Preparation and Electrochemical Performance of Porous Carbon from Fujimoto bean

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In this paper, we report a method to prepare high-performance porous carbon from the high-yield Fujimoto bean by the process of chemical activation with KOH. The physicochemical properties of porous carbon were characterized by scanning electron microscopy, X-ray diffraction, nitrogen adsorption/desorption, Raman spectroscopy and X-ray photoelectron spectroscopy. The nitrogen adsorption/desorption test demonstrated that KOH has a good pore-making ability (maximum specific surface area of 1,159.95 m²·g⁻¹ and a total pore volume of 0.60 cm³·g⁻¹). The porous carbon exhibited excellent performance in symmetric double-layer capacitors, with a high specific capacitance of 219.8 $F \cdot g^{-1}$ at a current density of 2 A·g⁻¹. When the current density increased from 1 A·g⁻¹ to 10 A·g⁻¹, the capacitance retention rate reached 84.73%; favourable cycle stability with 96.3% was maintained after 5,000 cycles at a current density of 2 A·g⁻¹ in an aqueous electrolyte of 6 M KOH. At the same time, the material exhibited a higher energy density (32.292 W·h·kg⁻¹) and power density (500 W·kg⁻¹). This result suggests that the porous carbon material could serve as an ideal electrode for supercapacitors.

Keywords: Fujimoto bean; supercapacitors; electrode; electrochemical performance

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