

FABRICATION OF A SUPERCAPACITOR USING PLASTIC WASTE

A Mini Project Report

**In Partial Fulfilment of the Requirement for Award of Degree of
Bachelor of Technology of the 2nd Year in Chemical
Engineering**

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CERTIFICATE

Certified that the Major Project Report entitled "Fabrication Of A Supercapacitor Using Plastic Waste" submitted by Rishika Rani of B.Tech. 4th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

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ABSTRACT

The increasing collection of plastic trash and the developing world demand for renewable energy storage materials are daunting environmental and technology challenges. A new and environment-friendly solution in this study considers a new mechanism to tackle these two challenges in one by depositing high-performing supercapacitor electrode materials from post-consumer waste plastic. Thermally decomposed waste plastics like polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET) were thermally decomposed by pyrolysis and chemically activated potassium hydroxide (KOH) to yield porous carbon materials. Characterization of these materials was performed using analytical techniques like SEM, XRD, FTIR, and BET surface area analysis to ascertain their microstructure, surface area, and presence of functional groups. Electrochemical properties were tested via cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), and electrochemical impedance spectroscopy (EIS). Waste-derived carbon electrodes revealed high specific capacitance, great cycle stability, and low inner resistance, and performance indicators equal to commercial products. The current research proves an affordable, mass-producible method for the upcycling of plastic waste to value-added energy storage materials. It aids in circular economy practice development by converting environmental pollutants into energy devices with functions. The research provides evidence to support the coupling of waste valorization and green energy technologies for a sustainable future.