Solar cell technology

Fall 2014

How Patents Are Used

- Corporate
  - Product protection
  - Corporate Value
  - Defensive portfolio
  - Licensing
- Consultant
  - Entrepreneurial
  - Professional credibility

Recent Patent Verdicts & Settlements
Or – Why it is really important?

- Alcatel/ Lucent v. Microsoft. - (2007) - $1.5 Billion
- NTP – Settled with RIM for $612M (plus $53M litigation plus verdict)
- Intergraph – over $880M in settlement from patent litigation with Intel, HP and others
- Eolas v. Microsoft (2003). $506M Jury verdict
- Acacia - $60M in licensing revenue (2004-2006)
- Forgent - $100M in licensing revenue 2004-2006

- Apple v. Samsung

- QUALCOMM?

Who is an Inventor?

- A person who alone or in conjunction with others makes a material contribution to the conception of an invention
- A person who reduces the conception to practice if it requires extraordinary skill
- Non-Inventors:
  - Persons who implement the ideas of others
  - Persons who have obtained the entire idea of an invention from another are not inventors
  - Persons who suggest concepts without contributing to the means for carrying out the suggestion

What can be patented?

- “Everything under the sun made by man.”
  - Products: things
  - Processes: ways to make things
  - Methods: ways to do things
  - Improvements: better things
- Defined Classes
  - Article of Manufacture
  - Machine
  - Composition
  - Process
- Some more:
  - Business Methods
  - Services
  - Software

What Is Not Patentable

- Laws of nature (wind, gravity)
- Physical phenomena (sand, water)
- Abstract ideas (mathematics, a philosophy)
- Anything not useful, novel and non-obvious
- Inventions which are offensive to public morality or designed for an illegal activity

Criteria – Legal Standards

- Novelty
  - Does not exist in the prior art
  - Not previously disclosed to public
  - OK if modification/Improvement of an existing product/ process, or use of something "old" in new/different way
- Usefulness - Utility - Performs a useful function
- Non-obviousness
  - Non-trivial - It would not have been obvious to one skilled in the art to combine multiple items in the public domain to arrive at or show the invention
  - Not Engineer's normal sense of "obviousness"!
- Enabled

Utility Patent Types

- Two types of US Utility Patents
  - Provisional application
  - Non-Provisional application
    - Continuation
    - Divisional
    - CIP (continuation-in-part)
    - PCT International

Other Types of Patents

- Design Patents
  - Novel, non-obvious
  - Ornamental design in an article of manufacture
    - In other words, for its appearance
  - The term of a design patent is 14 years from the date of grant
- Plant Patent
  - new or discovered asexually reproduced plant

Design Patent Example

US00D414168S

United States Patent [19]

Parsons et al.

[11] **Patent Number: Des. 414,168**

[45] **Date of Patent: ** Sep. 21, 1999**

[54] **FRONT PANEL OF A DISK DRIVE**

[75] Inventors: **James H. Parsons**, Berthoud; **Edwin J. Wadsworth**, Longmont; **Christopher F. Banks**, Boulder; **Lane W. Lee**, Lafayette, all of Colo.

[73] Assignee: **Caleb Technology Corporation**, Boulder, Colo.

[**] Term: **14 Years**

[21] Appl. No.: **29/079,379**

[22] Filed: **Nov. 14, 1997**

[51] **LOC (6) Cl.** **14-02**

[52] **U.S. Cl.** **D14/115**

[58] **Field of Search** D14/100, 102, D14/107–109; D13/162, 184, 199; D6/432, 436, 445, 448; 312/208.1; 360/99.02, 105, 106, 99.12; 361/690–696, 730, 732

[56] **References Cited**

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D. 286,050	10/1986	Roots et al.	D14/109
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D. 381,643	7/1997	Carlson .	
4,630,751	12/1986	Saito .	
4,686,594	8/1987	Kurafuji .	
5,396,385	3/1995	Tangi et al. .	

Primary Examiner—Freda Nunn
Attorney, Agent, or Firm—Emery L. Tracy

[57] **CLAIM**

The ornamental design for a front panel of a disk drive, as shown and described.

