Dye Sensitized Solar Cells: New Structures and Components for Greater Efficiency

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Although fossil fuels have the capacity to power the Earth for decades, solar energy is an essential, environmentally friendly form of renewable energy that can supplement fossil fuel energy. The Dye-Sensitized Solar Cell (DSSC) is a form of renewable energy that relies on excitation of dye electrons to produce electricity; it is structurally versatile, uses a variety of components, and can be integrated into everyday products. The purpose of this project is to analyze various structural and performance aspects of DSSCs. During the study, DSSCs were tested for photo-electric conversion efficiency and practicality in common items. In the experimentation, four different structures of DSSCs were created: Structure “A” was a rigid DSSC with conductive glass electrodes and platinum catalyst, Structure “B” was a rigid DSSC with conductive glass electrodes and carbon nanotube catalyst, Structure “C” was a flexible DSSC with plastic electrodes, and Structure “D” was a fiber DSSC with carbon nanotube yarns. Analysis of the four structures showed that Structure A had significantly greater efficiency with upper standards of 7%. Furthermore, it was concluded that while Structure C had potential applications in certain plastics, Structure D had the greatest real world applications due to potential integration into various textiles. This project proved that DSSCs are the future of solar technology due to relatively high photo-electric conversion efficiency and potential, everyday applications. DSSCs are a new technology with a bright future in the energy industry; given 10-20 years they can make a difference in the economy, environment, and everyday life.

Awards Won:
Fourth Award of $500