CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

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Project Number

S1913

Project Title

Solar Cells: Berries vs. Leaves

Abstract

Objectives/Goals

The objective of the project is to determine if dye-sensitized solar cells that implement berry pigments absorb more solar energy than dye-sensitized solar cells that implement leaf pigments.

Methods/Materials

Eight dye-sensitized solar cells were made, two implementing raspberry pigments, two implementing blueberry pigments, two implementing blackberries, and two solar cells implementing lemon leaf pigments.The solar dye-sensitized solar cells were put under fluorescent lights for ten minutes allowing solar absorption for three trials. The solar cells were tested for voltage by using a multimeter. The amount of voltage obtained by the berry solar cells were compared to the amount of voltage obtained by the leaf solar cells.

Results

The berry solar cells obtained a higher individual and average amount of obtained voltage than the leaf solar cells. The average amount of voltage obtained by all the dye-sensitized solar cells that implemented berry pigments was 0.401 volts while the dye-sensitized solar cells that implemented berry pigments obtained an average of 0.258 volts.

Conclusions/Discussion

The berry pigments performed better in the solar cells for different reasons. For instance, the berry dye containing anthocyanins reacted well with electrolyte injection and titanium dioxide. Furthermore, the leaf pigments, specifically chlorophyll, die off quickly, need to be produced often in a plant, and are designed to have less absorption ability due to the fact that they cover the majority of the surface area of most plants. In addition, the pigment structures of anthocyanins, the berry pigments, absorb more photons and the blue-green and green light of the spectrum. This means the pigments reflect the red end of the spectrum, resulting in a higher intensity of absorption. The data shows that dye-sensitized solar cells that implement berry pigments absorb more solar energy than dye-sensitized solar cells that implement leaf pigments.

Summary Statement

Dye-sensitized solar cells implementing berry pigments and leaf pigments were made and tested under fluorescent lights, resulting in the conclusion that the berry solar cells obtained more solar energy than those that used leaf pigments.

Help Received

My aunt helped me obtain nanocrystalline titanium-dioxide and laboratory materials; Mother and Aunt supervised me; Father bought berries.