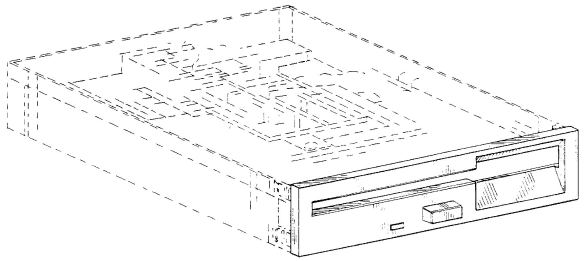
DESCRIPTION

FIG. **1** is a top front and side perspective view of a front panel of a disk drive showing our new design; and,

FIG. **2** is a top front and opposite side perspective view thereof.

The broken lines are shown in the views for illustrative purposes only and forms no part of the claimed design.

1 Claim, 1 Drawing Sheet



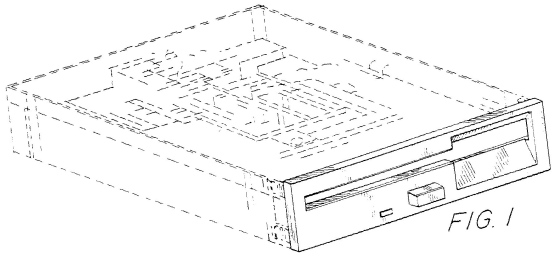


FIG. 1

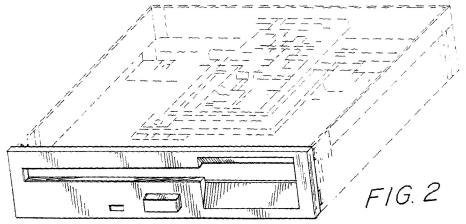


FIG. 2

Types of Patents

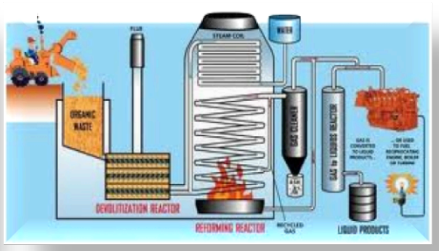
Type	**Is for**	**Term**	**#s**
Utility	Function, use	20 years	6,214,874
Design	Appearance	14 years	D202,331
Plant	Asexually reproduced	20 years	PP10123

The Patent Process

- Application Preparation
- Application
- Patent Office Rejections
- Patent Granting
- Patent Challenges

Solar Cell Market Needs






Space, Maintenance, Ecosystem, Controlled Environment , Pollution , Location, Cost

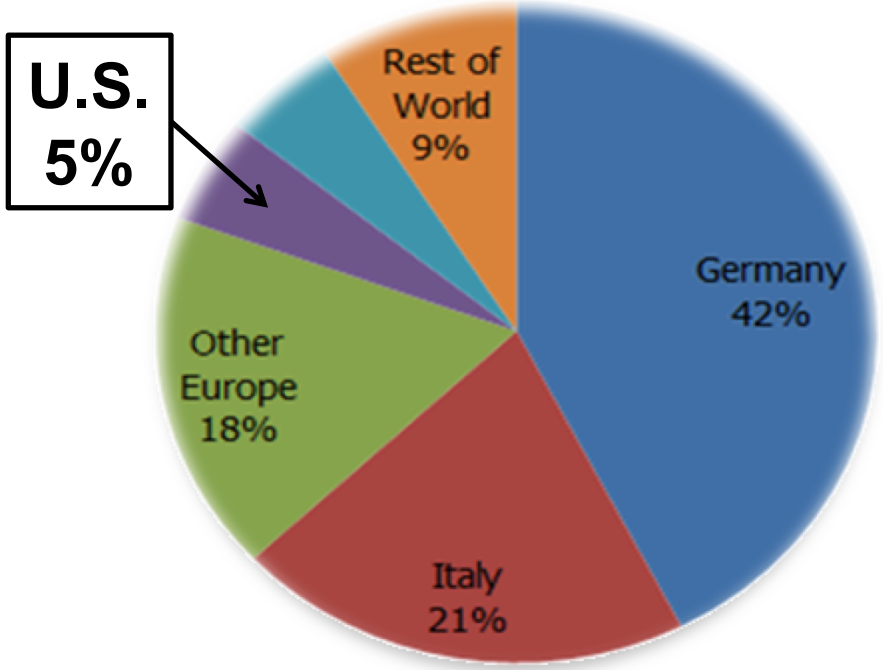
- **Renewable energy ~20% of world energy supply**
- **Solar accounts for less than 2%**
- **Silicon dominates the solar market:**
- **Rigid, opaque, heavy, EXPENSIVE**

