Mod 3 Day 4: Solar Cell Assembly

11/21/2013

- **LAB QUIZ**
- **Solar Cell assembly**
- **Jackie! Theory & Demo.**

Aneesh Ramaswamy, T/R

Announcements

- **Next week: Thanksgiving Break!**
  - We have lecture on Tuesday, 11/26
  - No lab next week (Shannon will have open lab time 1-3pm on Tuesday for revision help)
- **After Thanksgiving…things move fast**
  - M3D5: Quiz, testing your solar cells
  - M3D6: Mod 3 Report due (12/5 or 12/6, 5pm) **remember this is short and done with your partner*
  - 12/10 or 12/11 – Research Proposal Presentations
- **Research Proposal** – check the Wiki for added information/FAQ

Solar cell preparation

- Phage-nanomaterial complexes ground up and combined with TiO_2 paste
- You will prepare **anode**
- Base: glass coated with FTO and then TiO_2 – conductive and transparent
- YOUR PART: PASTE ONTO BASE
- High-temperature setting process, then dye addition

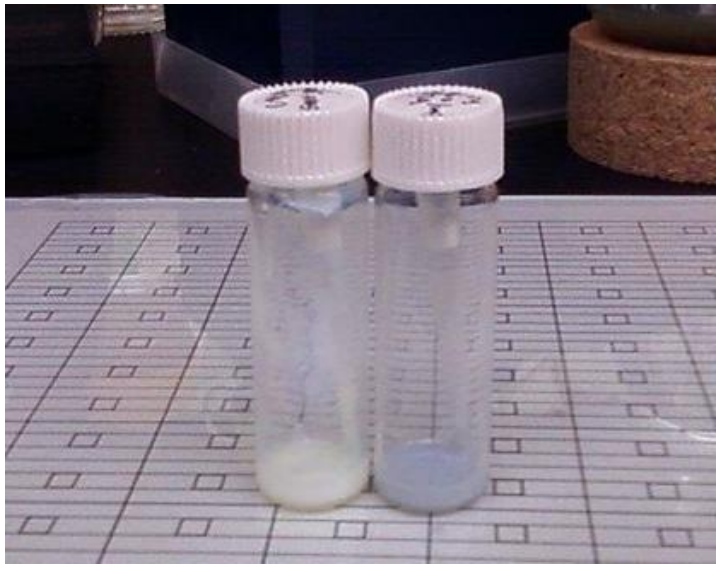


Image from wiki

M3D4 : Solar cell assembly

What are we doing today?

- DSSC background (Jackie)
  - Main components of a DSSC
  - How a DSSC works: where do the e- go?
  - Kinetics in a DSSC: what allows –e to move in the direction we want?
- Overview of fabrication process (Jackie)
- Doctor blading demo (Griffin)
- Build solar cells in Belcher lab

