# CALIFORNIA STATE SCIENCE FAIR
## 2010 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**J1038**

**Project Title**
# The Effect of Various Plant Dyes on the Efficiency of a Dye Sensitized Solar Cell and Comparison to a Silicon Solar Cell

**Abstract**

**Objectives/Goals**
The purpose of this work was to produce several dye sensitized solar cells and to measure their output power density as a function of the incident irradiance. Comparison was made to a conventional photovoltaic cell. The main objective was to determine which type of dye would produce the cell with the highest output power density.

**Methods/Materials**
To produce the dye sensitized solar cells for this work, plant dye was extracted from beets, red cabbage, blueberries, pomegranates, and blackberries. Nanocrystalline films, measuring 2 x 2 cm, were prepared for each cell, on electrically conducting glass slides. These films were dyed and the cells assembled. A test stand with a 100 Watt lamp was used to insure that each cell would be tested under identical conditions. Measurements of the open circuit voltage and short circuit current were made for each cell as a function of the incident irradiance.

**Results**
All of the dye sensitized solar cells constructed for this project produced open circuit voltages in the millivolt range and short circuit currents in the microamp range. The highest output came from the beet cell, followed by blueberry, pomegranate, blackberry, and red cabbage. All of the dye sensitized solar cells had power densities far below the silicon photovoltaic cell.

**Conclusions/Discussion**
Although all of the dye sensitized solar cells made for this project did produce voltages in the millivolt range, as expected, the current readings were lower than expected. For a dye sensitized solar cell of this size made with fruit dye, current readings in the few milliamp range have been reported. One possible way to improve the performance of the cells would be to change the procedure used in preparing the TiO2 suspension. While hand grinding was used for this project, a better method might be to use a magnetic stirring device or a sonicator.

**Summary Statement**
I wanted to find out which type of plant dye would produce the best dye sensitized solar cell.

**Help Received**
I borrowed some equipment from Dr. Pei-Chun Ho at Fresno State. I performed the work at home.