The Synthesis of Bridging Carbon Particles with Carbon Nanotubes from *Areca catechu* Husk Waste as Supercapacitor Electrodes

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This study examines the synthesis of carbon particles with nanotubes as electrodes for supercapacitors. The electrodes were made from areca catechu husk without the addition of adhesive materials. There was a multi-activation process including chemical and physical activation using KOH activator and CO₂. Physical activation time is the main factor for consideration in this discussion. The addition of activation time has an effect on the physical and electrochemical properties of supercapacitor electrodes. Carbon hollow fiber is clearly visible on the surface of the electrode with varying sizes of outer and inner diameters in the nanometer range. The results show there was an incredible performance by ACF-2.5 sample activated for 2.5 hours. ACF-2.5 sample delivered optimum capacitive properties of 165 F g⁻¹ with a maximum surface area of 757.449 m² g⁻¹. Thermogravimetric analysis and the degree of crystallinity were also carried out to strengthen the electrode analysis of supercapacitors.

Keyword: carbon fiber; areca catechu husk; supercapacitor

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