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DESIGN AND SYNTHESIS OF BISMUTH SULFIDE AND EXPLORING ITS APPLICATION AS A PHOTO ELECTRODEMATERIAL IN THIRD GENERATION SOLAR CELLS

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Solar energy has become one of the major sources of renewable energy and is a viable economic option in areas which receive a large amount of sunlight around the year, such as the state of Kansas. However, it currently relies on ultra-pure silicon ingots to produce commercial silicon photovoltaics, which prevents the cost of electricity being produced to compete with nonrenewable energy production. A viable low cost alternative for silicon based cells would be dyesensitized solar cells (DSSC), which are easier and cheaper to manufacture as they do not require expensive and delicate raw materials to make, while they could be made semi-flexible which allows for a greater variety of applications for these cells. A DSSC consists three components, a photoelectrode, an electrolyte and a counter-electrode. When exposed to incident light, the photoelectrode releases an electron which is transported to the external load, leaving the photoelectrode in an oxidized state. The electrons are collected by the counter electrode and used to reduce the electrolyte. This charged electrolyte then reduces the positively charged photoelectrode, allowing the process to begin again. To improve the efficiency of this process, we explore the use of Bismuth Sulfide and Titanium Oxide composite as photo-electrode material by testing it in varying ratios and studying their impact on the efficiency of DSSC.

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