Characterization of the Electrochemical Properties of Nitrogen-Doped Graphene

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In recent years, graphene has attracted extensive attention in many fields. A nitrogen-doped graphene sheet was synthesized using a solid microwave-mediated method. An experimental electrode was thereafter prepared using nitrogen-doped graphene sheets (NGS), and the physical and electrochemical properties of nitrogen-doped graphene sheets were studied. A three-electrode supercapacitor test system with the experimental electrode also serving as one of the electrodes was built to conduct constant current charge/discharge, cyclic voltammetry, life span, and impedance spectrum tests on the experimental electrode. After 5000 cycles of charging/discharging at a current density of 0.5 A/g, the specific capacitance of the experimental electrode was 208.17 F/g with corresponding capacitance retention of 98.56%; when the current density was increased to 5 A/g, the specific capacitance of the experimental electrode after 5000 cycles of charging/discharging dropped to 157.31 F/g, indicating capacitance retention of 75.57%. The effective series resistance was approximately 0.32 Ω . Owing to the stable properties and high relative spatial surface area of NGS, ions have a good contact rate and charge exchange capacity between the electrode and the electrolyte interface, thereby ensuring a stable supercapacitor capacitance.

Keywords: Graphene oxide; Nitrogen-doped graphene; Melamine; Microwave; Energy storage

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