- **Need solar technology that is cheaper AND adaptable to more applications**

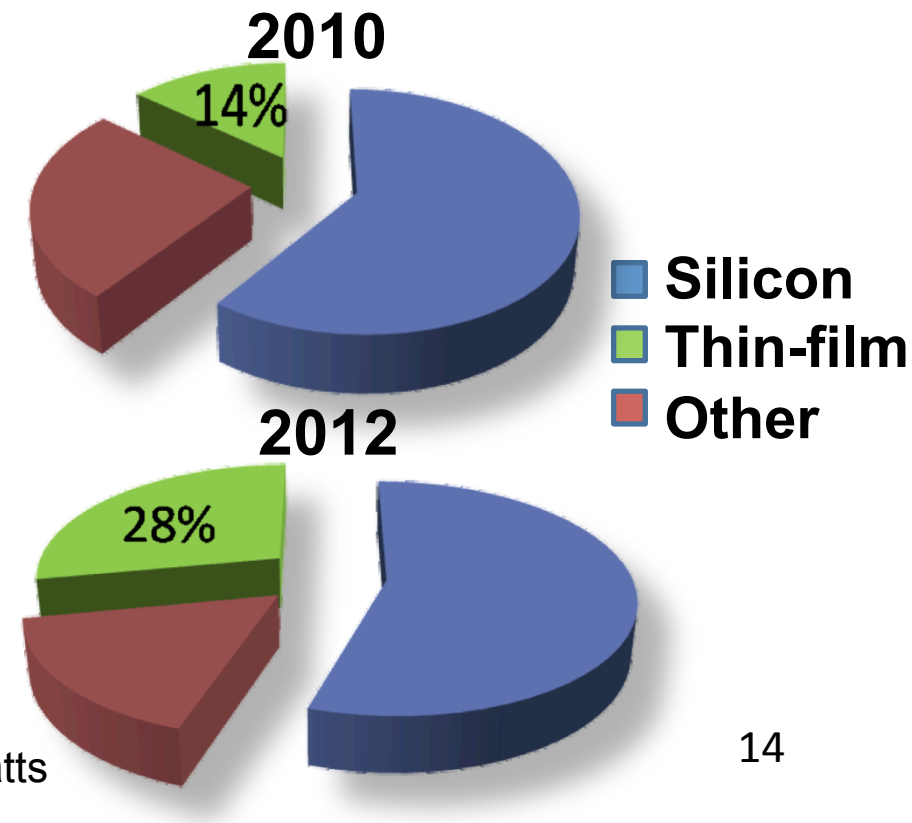
Solar Cell Market

- **PV Industry:** -$82 billion global revenue, up >100% from 2009
- **Thin film:** -Bring in $19.5 billion by 2015
  -Growth rate of 24% 2009-2020* (Watts)

