# PENGEMBANGAN MATERIAL GRAPHENE NANOSHEET UNTUK APLIKASI SUPERKAPASITOR

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ABSTRACT

Batteries and supercapacitors are the current leading energy storage system technology. Placed on the electrochemical transition. Batteries store electrical energy in compositions that are capable of producing a charge, whereas supercapacitors store electrical energy directly as a charge. Supercapacitors have several advantages in the process of storing energy compared to conventional capacitors, in the discussion are the longer life time, the working principle and the simple model, the charging time is short and safe to use (Kötz *et al*, 2000). Supercapacitor performance is very dependent on the nature of the electrode material used. Of the various types of carbon materials, graphene shows high surface area, exceptional electrical conductivity, excellent life cycle and good electrochemical stability, making the material promising to be used as a supercapacitor electrode (Hao *et al.*, 2015).

This research aims to develop nanosheet-shaped graphene material for supercapacitor electrode applications. As a source of carbon used pineapple fruit crown which is an abundant agricultural waste. In principle, the pineapple fruit crown waste is heated at 1800 ? in an inert atmosphere, where carbonization will occur forming a graphite-like structure. Then it is converted to graphene oxide using the modified Hummers method followed by thermal reduction at 900 ? for 5 minutes to obtain the final graphene nanosheet

Graphite oxide preparation using the modified Hummers method with graphite precursors and 4 grams of NaNO3 reagent as catalyst, 80 ml of 98% H2SO4 and 8 grams of KMnO4 as an oxidizer reacted at temperatures below 20 ° C for 2 hours then increased to 35 ° C to 24 hours . Graphite oxide obtained from the Hummers method was varied by ultrasonication for 2 hours, 4 hours and 6 hours to exfoliate graphite oxide to produce graphene oxide (GO). The next process is reduction using Zn metal in an acidic atmosphere (addition of HCl) to reduce oxygen-containing functional groups. The result of reduction with Zn is hydrothermally reduced at 200 ° C and the variation in time is 6 hours, 9 hours and 12 hours to produce better graphene. Ultrasonication and hydrothermal time variations affecting graphene characteristics include d-spacing, crystallite size, number of layers of graphene, capacitance, and conductivity. The best variations were on ultrasonication time of 4 hours and hydrothermal time of 12 hours with d-spacing characteristics of 3.67 Å, ??crystallite size of 1.49 nm, number of graphene layers of 4.06, capacitance of 191.18 F / g, and conductivity of 29.2072 S / m.

Kata Kunci: *Graphene, superkapasitor, grafit oksida, graphene nanosheet*