National Institute for Nano Engineering

Self-Assembled Templating for Low-Cost Photovoltaics

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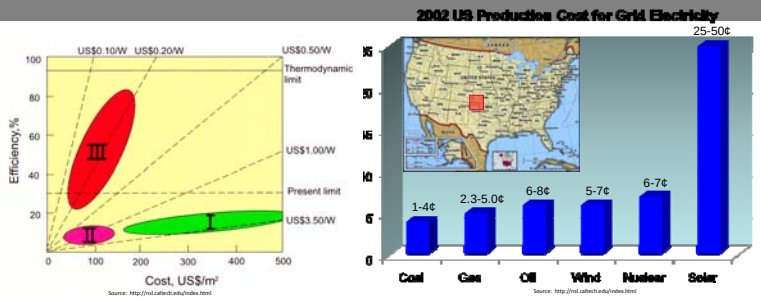
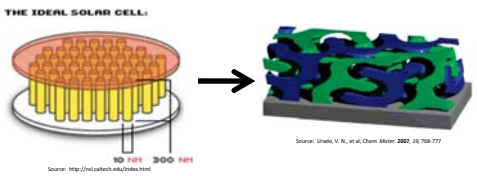
Introduction:

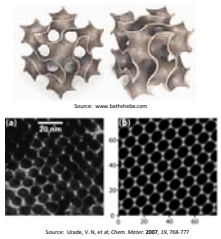
- The United States consumes 3.3 TW of grid electricity annually, less than 1% of which is derived from renewables
- A 100kmx100km land area of 10% efficient PV would meet this demand with 100% renewability
- Current PV technology is too expensive, inefficient to be competitive with fossil fuel powerplants on the grid



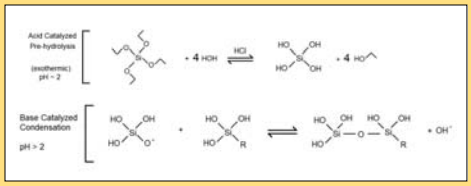
Objectives/Approach:

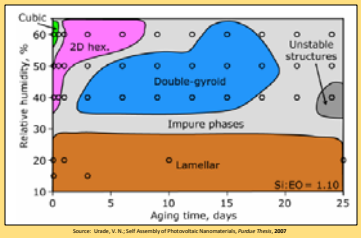
- PV for on-site power generation (off the grid)
  - Low production cost
  - Medium efficiency
  - Flexible, lightweight
- Utilize surfactant-assisted self-assembly (low cost)
- Utilize quantum confinement (efficiency)
  - Double Gyroid nanostructure

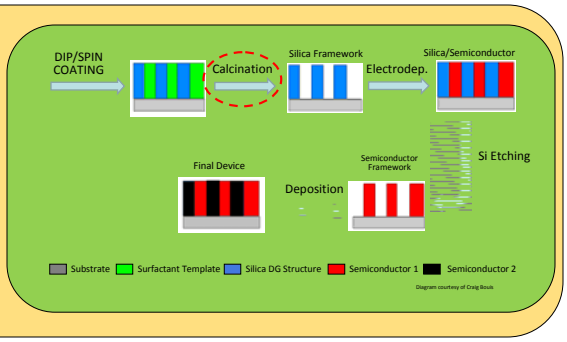




Procedure:

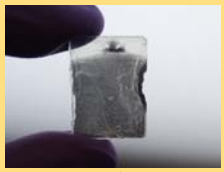


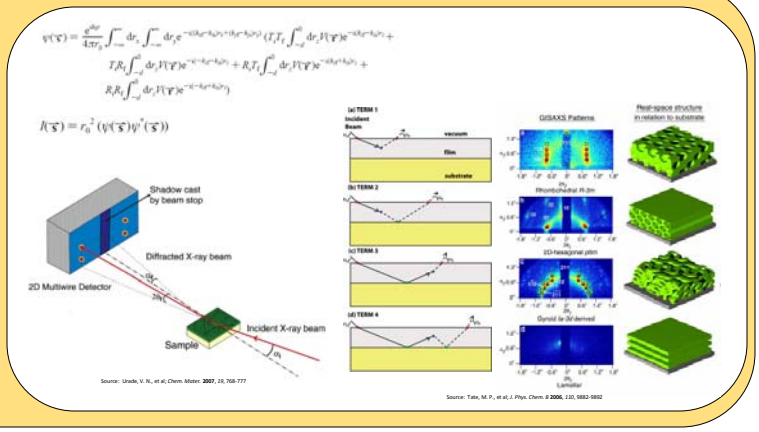




Recent Developments:

- Reproduced DG synthesis in Albuquerque
- Solvent extraction to replace caclination (film cracking)
- NANOCELL, NANODIFT simulation programs
  - Quantitatively Simulates GISAXS diffraction patterns
  - Simplified user interface, resolved compatibility issues
- SASC code for Au-surfactant core-shell nanoparticles





Conclusions:

- Mild heat treatment necessary before extraction
- UV/Ozone, DMSO, Acetone promising extraction media
- Pluronic P84 surfactant is more consistent than Synalox
- Reagent purities, coating humidity drastically affect morphology

Acknowledgments:

Sandia is a multiprogram laboratory operated by Sandia Corporation a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000

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