The Use of an Inkjet Printer to Dispense Chlorophyll Photosynthetic Dye onto the Cell Substrate to Aid the Creation of the Cell

Feldbush, Sydney (School: West Shore Junior/Senior High School)

Chlorophyll is a photosynthetic pigment found in plants that can be extracted from the use in a natural Dye-Sensitized solar cell. To construct the cell first the pigment must be extracted using harsh organic solvents and a process called column chromatography, where the solvents are used to dissolve and separate the chlorophyll form the beta carotene pigments, both found in spinach. Conductive glass is used to construct the cell, one side being coated in a crystalline Titanium -Dioxide layer to hold the pigment and the other coated with graphite to act as the anode where the electrons will flow. A printer is used to thinly apply the dye onto the TiO2 layer, and the two slides are placed together with iodine in between to act as an electrolyte supplying electrons. The microamps output of the cell was measured every 30 seconds over a 15 minute duration. This allowed the cells decomposition rate to be shown as well as the consistency of its energy output. Cells with printed Chlorophyll dye were compared to cells with the dye soaked into the TiO2 This project found that the use of a printer created a more efficient cell, likely since the application caused less disruption to the TiO2 layer then soaking the layer in dye. The research goal of creating a cell with an efficiency of .5 microamps per square centimeter was able to be reached.

Awards Won: