



Production of low-cost adsorbents with tunable surface chemistry by conjunction of hydrothermal carbonization and activation processes

S. Román^{a,*}, J.M. Valente Nabais^b, B. Ledesma^c, J.F. González^a, C. Laginhas^b, M.M. Titirici^d

^a Departamento de Física Aplicada y, Universidad de Extremadura, Avda. Elvas s/n, CP: 06006, Spain

^b Departamento de Química e Centro de Química de Évora, Universidade de Évora, Rua Romão Ramalho, 7000 Évora, Portugal

^c Departamento de Ingeniería mecánica, Energética y de los Materiales, Universidad de Extremadura, Avda. Elvas s/n, CP: 06006, Spain

^d Colloid Chemistry Department, Max Planck Institute of Colloids and Interfaces, 14424 Potsdam, Germany

ARTICLE INFO

Article history:

Received 13 June 2012

Received in revised form 3 August 2012

Accepted 7 August 2012

Available online 16 August 2012

Keywords:

Hydrothermal carbonization

Biomass

Absorption

Surface chemistry

ABSTRACT

We report a new methodology to produce activated carbons from biomass-derived hydrothermal carbons using air and carbon dioxide. The activation step is crucial to develop porosity in the hydrothermal carbons. Additionally different surface functionalities are also introduced on the surface of the final materials. Our method based on initial hydrothermal carbonization of lignocellulosic biomass (walnut shell, sunflower stem and olive stone) represents a more energy-efficient tactic as compared with the traditional pyrolysis. The final yield is higher and the initial hydrothermal treatment allows a better control over the resulting porosity. The produced activated carbons show a higher porosity development when activated with carbon dioxide. The activation with air produced carbon materials with acidic surface chemistry.

© 2012 Elsevier Inc. All rights reserved.