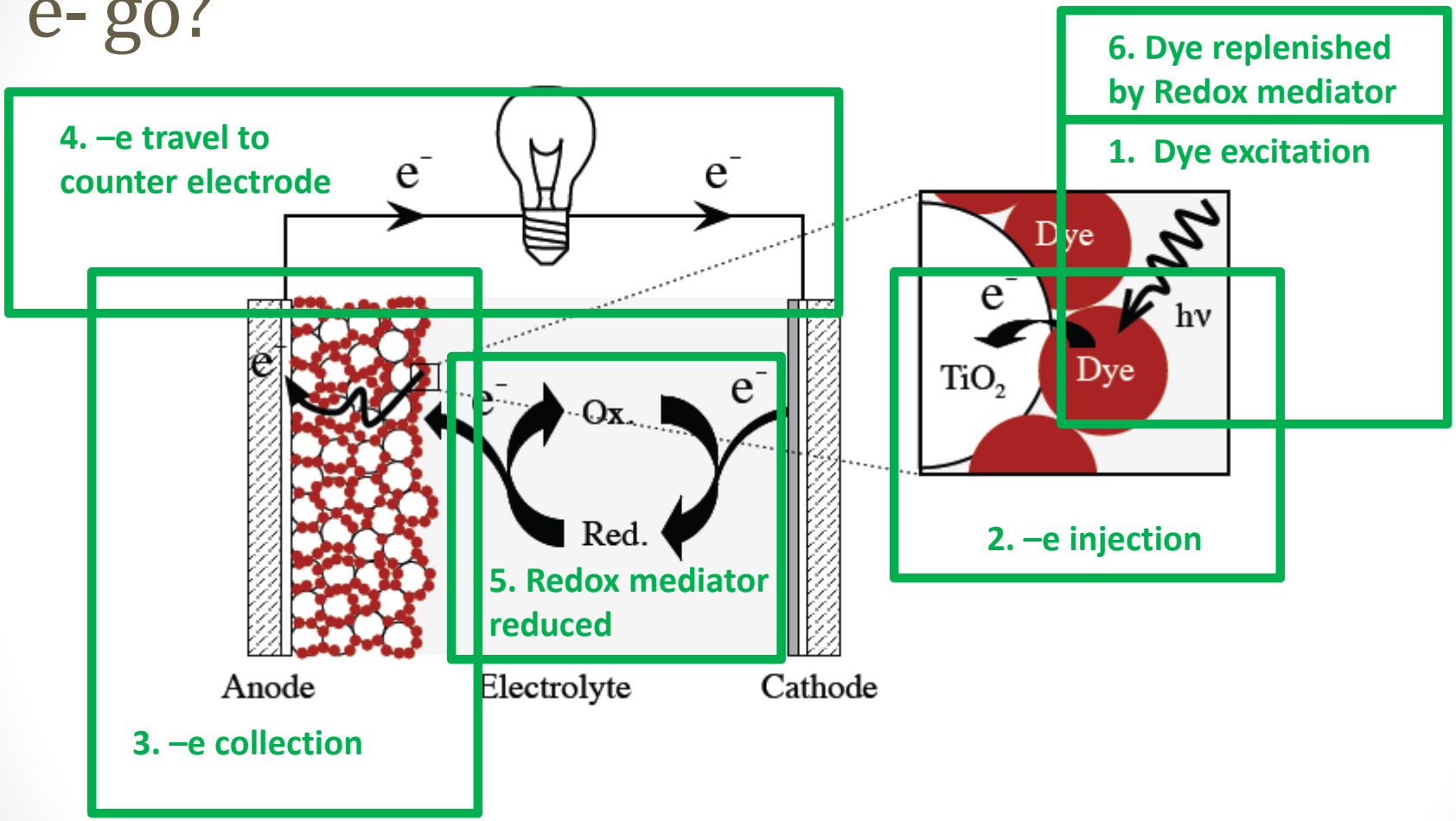
DSSC components

Our DSSC's

- **Semi –conductor:** TiO2

  Sensitizer (dye): N719 dye
- **Electrolyte and redox mediator:** I_3- / I-
- **Counter electrode:** Platinum
- **Mechanical support:** FTO glass with TCO (transparent conducting oxide) film

