

Electrochemical Double Layer Capacitor based on Commercial Graphite and Gel Polymer Electrolyte

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Abstract

Today, technology has made our life styles luxurious and as a result, many appliances such as mobile phones, laptops and computers are in full use. They all need un-interrupted power that has created a high demand for energy storage devices. This has given a substantial attention on supercapacitors, which are known to be lying between batteries and conventional capacitors in terms of power and energy. Electrochemical double layer capacitor (EDLC) is one type of supercapacitor that uses carbon based electrodes. In the present study, an EDLC was fabricated with a gel polymer electrolyte (GPE) and commercial graphite electrodes. Its performance was evaluated using cyclic voltammetry techniques and electrochemical impedance spectroscopy. The potential window within which the cycling is done and the scan rate are affecting the single electrode specific capacitance. No redox reactions could be observed in cyclic voltammogrammes (CVs) implying the non-faradaic nature of capacitance. The characteristic rectangular shape of CVs for ideal EDLCs was also present in each case. EDLC has the ability to withstand continuous cycling process. Even though there were some ups and downs of specific capacitance, they were reversible maintaining more or less constant value. This in turn shows the self-healing property of GPEs. The average single electrode specific capacitance was about 1.8 Fg^{-1} . In the Nyquist plot, resistive and capacitive properties were present at high and low frequency regions. The spike corresponding to the capacitive features was tilted due to the problems in electrode surface.