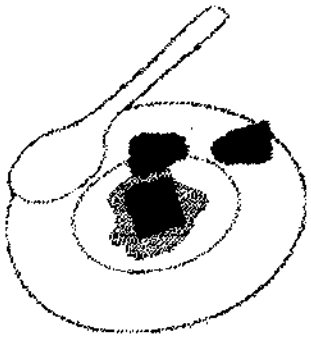
Sol Ideas Technology Development

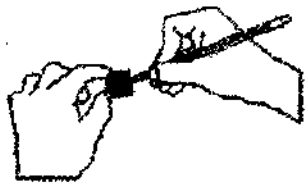
How to Build Your Own Solar Cell
English Version

"Cycles of energy and materials have existed on the Earth for billions of years. In a few hundred years, we have come to dominate and control many of these cycles. Our search for artificial photosynthesis is, therefore, not merely to present ourselves with alternatives for powering our society, but it is a search for our place in the Earth's biosphere."

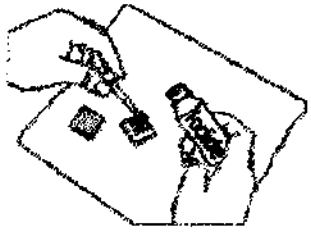
-Dr. Greg Smestad (Inventor of the kit)



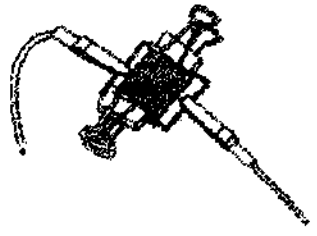
Step 1 - Stain the Titanium Dioxide with the Natural Dye: Stain the white side of a titanium dioxide (TiO_2) coated glass plate. This glass has been previously coated with a transparent conductive layer (SnO_2), as well as a porous TiO_2 film. Crush fresh (or frozen) blackberries, raspberries, pomegranate seeds, or red Hibiscus tea in a tablespoon of water. Soak the film for 5 minutes in this liquid to stain the film to a deep red-purple color. If both sides of the film are not uniformly stained, then put it back in the juice for 5 more minutes. Wash the film in ethanol and gently blot it dry with a tissue.



Step 2 - Coat the Counter Electrode: The solar cell needs both a positive and a negative plate to function. The positive electrode is called the counter electrode and is created from a "conductive" SnO_2coated glass plate. A Volt - Ohm meter can be used to check which side of the glass is conductive. When scratched with a finger nail, it is the rough side. The "non-conductive" side is marked with a "+." Use a pencil lead to apply a thin graphite (catalytic carbon) layer to the conductive side of plate's surface.

