Title: Calorimetric Study of functionalized carbonaceous materials

Author: Diana. P. Vargas L. Giraldo J.C. Moreno-Piraján

PII: S0040-6031(15)00173-2
DOI: http://dx.doi.org/doi:10.1016/j.tca.2015.04.029
Reference: TCA 77216

To appear in: *Thermochimica Acta*

Received date: 26-1-2015
Revised date: 25-4-2015
Accepted date: 27-4-2015

Please cite this article as: Diana.P.Vargas, L.Giraldo, J.C.Moreno-Piraján, Calorimetric Study of functionalized carbonaceous materials, Thermochimica Acta http://dx.doi.org/10.1016/j.tca.2015.04.029

Calorimetric Study of functionalized carbonaceous materials

Diana. P. Vargas[1], L. Giraldo[2], J.C. Moreno-Piraján[3*]

[1] Universidad del Tolima, Facultad de Ciencias, Departamento de Química, Barrio Santa Helena Parte Alta, Ibagué (Colombia).
[2] Universidad Nacional de Colombia, Facultad de Ciencias, Departamento de Química, Departamento de Química, Avenida Carrera 30 No. 45-03, Bogotá (Colombia).
[3] Universidad de los Andes, Facultad de Ciencias, Departamento de Química, Carrera 1 No. 18 A 10, Bogotá (Colombia).

[*] Corresponding author: Prof.Dr. J.C. Moreno-Piraján. Tel. +571 3394949 Ext 3465. E-mail address: jumoreno@uniandes.edu.co

Highlights

- The activated carbons were functionalized to increase the nitrogen.
- The content of the carboxylic groups promotes the modification of activated carbons with ammonia and ammonium hydroxide.
- The functionalization process that occurred in the carbon materials.
- The functionalization with ammonia modified the characteristics of the original samples in a smaller proportion.
- Was observed the utility of the calorimetric technique for the characterization of the carbonaceous materials.

ABSTRACT

For this paper we conducted a calorimetric study of functionalized carbonaceous materials. The activated carbons were obtained by chemically activating the African Palm Stone with a mix of 2% $CaCl_2$ solution and 32% H_3PO_4 solution. After the activation, the activated carbons were functionalized to increase the solids nitrogen content. In the study we determined the immersion enthalpies in benzene, water, NaOH, and HCl solutions. Additionally, the samples were characterized by N_2 adsorption at 77 K and Boehm titration. The calorimetric study showed that the immersion of different solids in respective solvents and solutions generated enthalpy values between -6.22 $J.g^{-1}$ and -173.2 $J.g^{-1}$. The immersion enthalpies of samples in the employed liquids varied with different functionalization processes to which the materials were subjected, showing changes in the carbons' textural and chemical characteristics. Surface areas and pore volumes decreased with the functionalization process because of the nitrogen surface groups' blocking the solids' porosity.

Keywords: Activated carbon, calorimetry, chemical surface, functionalization.

1. Introduction