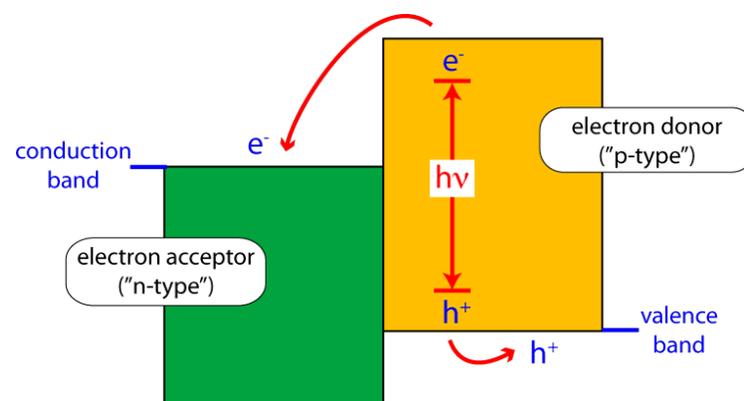
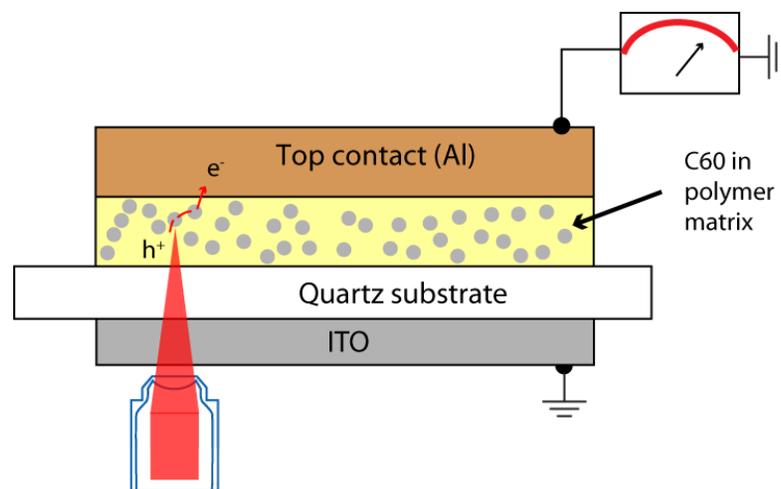


Progress Example 2: What limits efficiency of low cost solar cells? (B. Alphenaar)

In a recent article in *Nature Nanotechnology* (2009), Alphenaar made a fundamental discovery that can be explored further for improving efficiency of low-cost solar cells such dye solar cells and organic photovoltaics



Progress Example 3: Batch Biodiesel pilot plant (E. Berson)

- Sodexo is providing spent cooking oil from campus restaurants.
- Batch system (50 gal), fuel meets ASTM standards.
- The fuel will be used in the campus shuttle bus in ~10% blend.
- Future research is to convert glycerol in to other products



Progress Example 4: Small automated plants for distributed Biofuel production (*P. Ratnasamy*)

(Partners: Benefuel; Unitel; and Sudchemie)

- Pilot plant with 30-50 Gals/day fuel output (continuous)
- Liquid/gas feed
- Product can be gas or Liquid
- Co-op student training



Going forward

- Materials manufacturing
- Solar
- Biofuels
- Renewable energy storage
- Smart buildings
- Education

Key strategy in each theme:

- Build/foster partnerships among all KY institutions
- Establish corporate partnerships

CONN CENTER'S TRANSLATIONAL R&D

MATERIALS MANUFACTURING

ALTERNATE FUELS

RENEWABLE ENERGY STORAGE

Solar Energy Conversion

Scale-up facilities for
nanomaterials, porous
materials & thin films
for catalysts, batteries,
capacitors, & solar cells

- Continuous/batch
biodiesel
production
- Algal bioreactors
- Tobacco plant
expressions
- CO₂ to methanol

Li Ion battery
manufacturing
facilities
(18650 & Pouch)

Flexible roll to roll
manufacturing
processes for
flexible and thin
film solar cells

Materials
characterization

Fuels & Oils
characterization

Battery testing
(NBMRDC)

Solar cell testing

Cost effective & scalable
manufacturing of new
materials

Hybrid & Electric Vehicles
Off-grid use – renewables
Electrochemical Co₂
reduction