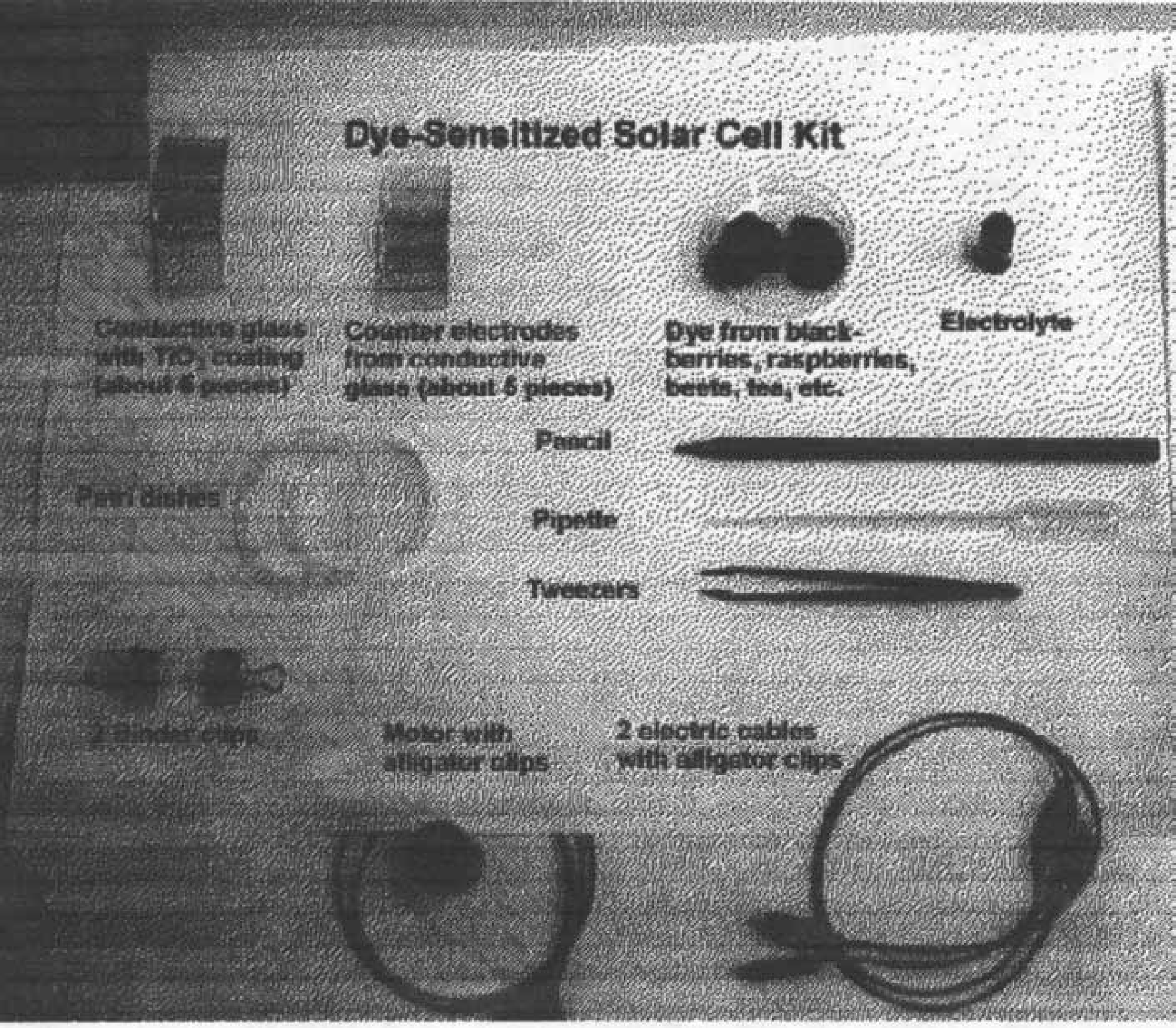


Steps 3 & 4 - Add the Electrolyte and Assemble the Finished Solar Cell: The Iodide solution serves as the electrolyte in the solar cell to complete the circuit and regenerate the dye. Place the stained plate on the table so that the film side is up and place one or two drops of the iodide/iodine electrolyte solution on the stained portion of the film. Then place the counter electrode on top of the stained film so that the conductive side of the counter electrode is on top of the film. Offset the glass plates so that the edges of each plate are exposed. These will serve as the contact points for the negative and positive electrodes so that you can extract electricity and test your cell.



Use the two clips to hold the two electrodes together at the corner of the plates.

The output is approximately 0.43 V and 1 mA/cm^2 when the cell is illuminated in full sun through the TiO_2 side.


Dye-Sensitized Solar Cell Kit
Conductive glass with TiO2 coating (about 6 pieces)
Counter electrodes from conductive glass (about 5 pieces)
Dye from black-berries, raspberries, beets, tea, etc.
Electrolyte
Pencil
Petri dishes
Pipette
Tweezers
2 binder clips
Motor with alligator clips
2 electric cables with alligator clips

Motor, Petri dish, Tweezers, Pipette, Alligator Clips and Wires ordered separately.

How to Order the Commercial Solar Cell Kit

Commercial Solar Cell Kit Components

Lab set-up for the Procedure

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Brombær-solcelle

Af Kåre Albrechtsen, OVE og Skolernes EnergiForum

Energien fra solens lys kan bruges til at lave strøm. De industrielt fremstillede solceller er i dag stadig så dyre, at de har svært ved at slå igennem i elproduktionen. Der forskes i forskellige teknikker til fremstilling af solceller.

Her er et eksempel på en solcellemodel, man selv kan lave. Modellen er til undervisningsformål, da den ikke er stabil i UV-lys og derfor kun holder ca. 15 minutter i almindeligt sollys. Fysiklærere m.fl. vil måske have de nødvendige dele til bær-solcellen, ellers kan de bestilles via internetadressen nederst.

Specielle materialer

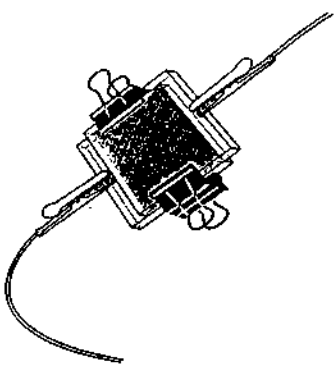
- To tin-dioxid-coatede glasplader (f.eks. 2,5 x 2,5 cm)
- 6 gram TiO_2 (titanium-dioxid)
- Friske brombær (brombær skulle være bedst)
- Iodid-opløsning

Fremgangsmåde

- Opløs TiO_2 i vand og smør en dråbe på den ene glasplade
- Pladen lufttørres, og bages derefter ved 450°C i 30 min.
- De friske brombær knuses og smøres på det hvide TiO_2-lag, hvorefter pladen skal lufttørre i 15 min.
- Brombærerne skylles af med vand og pladen lægges til tørre
- På det andet stykke glas påføres grafit med en blyant
- Glaspladerne lægges med grafit- og brombær-siderne mod hinanden.
- Mens pladerne holdes tæt sammen tilsættes en iodid-opløsning, der trænger ind vha. kapillærkræfter
- Nu kan der måles på solcellen

Fotosyntese

Solcellen virker ved at udnytte fotosyntesen. Solens lys rammer elektroner i brombærsaften, der frigøres og løber via titanium-dioxidlaget til den ene glasplade. Elektronerne fra brombærsaften bliver erstattet af elektroner fra iodid-opløsningen og henter nye elektroner fra grafitsiden. Derved løber der strøm mellem de to glasplader.



Læs mere eller køb

Bær-solcellen er opfundet af "Swiss Federal Institute of Technology" i Lausanne, Schweiz. En grundig vejledning på flere sprog kan findes på http://www.solideas.com/solrcell/cell-kit.html. Sættet kan bestilles via: http://ice.chem.wisc.edu/ice/order.html (pris 54 $ + 10$ i eksp.).

Læs også under Solceller på www.dr.dk/videnom/arkiv.htm.