2008 Solar Annual Review Meeting

Session: Seed Fund
Organization: NREL
Funding Opportunity: National Laboratory

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NREL/PR-520-43169
Presented at the Solar Energy Technologies Program (SETP) Annual Program Review Meeting held
April 22-24, 2008 in Austin, Texas

Budget and Solar America Initiative Alignment

NREL			
Project Beginning Date	**FY07 Budget**	**FY08 Budget**	**Total Budget**
not defined	$0.65 millions	$1.87 millions	$2.52 millions

- This project supports the Solar America Initiative by:
  - Exploring new ideas that have the potential to make a real difference
  - Portfolio of ideas including some that bring a new twist to a proven approach and some that are entirely new

Individual projects

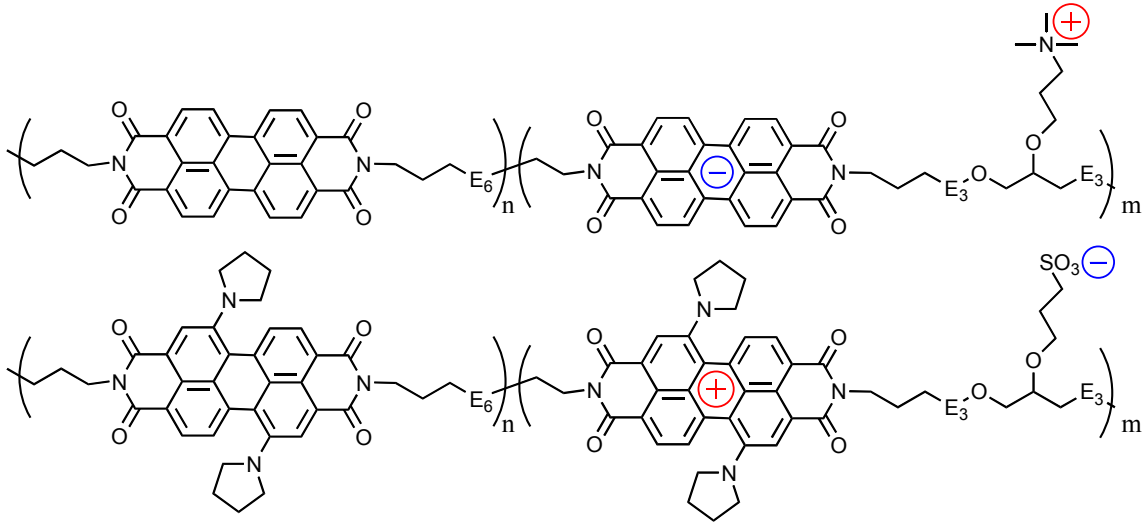
- NREL projects
  - Multiple-exciton generation (Ellingson, $300k)
  - Carbon nanotubes (Blackburn, $300k)
  - Junction OPV cells (Gregg, $300k)
  - Multifunctional barriers (Simpson, $150k)
  - Amorphous metal oxide solar cells (Perkins, $221k)
  - 3rd generation mechanisms for OPV (Ginley, $200k)
  - Quantum confinement in film silicon (Stradins, $300k)
- Sandia (joint with NREL) projects will be presented by Jeff Nelson

Junction OPV cells from doped polymeric molecular semiconductors

Gregg

Advantages

- Based on type of materials used for automobile paints
- Stable OPV



Goals for 1st year

- Synthesis of gram quantities
- First functional device

Perylene diimides (small oxidized graphene particles) are some of the chemically toughest, most light-stable pigments known

