

**PREPARATION OF ACTIVATED CARBON DERIVED
FROM CARROT PEEL FOR SUPERCAPACITOR
APPLICATIONS**

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This Final Year Project Report entitled “Preparation of Activated Carbon Derived from Carrot Peel for Supercapacitor Applications” was submitted by Nurul Husni Shawani binti Shahrolnizam in partial fulfilment of the requirement for the Degree of Bachelor of Sciences (Hons.) Physics, in the Faculty of Applied Sciences and was approved by:

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ABSTRACT

CARROT PEEL DERIVED ACTIVATED CARBON FOR SUPERCAPACITOR APPLICATION

Supercapacitor is an energy storage that stores electrical energy through electrostatic charge. It consists of two electrodes in contact with electrolyte solutions. Due to the environmental pollution, there was an investigation of using biomass waste as a possible resource for the preparation of the activated carbon. This research objectives are to prepare a high surface area activated carbon from carrot peel for supercapacitor applications and to study the energy density and specific capacitance of supercapacitor derived from carrot peel. In this research, carrot peels undergo systematic process including pre-treatment, carbonization, activation and post-treatment that then followed with electrode fabrication and performance evaluation. The activated was distributed into three samples that undergo carbonization process for 300°C in different period (AC-2 for 2 hours, AC-3 for 3 hours and AC-4 for 4 hours). This process used KOH as activating agent. The synthesized activated carbon demonstrates a carbon yield of 33.33% for AC-2, 30.07% for AC-3 and 28.82% for AC-4 indicating the efficiency process with an ash content of 0.32% that reflects the inorganic residue. Electrochemical analysis revealed that AC-2, AC-3 and AC-4 achieved capacitances of 8.2 F, 30.0 F and 31.0 F respectively. The value of specific capacitances that AC-2 reached was 546.7 F, 1892.74 F for AC-3 and 2080.54 F for AC-4. Energy densities were gained at 3.04 Wh/kg for AC-2, 10.54 Wh/kg for AC-3 and 11.56 Wh/kg for AC-4. Sample AC-4 shows the best results because it reached the highest energy density and specific capacitance. Overall, this research has validated the potential of carrot peel derived activated carbon as an achievable and sustainable electrode material for advanced energy storage applications.

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