Global PV Market

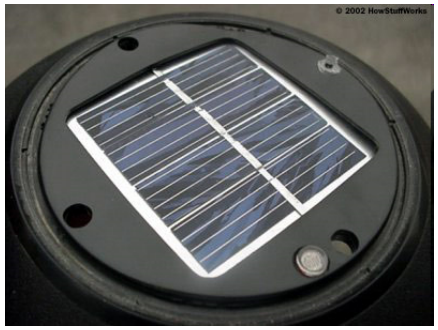


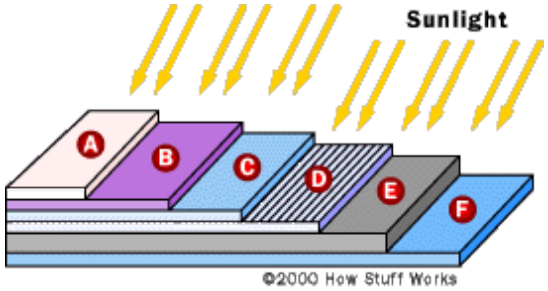
Thin-film Market Share



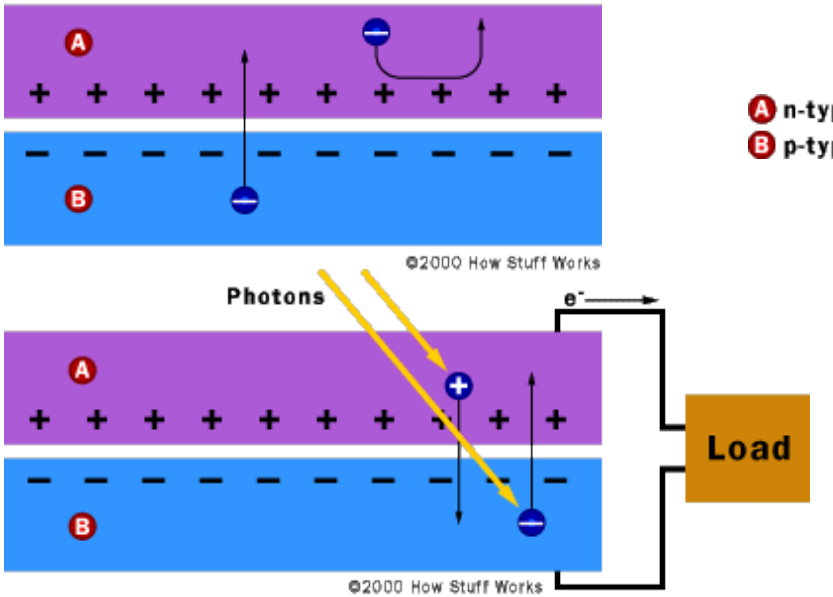
*Solarbuzz, GBI Resesarch, 22,214 MWatts

Basic structure of a generic silicon solar cell

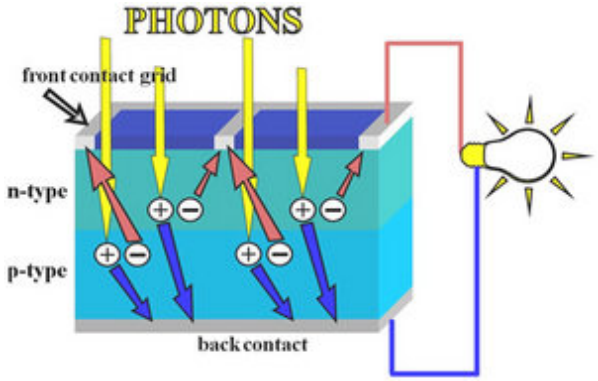




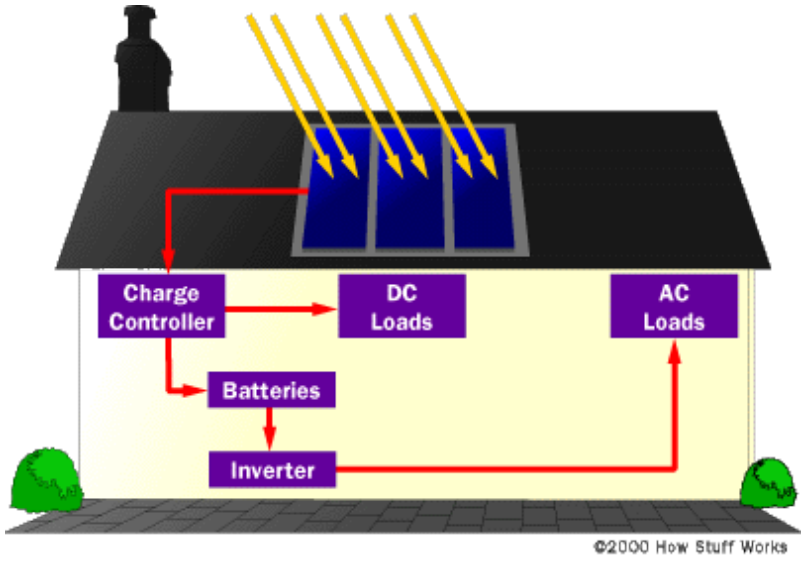
A Cover glass
B Antireflective coating
C Contact grid
D N-type Si
E P-type Si
F Back contact

