Short Communication

Preparation and Electrochemical Performance of Coconut Shell Activated Carbon Produced by the H₃PO₄ Activation with Rapid Cooling Method

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Activated carbon (AC) was prepared by the H₃PO₄ activation of coconut shells. After activation, AC was immediately treated by rapid cooling with liquid nitrogen to prevent the pore occlusion typically observed during natural cooling thereby prevent pore sizes and pore volumes from decreasing. When compared with slow cooling, rapid cooling increased pore sizes from 2.540 nm to 2.936 nm and increased the specific surface area from 578.224 m²/g to 1176.344 m²/g. Furthermore, rapid cooling method reduced the number of carboxyl and lactone groups and increased the number of hydroxyl groups. In electrochemical testing, carbon electrodes prepared from the AC showed excellent double-layer capacitance performance, with a substantial increase in specific capacitance from 66.06 F/g to 101.68 F/g and lower impedance.

Keywords: activated carbon; rapid cooling; pore sizes; specific surface area; specific capacitance

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