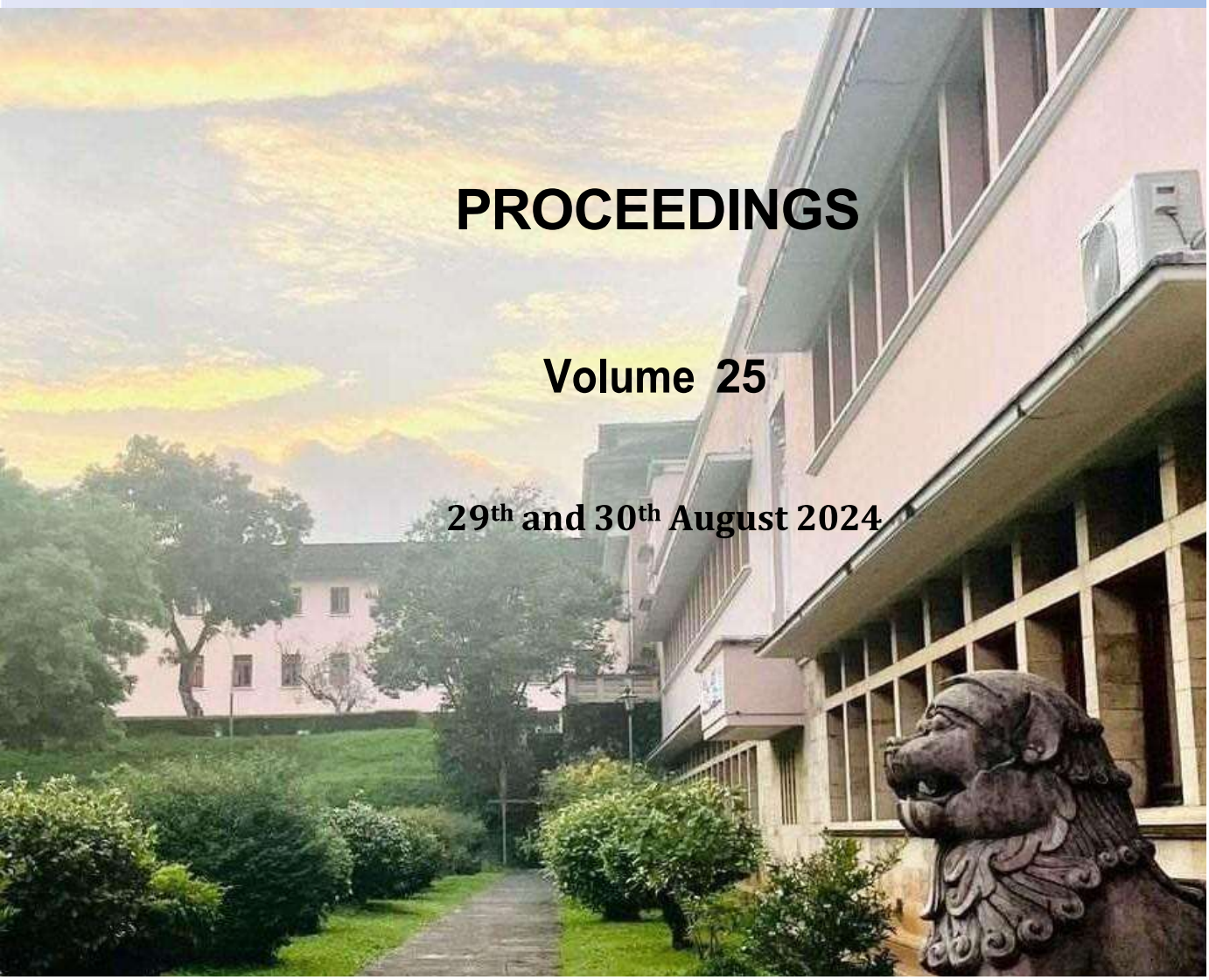
PERADENIYA UNIVERSITY INTERNATIONAL RESEARCH SYMPOSIUM AND EXPOSITION

"A Resilient and Sustainable Sri Lanka: Weaving Together Diverse Threads"



PROCEEDINGS

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Coconut Water Electrolyte for Biomass Derived Activated Carbon Supercapacitors

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A supercapacitor is an energy storage device that has a high power density and high charge and discharge rates. Compared to conventional capacitors, supercapacitors possess higher capacitance values. Electrolytes, electrode materials and separating membranes are the major components in a supercapacitor. As the ion conducting medium within the supercapacitor, electrolytes play a crucial role. The widely used aqueous type electrolytes like sulfuric acid (H_2SO_4) and potassium hydroxide (KOH) are expensive and detrimental. As an alternative for these electrolytes, in this work, the possibility of using cost effective, non-toxic coconut water was investigated for the first time. The process of fabricating the supercapacitor began with forming a thin film of activated carbon on a current collector plate using the spray pyrolysis method. The precursor material for the activated carbon was coconut shells. Polyvinylpyrrolidone (PVP) was employed as a binder at a concentration of 10% by mass relative to the mass of activated carbon. The solution was made with isopropanol, and spray pyrolysis was done at 150 °C. Thin film coated plates were heat treated for 20 minutes at 300 °C. To assemble the supercapacitor, filter paper was sandwiched between two activated carbon coated electrodes. Then the filter paper was wetted with coconut water, and the supercapacitor was connected to Autolab PGSTAT302N instrument to run the cyclic voltammetry (CV), galvanostatic charge discharge (GCD), and electrochemical impedance spectroscopy (EIS). It showed the electric double layer supercapacitor behavior and gave the specific capacitance values of 27.0 , 25.3 , 23.7 , 17.6 , 12.9 , 8.3 F g^{-1} for 5 , 10 , 20 , 50 , 100 , 200 m V s^{-1} scan rates, respectively. Series resistance of the cell was observed as 15.0 Ω. This result shows that coconut water can be successfully utilized as an efficient natural electrolyte for supercapacitors.

Keywords: Supercapacitor, Natural Electrolyte, Coconut Water, Activated Carbon