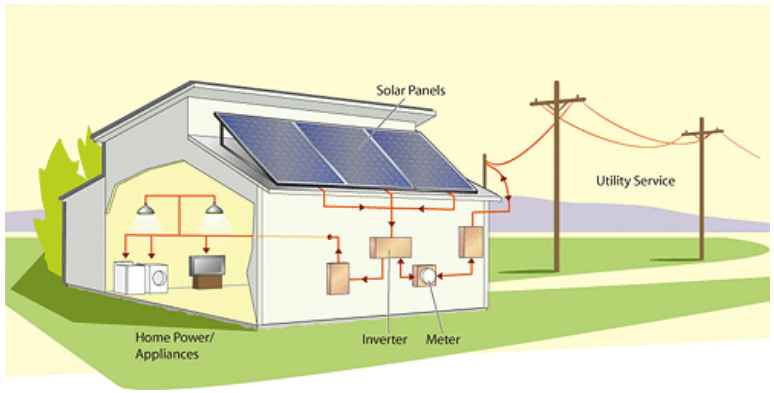


A n-type Silicon
B p-type Silicon



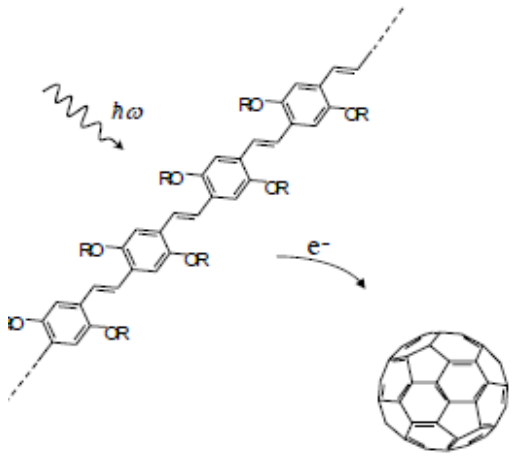
General schematic of a residential solar cell system





Polymer Solar Cells

- Options for reducing photovoltaic generating costs
- Cheap polymers using low-cost fabrication methods
- Problems
  - Cost: Electrode metallization
  - Area: Low efficiency (<6%)



