Proceedings of the

YSCMR 2023

YOUNG SCIENTISTS' CONFERENCE ON MULTIDISCIPLINARY RESEARCH

VIRTUAL INTERNATIONAL CONFERENCE

ORGANIZED BY THE YOUNG SCIENTISTS' ASSOCIATION
NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES
SRI LANKA

YSCMR 2023

Proceedings of the

Young Scientists' Conference on Multidisciplinary Research - 2023

Virtual International Conference

09th November 2023

"Artificial Intelligence Empowering Research Across Disciplines"

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2023
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
09th November, 2023

Paper ID: CMT-114

Enhancing supercapacitor performance through multiple activation of coconut shell charcoal

A.D.T. Medagedara[1,2], M.I.U. Weerasinghe[1,2], I.G.K.D. Amarathunga[1], T.M.W.J. Bandara[2,3], G.R.A. Kumara[1*]

[1]*National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[3]*Department of Physics, University of Peradeniya, Peradeniya, Sri Lanka*

[*]*grakumara2000@yahoo.com*

Electrochemical double-layer supercapacitors (EDLC) are mostly based on activated carbon electrodes. The manufacturing process of activated carbon has a significant impact on the electrode's performance as well as the supercapacitor itself. In this work, we created a few supercapacitors out of activated carbon that was activated multiple times using the same activation process. The samples were labeled as AC1, AC2, AC3, AC4, AC5, and AC6, with each number indicating the number of activation processes performed on the samples. The electrode was created by filling a carbon fiber felt with a solution of activated carbon, polyvinylpyrrolidone (PVP), and isopropanol. The activated carbon was characterized using Raman spectroscopy, which revealed the highest I_D/I_G value of 0.96 for sample AC3. To assess the performance of the supercapacitor, various tests were conducted, including cyclic voltammetry (CV), galvanostatic charge discharge (GCD), and electrochemical impedance spectroscopy (EIS). The AC3 sample exhibited the highest specific capacitance of 17.3 F g^{-1}, while the lowest specific capacitance value of 7.79 F g^{-1} was observed in sample AC1. Additionally, the AC3 sample showed lower charge transport resistance (*R*ct) and series resistance (*R*s) values of 2.2 Ω and 0.6 Ω, respectively. These results indicate that activated carbon produced through a simple, chemical-free, and low-cost activation method can be effectively utilized as an electrode material for supercapacitors.

Keywords: *Activated carbon, supercapacitor*

Acknowledgement: *This work was supported by the National Institute of Fundamental Studies, Hanthana, Sri Lanka*