Investigation of Self Discharge Mechanism of Locally Available Activated Carbon-Based Supercapacitor

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Carbon materials in their various forms are the most used electrode materials in the fabrication of supercapacitors. Activated carbon is derived from a variety of organic parent sources such as lignite, peat, coal, synthetic resins and biomass resources. Sri Lanka holds a global reputation for supplying high quality activated carbon derived from coconut shell with low levels of contaminants, which makes it ideal for incorporating in supercapacitors as the electrode material.

The capacitance of supercapacitors, fabricated from activated carbon and an aqueous electrolyte, arises from the charge stored in the electric double layer at the interface between the surface of porous carbon and the electrolyte. Hermann von Helmholtz first proposed the double layer theory for supercapacitors and Gouy, Chapman, Grahame, and Stern later developed it.

In electric double layer capacitors, self-discharge has been an inevitable issue which results in the decay of cell voltage and thus loss of stored energy. Further, fast self-discharge rates restrict practical applications of the supercapacitors. In this research, our major interest was to identify the self-discharge mechanism of the supercapacitor fabricated using locally developed activated carbon in a neutral aqueous electrolyte. The results indicate that self-discharge of the fabricated supercapacitor can be adequately modeled simulating to the diffusion based model.

Keywords: *Self-Discharge Mechanism, Activated Carbon, Supercapacitor, Electric Double layer*