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GRAPHITE POWDER BASED LAYER FOR ACTIVATED CARBON SUPERCAPACITOR TO ENHANCE CONNECTIVITY BETWEEN ACTIVATED CARBON ELECTRODE AND CURRENT COLLECTOR

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One of the most widely used techniques for making a supercapacitor is the fabrication of electrodes with activated carbon. The interface between the electrode material and the current collector has a significant impact on its performance. In this work, we used the spray pyrolysis method to form a graphite layer on top of the current collector, and on top of it, an activated carbon layer was formed. We discovered that the existence of a layer made of graphite powder between the electrode material and the current collector could significantly improve the performance of the supercapacitor. The rectangular shape of the Cyclic Voltammetry (CV) exhibits ideal supercapacitor behaviour, but the loose contact between the current collector and the electrode material causes the rectangular shape of the CV to be distorted. The behaviour of a supercapacitor made of graphite slightly deviated from the optimum CV, proving the importance of the graphite layer for the connection of the activated carbon electrode. The supercapacitor with the best performance was obtained when the concentration of the binder in the graphite powder was 20% (w/w) and the suspension and heat-treated at 300°C for 20 min; the procedure showed a specific capacitance of 23.51 F g^{-1}. The cell with the same conditions except the graphite layer had a relatively low specific capacitance value of 19.76 F g^{-1}. Electrochemical Impedance Spectroscopy measurements show that the series resistance of the cell with a graphite layer is 0.720 $\wedge$, and the series resistance of the cell without a graphite layer is 0.774 $\wedge$. These results show the feasibility of employing graphite powder as a layer between an electrode and a current collector, increasing the specific capacitance and acting as an anti-corrosive material at the same time. As a result, it extends the supercapacitor's performance and durability.

Keywords: Activated carbon, Graphite, Supercapacitor