Organic Solar Cell Structure

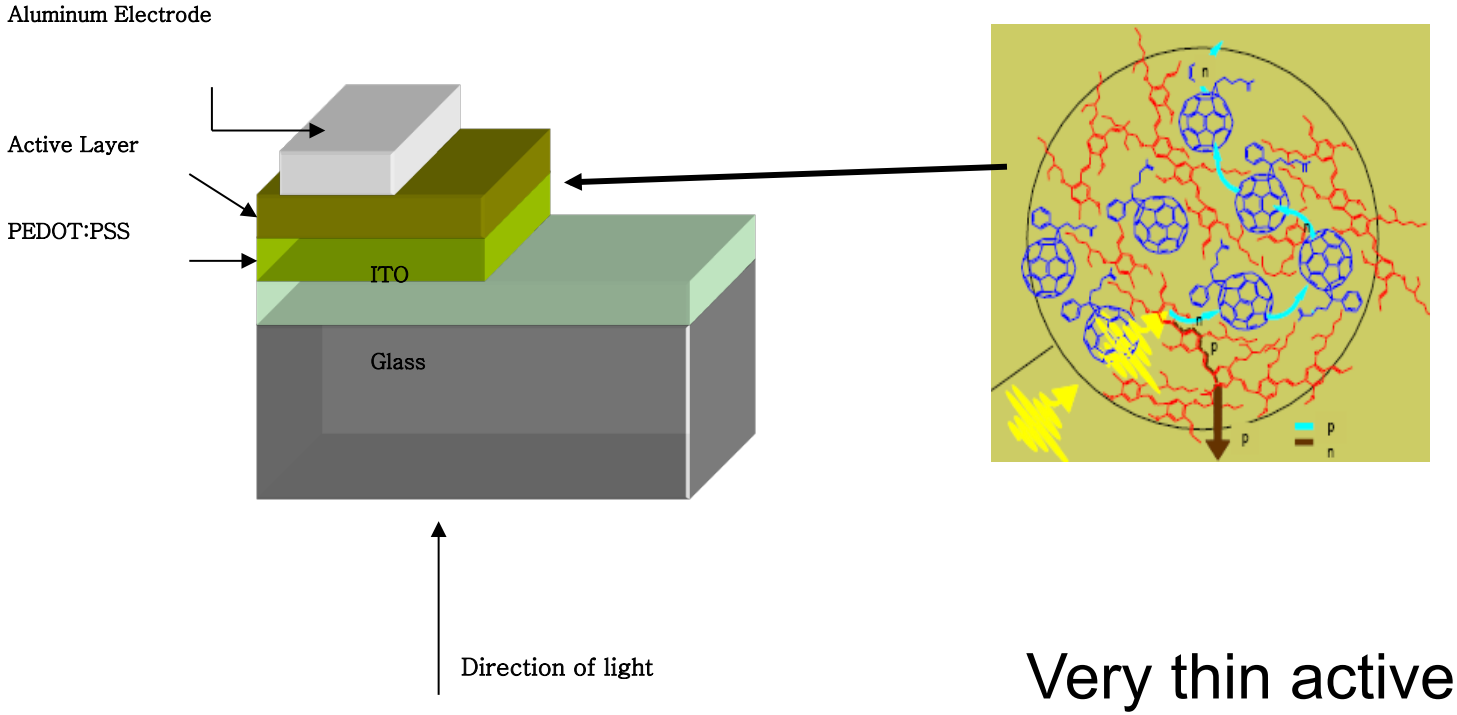


Figure 1.A: Schematic representation of an organic (polymer) solar cell (existing technology).

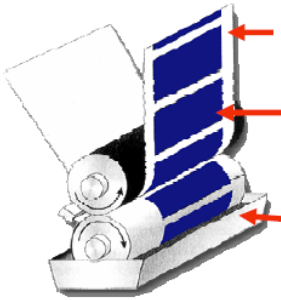
Very thin active layer (~100nm)!

Plastic Solar Cell: Inexpensive Manufacturing

Printing of Plastic Electronics

"inks" ---- with electronic functionality!

The Dream →



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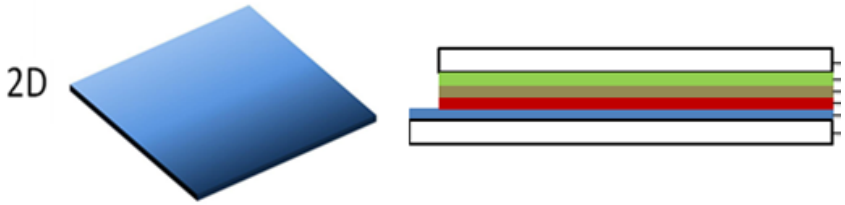
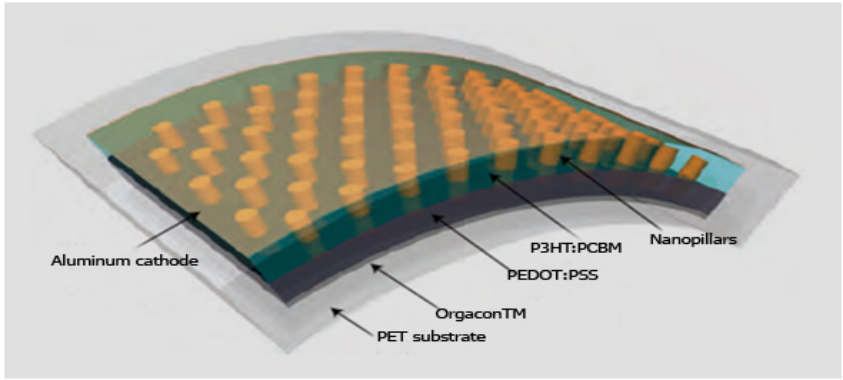
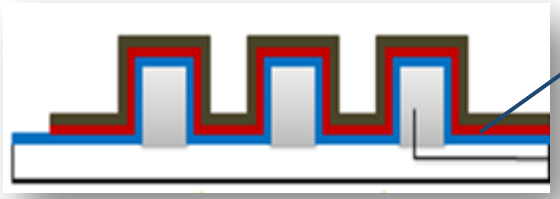
Conventional 2D structure

