World Energy Strategies Congress and Exhibition (WESCE-2019)
August 26-28, 2019
Istanbul, Turkey

N-DOPED GRAPHENE BASED ELECTRODEs FOR SUPERCAPACITOR APPLICATIONS

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ABSTRACT

The rapidly growing and developing human population is gradually increasing the need for energy. This increasing demand to energy increased the interest of researchers in this subject in recent years. Energy storage technologies such as batteries and supercapacitors are taken a great part in these researcher interests. Conventional energy storage systems, such as lead acid batteries and lithium ion batteries, are often expensive to use in energy storage and cause some environmental damage. Electrochemical supercapacitors are also important energy storage devices due to their advantages such as low cost, easy preparation and high capacity. The use of carbon-based materials as electrode materials reduced the costs of the supercapacitors and made the system more environmentally friendly. Especially, graphene-based supercapacitors are taken great attention because of their advantages such as long cyclic life, stability and high capacity.

In this study, supercapacitor performances of N doped graphene based electrodes synthesized in nitric acid by cyclic voltammetric method were investigated. The electrodes consisting of different functional groups (-NO_2, N-C, C-C, C-O, C=O) were obtained with different scanned potential in the preparation process. Electrodes were electrochemically characterized by electrochemical impedance spectroscopy and cyclic voltammetry. The specific capacitances of the electrodes were determined by charge discharge tests and they were quite good compared to the literature. N-doped graphene based electrodes synthesized in different scanned potential ranges had significant differences in charge discharge capacities as a function of functional groups. After 1000 cycles, only 10% decrease in specific capacitance as compared to initial values.

Acknowledgments

This work was supported by YTU BAPK with the FDK-2019-3573

Keywords: Energy, electrochemical supercapacitor, graphene, energy storage systems