

To investigate the power efficiency of Grätzel solar cells prepared from various organic dyes

Introduction

Various organic dyes can be used to power a Grätzel solar cell. However, it would be interesting to determine which organic dye is the most power efficient. This can be established by calculating the power efficiency of each of the Grätzel cells using the following equation,

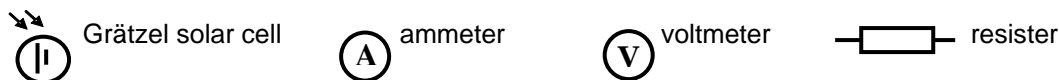
$$\text{Power Efficiency \%} = \left(\frac{\text{Power output (watts)}}{\text{Power input (watts)}} \right) \times 100\%$$

The power input will depend on the light bulb employed. The power output can be calculated from voltage and current measurements of each of the Grätzel solar cells.

$$\text{Power output} = \text{voltage} \times \text{current}$$

In this experiment you will determine the most power efficient dye for Grätzel solar cells.

Circuit Symbols:

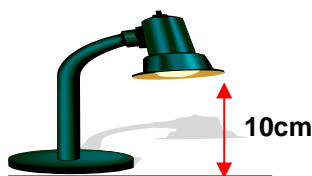


Materials needed: Grätzel solar cells prepared from various organic dyes, Ammeter, Voltmeter, Resistor, Crocodile Clips, Ruler, Desk Lamp (100 watt bulb)

Experimental:

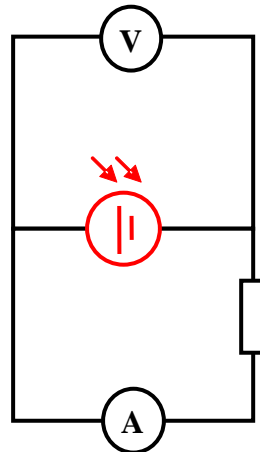
1. Setting up the light source (desk lamp)

- Point the head of the desk lamp onto the bench.
- Using a ruler, measure the distance between the head and the bench top.
- Adjust the head so that there is a 10cm gap.



2. Making voltage and current measurements

a. Connect one Grätzel solar cell in series with a ammeter and a resistor. Then connect a voltmeter in parallel to the circuit.



c. Carefully place the Grätzel solar cell under the light source (100watts) and measure the voltage and current output. Note down the measurements in the table below.
d. Repeat for the other Grätzel solar cell prepared from different organic dyes.

Results

1. Table of results

Organic Dye	Voltage / volts V	Current / amps μA	Power / Watts μW

2. Calculate the power for each of the different Grätzel solar cells tested.
3. You can now calculate the power efficiencies for each of the Grätzel solar cells.

Organic Dye	Power Efficiency / %

4. Which organic dye is the most efficient?

5. Why do you think this is?.....