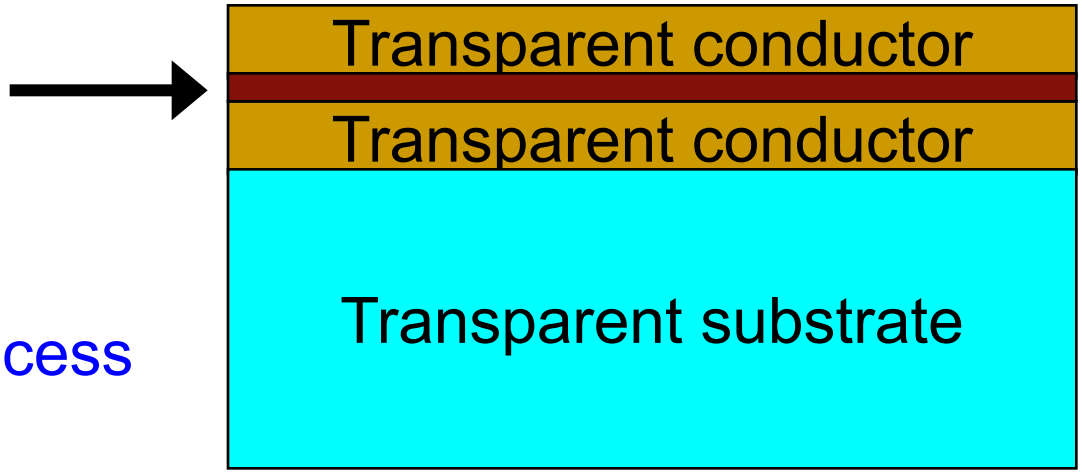
This idea combines the best properties of polymer and small molecule OPV along with a patented doping process.

Multifunctional transparent conducting and self-healing impermeable barriers

Simpson

Advantages

- Lower cost than ITO
- High conductance
- High transparency
- Barrier
- Low temperature process



Goals for 1st year

- Multilayer films with:
  - 80% transmission,
  - <10 ohm/sq,
  - $<10^{-2}$ g/m^2/day O_2/H_2O impermeability

Novel coating will be sandwiched between ZnO or other transparent, conducting layers

Amorphous oxide semiconductors for ambient-temperature-deposited photovoltaics

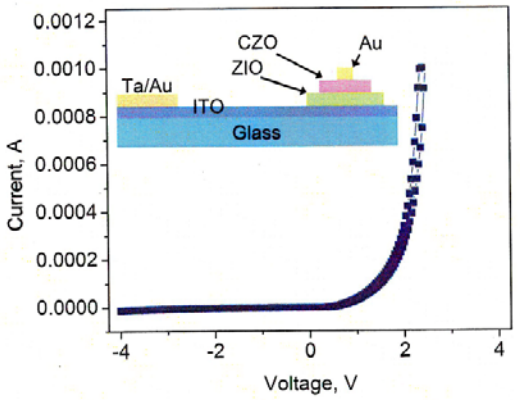
Perkins

Advantages

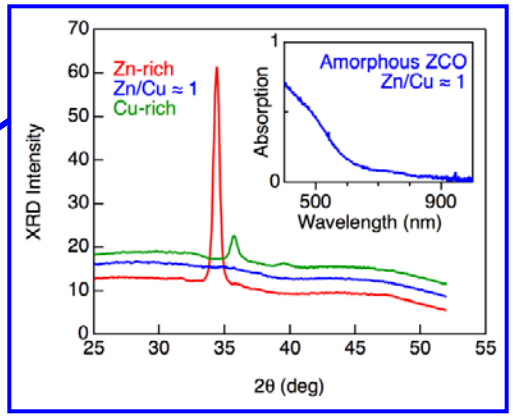
- Low-cost metal-oxide solar cell
- Deposition at low (ambient) temperature

Goals for 1st year

- Zn-Cu-O material libraries
- Demonstrate amorphous metal oxide p-n diode with photo-active response



ZnCuO - InZnO p-n junction @ HP (2006).



Sputtered amorphous ZnCuO @ NREL

To Date: Successful identification of amorphous region through combinatorial study

