Biomass-Based Porous Carbon Electrode for Supercapacitor

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Biomass-derived porous carbon materials have attracted researchers' attention due to their availability and plentiful. Acacia auriculiformis is a biomass distributed throughout the world and in some areas classified as an invasive plant. Acacia auriculiformis was reported to be high in lignin content which resulted in high hydrochar yield. This study investigates the production of porous carbon materials for used in supercapacitor by hydrothermal carbonization process subsequence with activation and pyrolysis from Acacia auriculiformis bark. A comparative study of various activators, sodium hydroxide and zinc chloride, was carried out. The hydrochar-activator mass ratios of 1:1, 1:2, and 1:3 was examined. The prepared porous carbons exhibited different electrochemical performance. It was found that the specific electric capacitances of sodium hydroxide-activated carbons at hydrochar-activator mass ratios of 1:1, 1:2, and 1:3 were 94.2 F/g, 129.1 F/g, and 62.0 F/g respectively (at a current density of 0.25 A/g) and that of zinc chloride-activated carbons at similar hydrochar-activator mass ratios and the same current density were 226.2 F/g, 242.1 F/g, and 212.3 F/g respectively. The specific capacitance depends on many factors, namely the specific surface area, pore size, and the appropriate pore volume. The porous carbon with the highest specific capacity is the zinc chloride-activated carbon at the hydrochar-activator mass ratios of 1:2. The bark of Acacia auriculiformis has been successfully utilized to produce porous carbons for supercapacitor electrodes.