Abstract

Energy availability is a challenge faced by the world in the 21st century. This is due to the increasing population and industry. The use of clean renewable energy (CRE) can reduce pollution and greenhouse gas emissions into the atmosphere. Solar panels provide a sustainable solution to address the global energy crisis and meet the growing demand for energy. This research aims to explore the potential utilization of sugarcane extract as a base material for Carbon Nanodots (C-dots) in DSSC applications to convert sunlight into electricity. This approach supports efforts to create clean, sustainable energy sources, and is able to reduce carbon emissions. The research process involves the manufacture of C-dots and DSSC with components such as FTO glass, TiO_2 semiconductor, and variations in synthesis parameters, namely time and temperature. Sugarcane extract was processed through the pyrolysis method, with variations in heating time of 30, 45, and 60 minutes, and temperature variations of 200°C, 215°C, and 225°C with the best heating time as the control variable. In C-dots, UV-Vis spectrophotometer testing is required to identify the best light absorption ability of sugarcane extract-based C-dots. The spectrofluorometer test is needed to show the effect of temperature on the intensity of C-dots photoluminescence which indicates that C-dots are successfully synthesized. TiO2 paste will be calcined at 500°C, and all DSSC components will be put together, the DSSC will be tested using a sun simulator, the test results show that the sample with 225°C temperature gives the best performance with an efficiency of 12.53%. These findings reveal the potential of sugarcane as a base material for renewable and sustainable energy technologies, which can contribute to the reduction of carbon emissions. This research is expected to be the foundation for further development of efficient and environmentally friendly organic material-based DSSCs.

Keywords : Solar Cell, DSSC, C-dots, Synthesis, Pyrolysis, Sun Simulator