the grafted amount of bromine practically does not change and is equal to 17–18 mass.% for SAC and 18–20 mass.% for SCN. Also the bromination kinetic parameters for the studied temperature range were calculated.

Keywords: activated carbon, gas-phase bromination, surface modification.