Exploration of 3rd generation mechanisms for OPV devices

Ginley

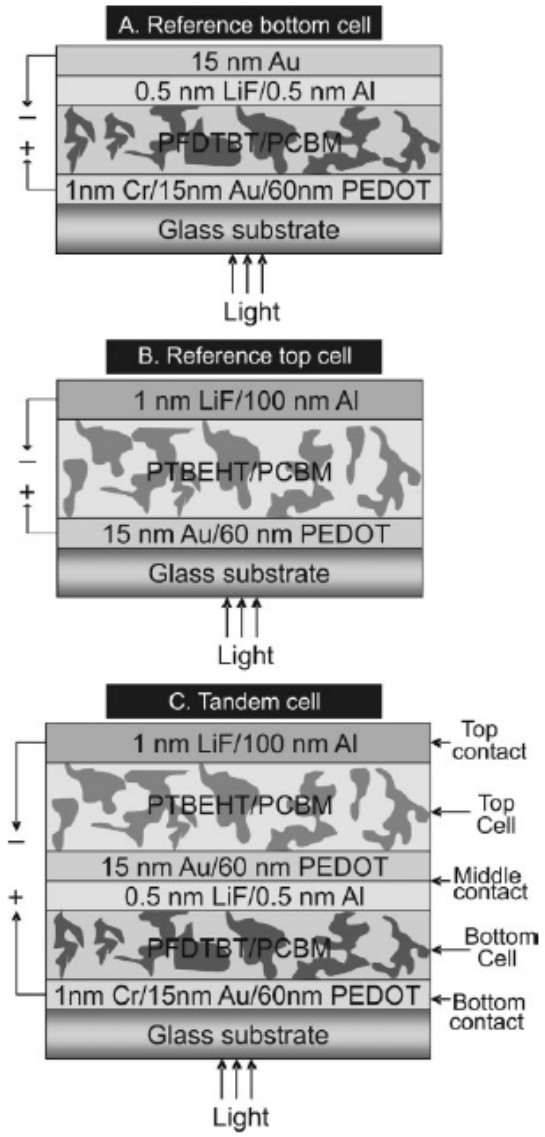
Advantages

- Higher OPV efficiency

Goals for 1st year

- Demonstrate a single-junction QD/polymer device
- Publication

QDs can tune absorption to provide pathway to higher efficiency multijunction OPV



Application of quantum confinement in film silicon

Stradins

Advantages

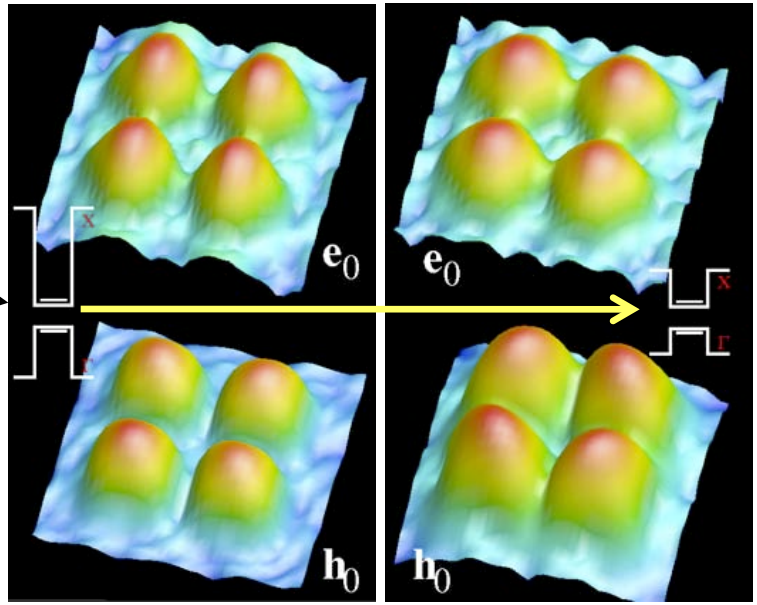
- Higher Si cell efficiency (use QDs to create a multijunction cell)

Goals for 1st year

- Create simulations package to calculate the properties of Si QD in matrix
- Select most promising growth method of QD structures

Dot/matrix band offset decreases:

Stronger communication between QDs



Wavefunctions provide tools to address key issues: transport and absorption

Project Update

Work plan	Date
Funding announced	Jan-08
Reviews	Quarterly
Solicit and select new projects; Proposals for year 2 of current projects	April-June 08
Peer Review (Year 2 funding decisions will be based on external peer review inputs)	Jan-09

Obstacle Discussion

- Barriers encountered or anticipated that may inhibit success of programs
  - Continuing resolution and need to hire post docs delayed start of all of the projects, so the one-year milestones are scheduled for December
- Other notes:
  - High-risk projects are included intentionally
  - Collaborations with universities and industry are encouraged but take time to cultivate