GREENCAP: Development of Carbon Materials Based on Green Algae Biomass and Activated Carbon as Supercapacitor Electrodes for Sustainable Energy Applications

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ABSTRACT

Indonesia currently has a large population, accompanied by rapid economic growth. This has an impact on the increasing demand for energy, especially electricity. Technology plays an important role in supporting human life, especially in electrical energy storage. Supercapacitors are one of the promising solutions because they have advantages in high cycle endurance, fast charging time, and stable performance. In this study, we developed carbon materials based on green algae biomass and activated carbon as supercapacitor electrodes. Green algae biomass and activated carbon are used as supercapacitor electrodes because activated carbon is a porous carbon material that has porosity and large area so that it can be applied as a supercapacitor material. Porous carbon is made through the preparation of green algae raw materials, activation process with KOH, making electrodes, arranging supercapacitor components. The purpose of this research is to find out how to synthesize biomass from green algae and test the effectiveness of green algae into activated carbon as a supercapacitor electrode filler. This research is a quantitative research through experimental. This research uses 3 samples. The results show that the best performance is shown by sample 2 which has the highest DC voltage (3.4 V), medium DC current (50 A), and the highest AC voltage (85 V). Sample 3 had the highest DC current (80 A) which showed the best conductivity among all the samples. Sample 1 had the lowest performance in all aspects, with the lowest DC voltage (2.3 V), lowest DC current (35 A), and lowest power (80.5 W). This indicates that the electrodes in this sample have a larger internal resistance or smaller active surface area, making them less efficient in conducting electrical charges.

Keywords: *Supercapacitor, Green algae, Activated carbon, Sustainable energy, Synthesis*