

Experimental Materials

Materials are enough for 20 solar cells (People/students can work in groups of 2-3)

1) 40 Plates of Conductive Tin Oxide Coated Glass (ITO or FTO: ITO is Indium-Tin Oxide and FTO is Fluorinated Tin Oxide). The difference between ITO and FTO is that FTO has a slightly smoky-blue appearance where as ITO is completely clear and gives better transmission of light. Thus ITO is more expensive and is usually used by researchers but either can be used in this activity.

Vendor: Hartford Glass Co. Inc, Hartford, NJ;

Contact: Mike Ready @ 765-348-1282, Product: 1", TEC 8, 2.3 mm thick, seamed edges, FTO/ITO coated, 8 ohms/sq.inch

2) 12 g nanocrystalline Colloidal TiO₂

- Vendor: Sigma Aldrich, Product: TiO₂ (IV) Oxide nanopowder < 100nm, 634662, CAS No; 13463-67-7, available in 25g (\$46.00) and 100g (\$148.00) (available as of 03/2011).
- Vendor: Degussa, Inc. Product: P25 TiO₂, only available in bulk, 22lbs (\$363.22). California contact: Dorsett and Jackson @ 415-626-9241

3) 2 mL Triton X-100, Laboratory grade

- Vendor: Sigma Aldrich, available in various sizes; 5ml (\$9.67), 100ml (\$29.60)

4) 200 mL Aqueous Acetic Acid Solution (pH 3-4 in deionized water)

5) Mortar & Pestle

6) 2 Dropper Bottles for TiO₂

Procedure for making TiO₂ solution:

Suspension made with 12 g of TiO₂ will make about 50-75 solar cells.

The TiO₂ solution is prepared by incremental addition of acetic acid to the TiO₂ powder in a mortar while grinding with a pestle. Each 1 ml addition of the dilute acidic solution proceeds only after the previous mixing and grinding has produced a lump free paste. Add a drop of Triton X (surfactant similar to detergent) once the TiO₂ mixture is ready. Then pipette TiO₂ from the mortar into the drop bottles. Do not grind or swirl after the surfactant is added.

7) 200 mL Iodide Solution (0.5M KI & 0.05M I₂ in ethylene glycol)

8) 2 Dropper Bottles for Iodide Solution

- 9) 10 Petri Dishes with Lids
- 10) 25 Pasteur Pipettes/glass rods
- 11) Multimeter
- 12) 2 Alligator Clips
- 13) 40 Binder Clips
- 14) Frozen Raspberries/Blackberries (allow to thaw in refrigerator overnight)
- 15) Cheese cloth (for squeezing raspberry juice)

Ethanol (Isopropanol or Rubbing Alcohol may be substituted)

Distilled or Deionized Water

Scotch Tape

Absorbent Tissue or Cotton Swabs

Hot Plate

Light Source: Sunlight/Overhead Projector/Goose neck lamp