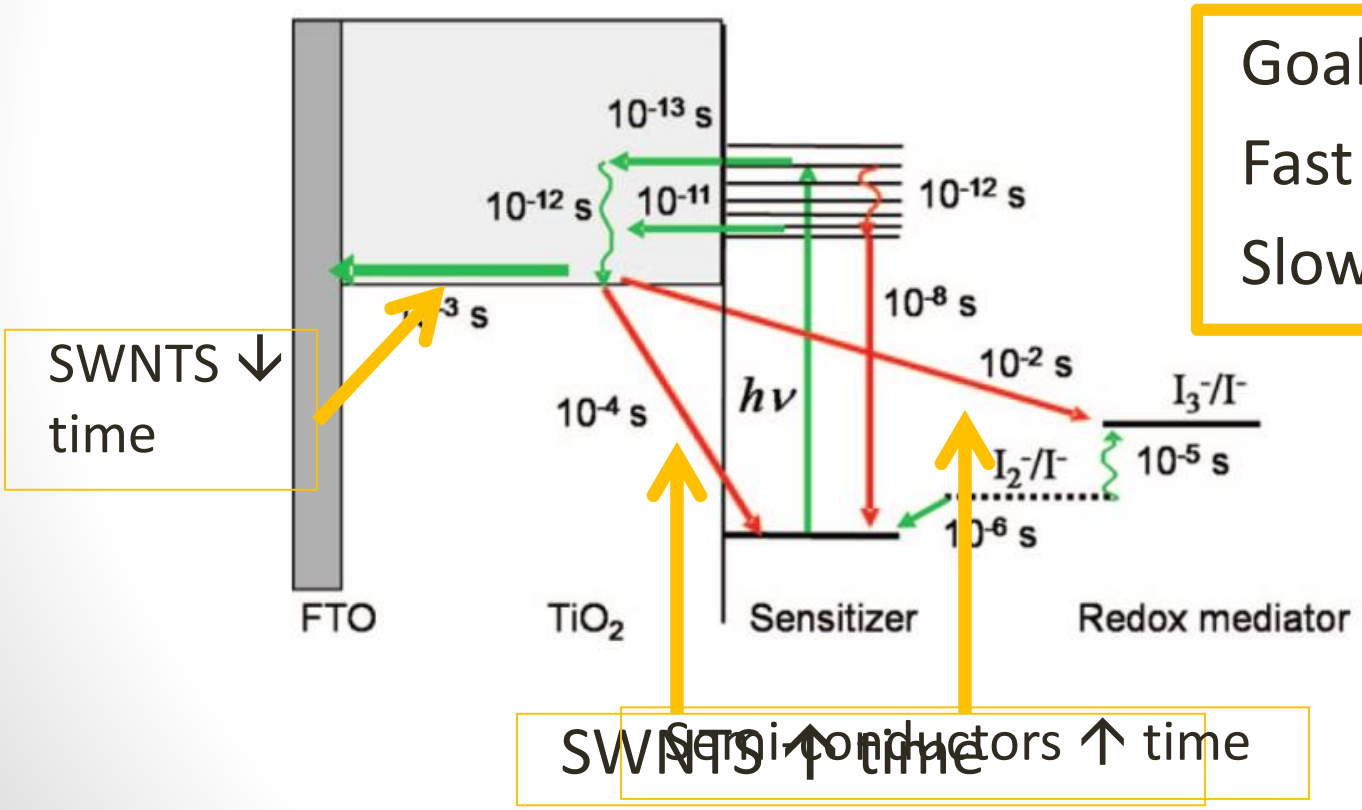
How a DSSC works: where do the e- go?



http://www.solaronix.com

Kinetics in a DSSC: what allows –e to move in the direction we want?

Directional electron flow occurs due to kinetics of electron injection and recombination events:



Goal:

