One-step Preparation of Alkaline Lignin-based Activated Carbons with Different Activating Agents for Electric Double Layer Capacitor

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doi: 10.20964/2017.08.01

Received: 3 May 2017 / Accepted: 29 May 2017 / Published: 12 July 2017

Different structured activated carbons (ACs) were made from lignin (alkaline) by one-step activation. Using ZnCl_2 , KOH and K_2CO_3 as activating agents and the effect of activating agents on the electrochemical properties of the ACs for electric double layer capacitor (EDLC). The ACs prepared by the three kinds of activating agents are mainly microporous, while the ZnCl_2 -activated and KOH-activated ACs contain mesoporous through the nitrogen adsorption-desorption test. All the ACs used as electrode for EDLC showed excellent cyclability. The small amount of CO_2 produced by K_2CO_3 decomposition involved in the activation reaction and a series of reactions between carbon of lignin and K_2CO_3 , giving a AC with the maximum specific surface area of $1585 \text{ m}^2 \text{ g}^{-1}$, and the best specific capacitance (C_s) performance of 263.46 F g^{-1} at the current density 40 mA g^{-1} , using a two-electrode system. The results indicate that the K_2CO_3 as activating agent to prepared lignin-based AC applied in EDLC is appropriate.

Keywords: Activated carbon; Activating agent; Lignin; EDLC; Specific capacitance.

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