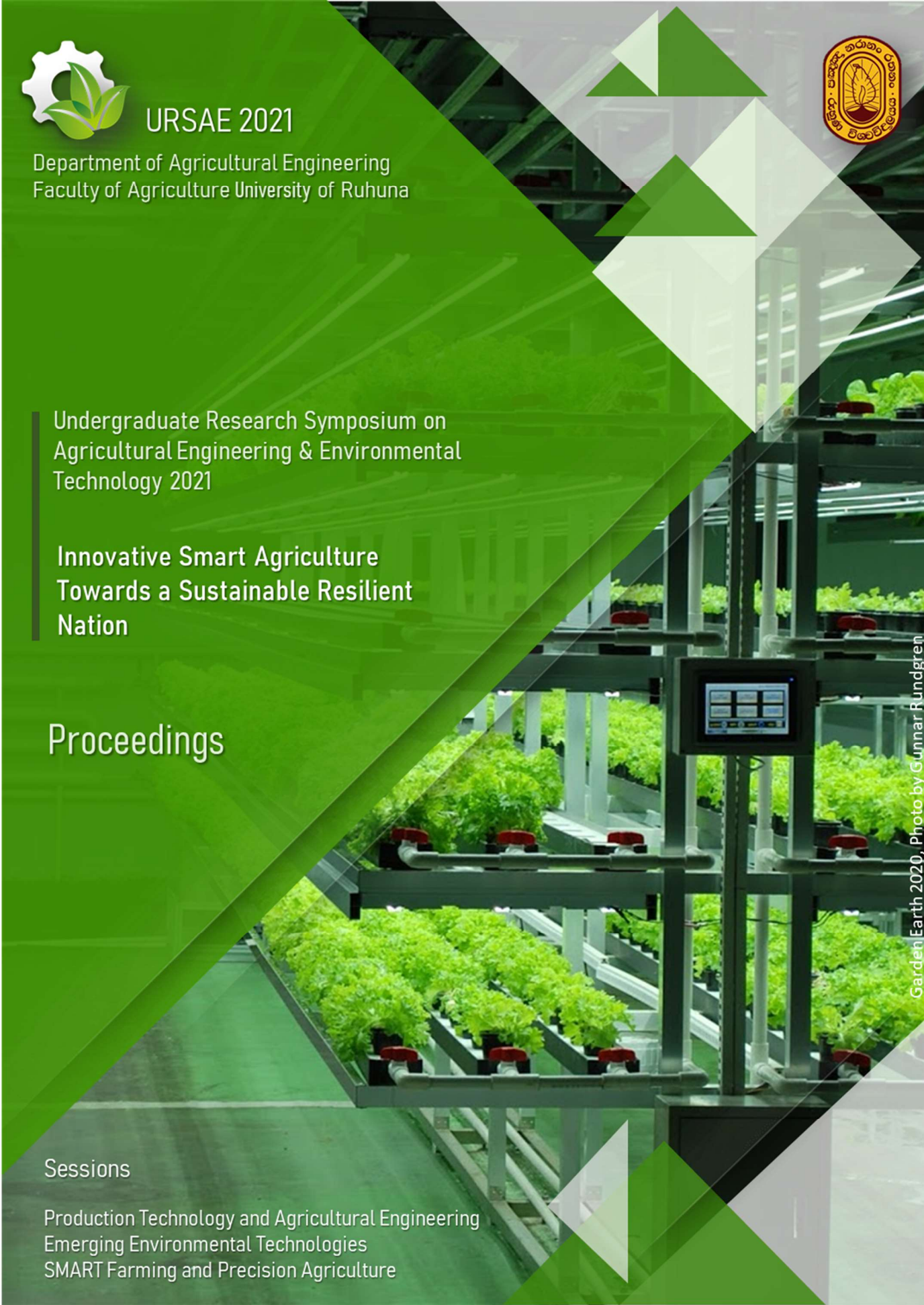
URSAE 2021

Department of Agricultural Engineering
Faculty of Agriculture University of Ruhuna

Undergraduate Research Symposium on Agricultural Engineering & Environmental Technology 2021

Innovative Smart Agriculture Towards a Sustainable Resilient Nation

Proceedings



GardenEarth 2020, Photo by Gunnar Rundgren

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Use of Thiocyanate Based Ionic Liquid Electrolyte in Supercapacitors

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Abstract

The present energetic and environmental crisis has inspired the idea of designing energy storage devices such as supercapacitors using natural resources and the investigation to find its ability to perform under various conditions with various substitutes. Earlier, Organic solvents were the typical commercially-used electrolytes in supercapacitors, but they had some fundamental drawbacks. The usage of ionic liquid electrolytes opens up many advantages over the usage of traditional organic and aqueous electrolytes. This research presents the results on the fabrication and characterization of a supercapacitor using activated carbon, which is fabricated with coconut shells as the activate material and Triethylamine hydrothiocyanate (THT) ionic liquid ($C_7H_{16}NS$) as the electrolyte. In this experiment, both electrodes were constructed using the spray pyrolysis method. Furthermore, the performances of the supercapacitor were optimized with the sintering temperature of electrodes and the amount of binder (Polyvinylpyrrolidone-PVP) in electrodes. The electrodes were characterized with CV measurements, SEM images, P-XRD patterns, and Raman spectrometer. Finally, THT-based ionic liquid electrolyte in Supercapacitor was compared with existing literature. As per the optimization, the best binder percentage was recorded as 5% from the mass of activated material, and the best sintering temperature was recorded as 200 °C with a hold-time of 30 minutes. The cell exhibited a specific capacitance of 34.89 F g^{-1} measured from two-electrode cyclic voltammetry experiments at a scan rate of 0.020 Vs^{-1}. The enhanced performance with the demonstration of comparatively high-specific capacitance with THT ionic liquid electrolyte is suitable for high-temperature applications.

Keywords: Activated carbon, Electrolyte, Ionic liquids, Supercapacitor