

SUPERCAPACITORS BASED ON ACTIVATED SILICON CARBIDE-DERIVED CARBON MATERIALS AND DIFFERENT ELECTROLYTES

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Cyclic voltammetry, constant current charge/discharge, electrochemical impedance spectroscopy and constant power discharging methods have been applied to establish the electrochemical characteristics of supercapacitors consisting of micro/mesoporous carbon electrodes prepared from silicon carbide derived carbon (SiC-CDC) that have been additionally activated with carbon dioxide (CO_2) and different electrolytes. In the first case the electrolyte used was 1 M $(\text{C}_2\text{H}_5)_3\text{CH}_3\text{NBF}_4$ solution in acetonitrile [1] and in the second work 1-ethyl-3-methylimidazolium tetrafluoroborate (EMImBF₄) [2]. The electrochemical characteristics for supercapacitors (region of ideal polarizability, characteristic time constant, specific series and parallel capacitances) are significantly dependent on the CO_2 activation extent of the SiC-CDC materials. The electrochemical data indicated at least two-times increase in specific capacitance. From impedance spectroscopy the highest capacitance values of 130 F g^{-1} at 3.0 V [1] and 170 F g^{-1} at 3.6 V [2] respectively have been established. Most importantly, the activation of SiC-CDC with CO_2 significantly increases the performance (energy density, power density, etc.) of the supercapacitors especially at higher potential scan rates and at higher power loads. CO_2 activation is a fairly simple and inexpensive method, which significantly improves the electrochemical properties of carbon materials used as supercapacitor electrodes.

References

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