Low cost and scalable
production of solar cells
Solar fuels (Hydrogen &
Hydrocarbons)

Materials Manufacturing

Scale-up of manufacturing new materials to quantities suitable for full scale testing of renewable energy conversion and storage devices

Example:

Develop new cost-effective, scalable processes for certain new materials (eg. metallic SWNTs)

“Preferential growth of single-walled carbon nanotubes with metallic conductivity”, **G. U. Sumanasekera et al, SCIENCE, 326, p116-120 (2009)**

- Fundamentally a transformative discovery on synthesis method for single walled, metallic carbon nanotubes.
- Need to scale up manufacturing to kilogram scale
- Need to demonstrate its use as low cost, transparent & conducting substrates for solar cells.

SOLAR ENERGY

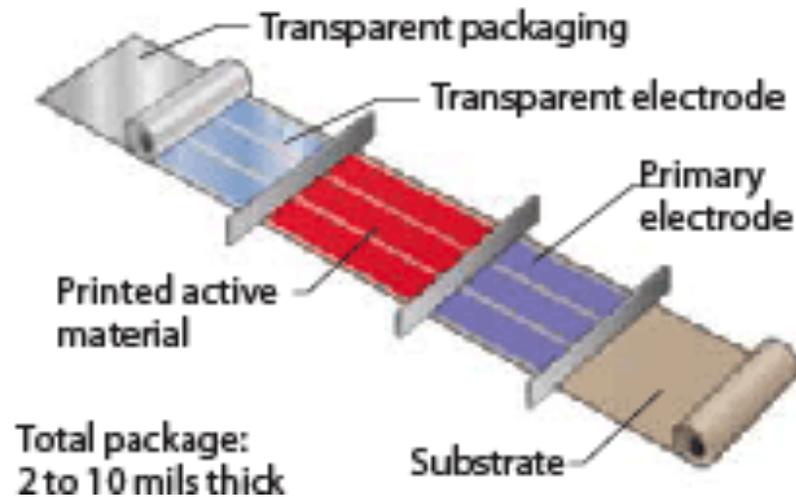
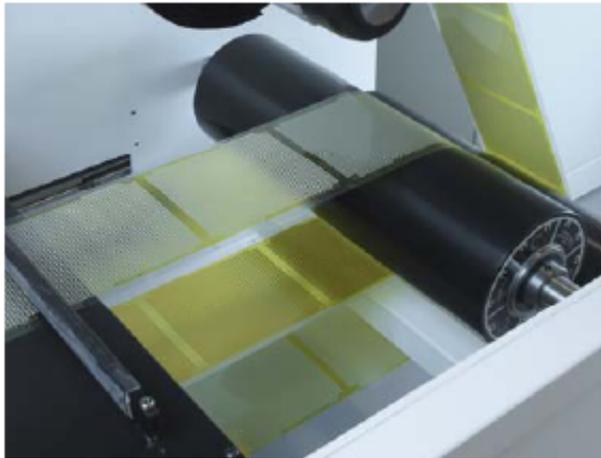
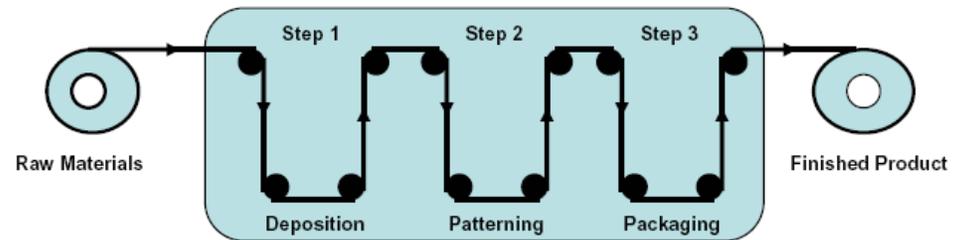
Low cost & scalable solar cell technology:

- Low cost, transparent conducting substrates
- Low cost, efficient & stable thin film absorbers

Flexible, roll to roll manufacturing R&D:

- Thin composite films for conducting substrates
- Thick film technology for solar absorbers
- Rapid testing of potentially transformative material and device concepts in a manufacturing environment

Roll to Roll Manufacturing: Low-cost solar cells



Biofuels

