



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Aniruddh Mandalapu	Project Number J0212
Project Title Dye-Sensitized Solar Cells: Lighting the Path to Our Future	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Dye sensitized solar cells are solar cells made of a nanocrystalline titanium dioxide layer that is soaked in dye and sandwiched by two conductive pieces of glass. The goal of this project was to find out what fruit or vegetable dye allowed a dye sensitized solar cell to operate the most efficiently. I hypothesized that cranberry dye would work the best. In addition to this, I also wanted to learn about some of the advantages of this new, interesting solar cell.</p> <p>Methods/Materials Multiple solar cells were built using simple lab materials and multiple fruit and vegetable dyes. The materials I used were raspberries, a pomegranate, blueberries, blackberries, beets, and cranberries, nanocrystalline TiO₂ powder, dilute acetic acid, iodide solution, ethanol, deionized water, a mortar and pestle, a dropper, conductive glass, a multimeter, alligator clips, wires, a pencil, transparent tape, a heat source, a watch, water, binder clips, a strong light source, gloves, a paper towel, goggles, a plastic stirring rod, and a strainer. After I constructed the cell out of these materials, I measured the voltage and ampere output of each cell while I left each one under a flashlight for 1 minute.</p> <p>Results The trials using red bell pepper dye generated the most voltage and amperes, with 0.44 volts and 0.003 milliamps. It beat raspberry, pomegranate, blueberry, blackberry, beets, and cranberry. Pomagranate finished second overall with 0.25 volts, and 0.001 mA. The results did not support my hypothesis. Cranberry did not generate significant amounts of electricity. It generated 0.14 volts of output, and too small a current to measure.</p> <p>Conclusions/Discussion I believed raspberry dye would be the most successful due to its anthocyanin rich juice (I believed it would absorb the most sunlight). However, there are other factors that play into the dye's success such as viscosity of a dye, and how well the dye can stick to the titanium dioxide coating. Further research into this project may include testing different mediators rather than just iodide solution. This project can significantly affect the solar cell industry. Some of its advantages include flexibility and eco-friendliness. If these cells can be improved a bit more in energy efficiency, it can take over the oil and gasoline industry in the energy business.</p>	
Summary Statement This project tests the effectiveness of different fruit and vegetable dyes on a dye-sensitized solar cell.	
Help Received My mother supervised the project as I performed my experiment.	