Fast green steps

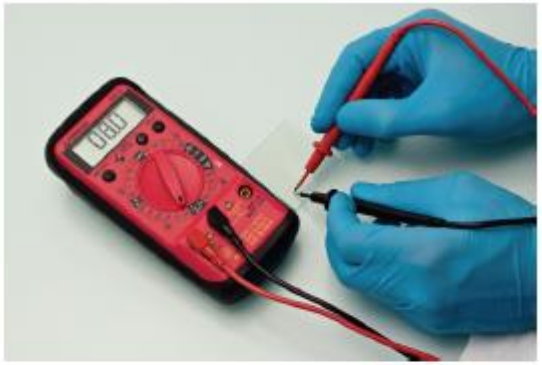
Slow red steps

SWNTS ↓ time

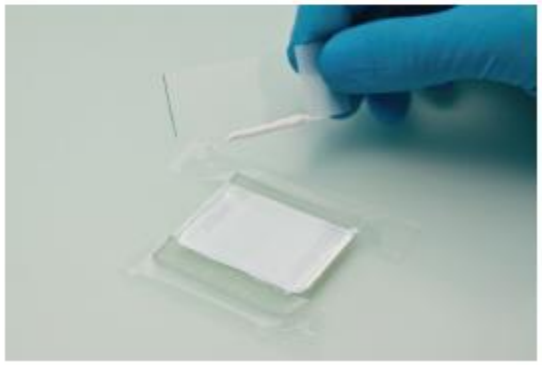
SWNTS ↑ time

Semiconductors ↑ time

PUTTING THE SOLAR CELL TOGETHER

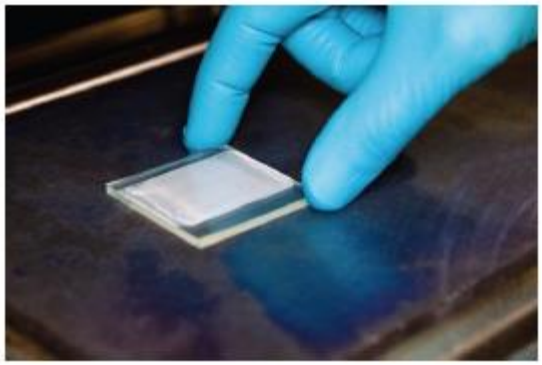


Identifying the conductive side of the TCO (transparent conductive oxide)



"Doctor-blading" the titania (TiO_2) paste

http://www.solaronix.com

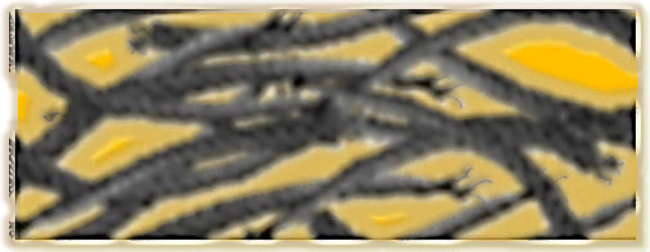


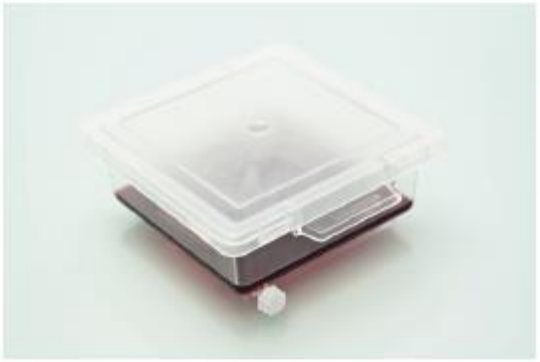
Sintering the film (heating)

http://www.solaronix.com

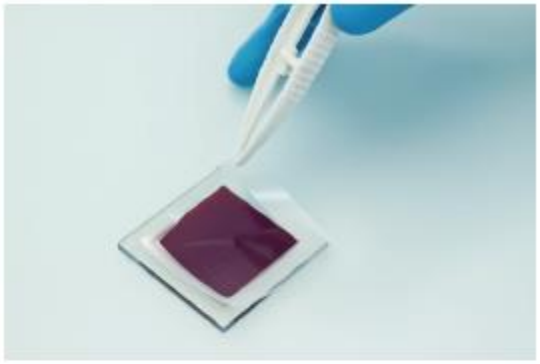
(1) Burn off polymer binder in paste to create pores for the dye. (Must be in air)

