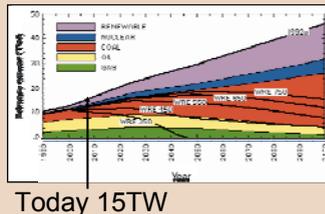


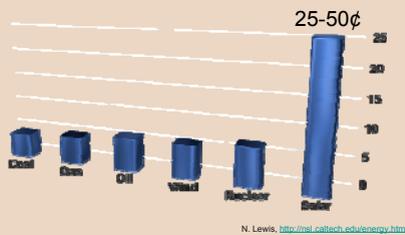
Next Generation Photovoltaics

Julia W. P. Hsu, Sandia National Labs

Motivation



Challenges



Needs new materials and technologies!

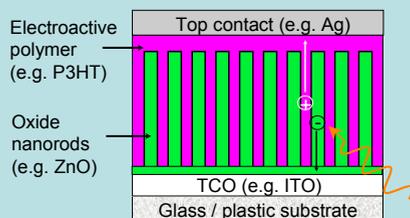
Organic Photovoltaics (OPVs)



Konarka, <http://www.konarka.com>

- Low materials and balance of systems costs
 - Low temperature, non-vacuum synthesis
 - Printed on flexible substrates using high speed roll-to-roll processing
- Near term target: 5-10% power conversion efficiency
10,000 hr lifetime
- Current technology: $\geq 5\%$ efficiency

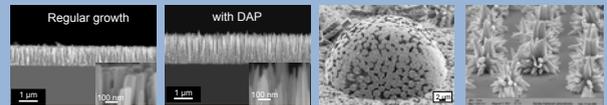
Nanostructured Oxide - Conducting Polymer Hybrid Solar Cells



- High electron mobility in crystalline oxide
- Ordered nano-architecture with line of sight transport paths
- Potential interfacial energy band engineering via doping and alloying of oxides
- Environmental stability (processing done in ambient)
- Better lifetime (shelf lifetime > 1 yr)

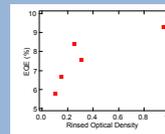
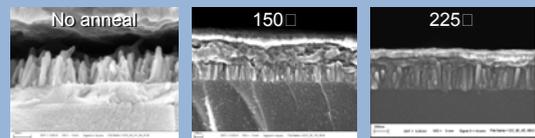
Sandia's Current Efforts

Oxide Nanostructure Synthesis



- Vary shape with organic growth modifiers
- Controlled nanorod array orientation & density
- Complex hierarchical nanostructures
- (Organic-) Templated growth on surfaces
- Doping to alter conductivity, e.g. In, Al, Ga, Li

Polymer Infiltration

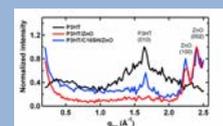


- Solvent affects infiltration
- Annealing enhances infiltration
- More polymer in the nanorod array, better device performance

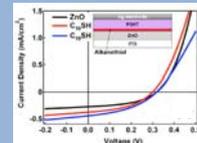
Interfacial Modification to Enhance Charge Transfer



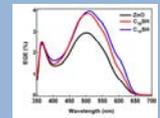
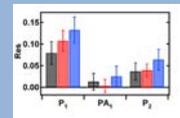
- Promote polymer crystallinity



- Increase short-circuit current



- Reduced recombination



Nanoengineering challenges

Interfacial Architecture & Efficient Charge Transfer