Conventional 2.5D structure

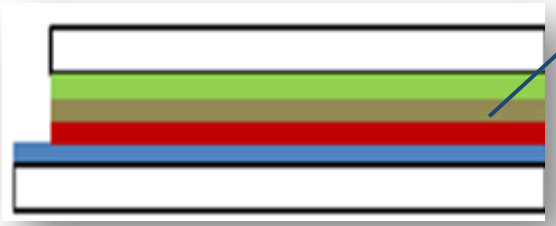




SDSU 3D Organic PV Cells - Invention

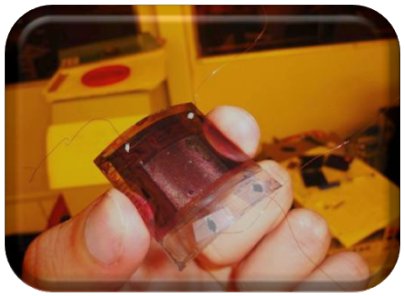


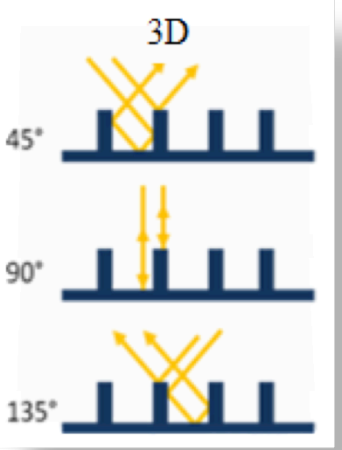
Orgacon™

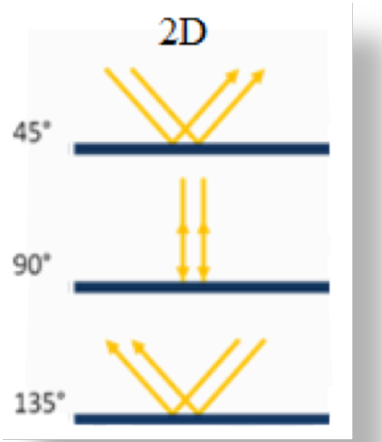


ITO

Optimizes photon absorbance!



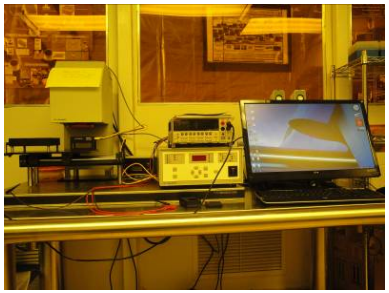


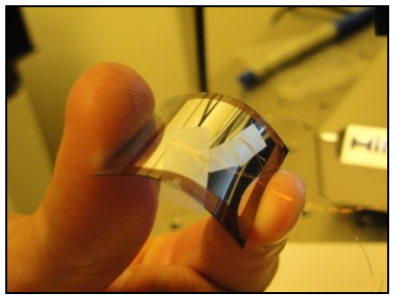


3D architecture works!

Device Type	Imax (mA)	Jsc (mA/ cm2)	Vmax (V)	Pmax (mW)	FF (%)	Efficiency (%)
2-D ITO	4.70	5.74	0.500	2.39	40.42	**2.39**
3-D ITO	15.08	6.43	0.482	7.27	75.70	**2.42**
2-D PET Orgacon	12.40	37.97	0.100	1.24	54.98	**2.49**
3-D Glass Orgacon	19.60	17.83	0.319	6.25	83.89	**6.25**
3-D PET Orgacon	1.60	17.15	0.421	0.69	93.46	**6.88**

Performance for Organic PV cells





Can dream come true?

- **Flexible**
- **Light-weight**
- **Cheaper process**
- **Multiple colors**
- **Transparency**