

**PEMANFAATAN KARBON AKTIF DARI LIMBAH KULIT BUAH NIPAH  
(*Nypa fruticans*) DENGAN AKTIVATOR KOH SEBAGAI BAHAN  
ELEKTRODA SUPERKAPASITOR**

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## ABSTRACT

### UTILIZATION OF ACTIVATED CARBON DERIVED FROM *Nypa fruticans* FRUIT HUSK WASTE USING KOH ACTIVATION AS ELECTRODE MATERIAL FOR SUPERCAPACITORS

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Activated carbon derived from nipah fruit peel (*Nypa fruticans*) has been utilized as electrode material for supercapacitors. The synthesis process begins with a dehydration method using 1 M  $\text{H}_2\text{SO}_4$  solution, followed by a chemical activation process using KOH as an activator with a carbon and activator mass ratio of 1:2, with carbonization at  $400^\circ\text{C}$  for 2 hours. The activated carbon obtained was characterized using Scanning Electron Microscopy - Energy Dispersive X-Ray (SEM-EDX), Fourier Transform Infrared Spectroscopy (FTIR), Surface Area Analyzer (SAA) method (Brunauer Emmet Teller)-(Barret Joyner Halenda) BET-BJH, and measurement of electrochemical properties using Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS). SEM-EDX characterization results show that activated carbon with KOH activator is more porous and has a deep round hole with a carbon percentage of 68.26%. Characterization results show that activation with KOH can increase the specific surface area of activated carbon from  $0.551478 \text{ m}^2/\text{g}$  to  $16.8144 \text{ m}^2/\text{g}$ , pore volume from  $0.00136 \text{ cm}^3/\text{g}$  to  $0.02939 \text{ cm}^3/\text{g}$ , and produce a uniform mesoporous structure. FTIR spectra showed the presence of functional groups such as C=C, C-O, and C-C that support the electrochemical properties of activated carbon. CV test results showed a higher specific capacitance value for the KOH-activated electrode of  $37.85 \text{ F/g}$ . EIS analysis shows that activated carbon with KOH activator has a lower internal resistance value and better ion diffusion than without KOH activator. The utilization of activated carbon from nipah fruit peel activated using KOH shows high potential as an environmentally friendly and sustainable supercapacitor electrode material.

**Keywords:** Activated Carbon, Nipah Fruit Peel, Activation, Dehydration, Supercapacitor, Electrode