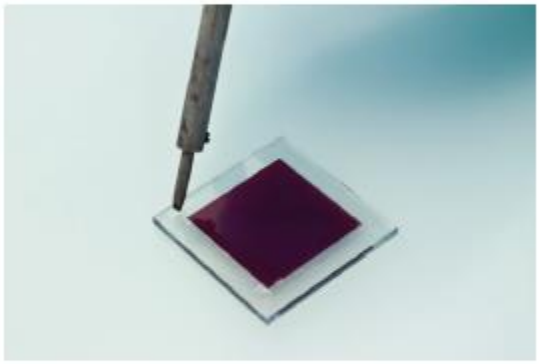
(2) Sinter nano-particles . Must be in argon, here particles are connected in a conducting network

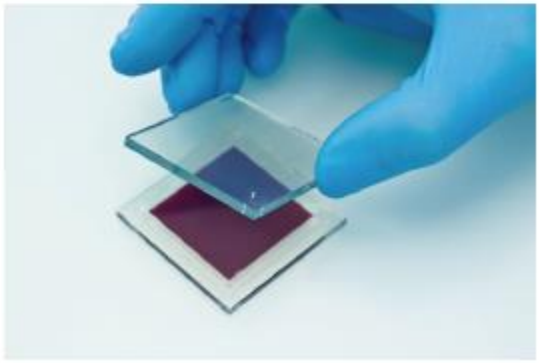




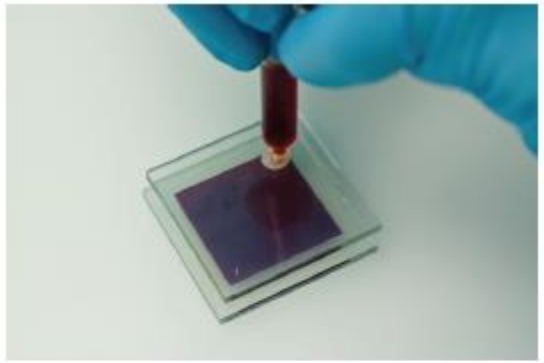
Dyeing the film http://www.solaronix.com

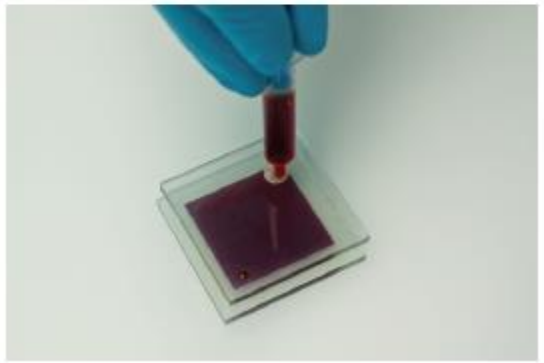




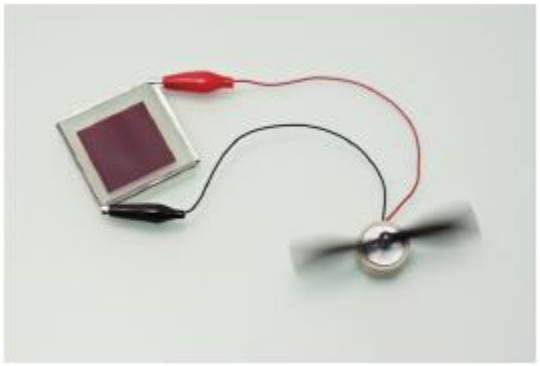


Assembling the device with another electrode





Filling the electrolyte



Testing the device

Cross-Group Meetings:

These teams go to Belcher lab first:

John Calderon		Carol Davis
Elana Ben-Akiva		Derek Jang
Christian Hyacinthe		Hannah Kempton
Maria Joh		Prithwis Mukhopadhyay
Meryem Ok		
Denis Bozic		Laura Dunphy
Sneha Lingam		Ana Burogs
Sophia Li		Austin Gromatzky
Jamin Liu		Julie Ramseier

These teams go to Belcher lab second: