Preparation of Vapor Grown Carbon Fiber/2-((4-dimethylamino) phenyl) amino) naphthalene-1, 4-dione Composites and their supercapacitor properties

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doi: 10.20964/2021.07.51

Received: 11 February 2021 / Accepted: 9 April 2021 / Published: 31 May 2021

In this work, a derivative of 1,4-dihydroxynaphthalene, 2-((4-dimethylamino) phenyl) amino) naphthalene-1,4-dione (HBU) was synthesized by reacting 1,4-dihydroxynaphthalene with N, N-Dimethyl-p-phenylenediamine. The supercapacitive properties of the electrodes containing various weights percent of vapor grown carbon fiber (VGCF) and HBU were probed in terms of redox behavior, the effect of VGCF, and specific capacitance. The VGCF created an excellent electronic pathway in the electrode, boosting the redox transition reaction in HBU involving a total of three-electron ($3e^-$)-three-proton ($3H^+$) processes corresponding to 2,3-dihydro-1,4-naphthoquinone-1,4-dihydroxynaphthalene and the aliphatic amine in the backbone of the substituted derivative of aniline. This led to a higher specific capacitance of 98 F/g for the HBU-VGCF electrode with a higher weight percent of HBU. The

capacity retention of about 57% was observed for the HBU-VGCF electrodes after the 1000th cycle owing to the VGCF supporting the HBU by stabilizing its redox activity.

Keywords: vapor grown carbon fiber, 1, 4-dihydroxynaphthalene, electrode, supercapacitor

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