



The effect of temperature and impregnation ratio on the active carbon porosity

Naima Bouchemal, Meriem Belhachemi, Zoulikha Merzougui, Fatima Addoun*

Laboratory of Physico-Chemical Study of Materials and Application to the Environment, Faculty of Chemistry, USTHB, B.P. 32, El Alia, 16111 Bab-Ezzouar, Algiers, Algeria

Tel. +213 21 24 73 11; Fax +213 21 24 73 11; email: adfatdz@yahoo.fr

Received 30 July 2008; Accepted in revised form 25 August 2009

ABSTRACT

Three active carbons were prepared starting from Algerian date pits by chemical activation with the H_3PO_4 , $ZnCl_2$ and by the method combined in the presence of $ZnCl_2/CO_2$. A systematic study of certain parameters (temperature of activation and impregnation ratio) was undertaken. The active carbons obtained were followed by the evaluation of the yield and the physisorption of nitrogen at 77 K. It was shown that the preparation of activated carbon by H_3PO_4 and $ZnCl_2$ requires relatively moderate temperatures (500–600°C) while the combined method is rather favored at higher temperatures (800°C). The variation of the impregnation ratio revealed that the active carbons obtained have different porosities. Indeed, the prepared carbon by chemical activation with the phosphoric acid is made of mesoporous structure whereas the carbon prepared by $ZnCl_2$, shows a very high ratio of microporosity (90%). This difference in porosity is directly related to the proper activation mechanism of each chemical additive. The study of the evolution on a specific surface of the prepared carbons with various impregnation reports/ratios shows that an increase in the impregnation ratio, improves the specific surface when H_3PO_4 is used, contrary to the other agents where the surface reaches a certain value then decreases again. In general, a high rate of impregnation led in all cases to a more marked opening of porosity and particularly in presence of H_3PO_4 . This results in the development of a less specific surface, compared with the prepared carbons by $ZnCl_2$ and $ZnCl_2/CO_2$. The elaborate active carbons have very interesting textural characteristics and can have various applications.

Keywords: Activated carbon; Chemical activation; Specific surface; Pore volume

* Corresponding author.