

Testimony on S.B. 221

Professor Steven A. Ringel, The Ohio State University

Ohio Senate Energy and Public Utilities Committee

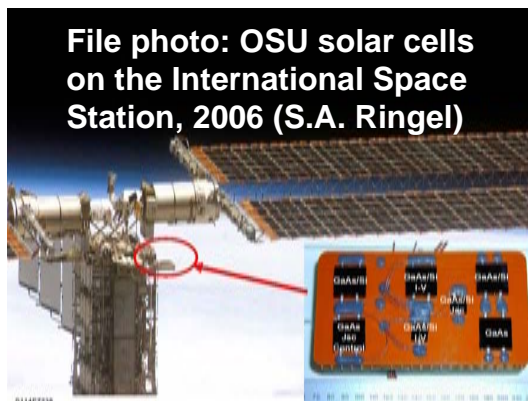
Steven A. Ringel, PhD

Position:

- Neal A. Smith Endowed Chair and Professor in Department of Electrical & Computer Engineering at The Ohio State University
- Director, OSU Institute for Materials Research

Field of Expertise and Relevant Experience:

- Photovoltaics and Materials for Advanced Energy Technologies
- Many national research awards, honors and recognitions
- > 200 archival scientific articles, several edited books, including a book on energy generation, storage and transport, etc. ...
- Guided more than 50 PhD and Masters students at OSU to careers either directly or indirectly involved in solar cell technologies and related fields
- Individually and collaboratively secured > \$40M to OSU in competitively awarded federal and industrial research funding since 1995
- Created a hybrid solar cell technology at OSU that is being considered for adoption in PV applications



Ohio State's Photovoltaics Research Program: impacts high-tech trained workforce, large/small industry, attractiveness of Ohio for national/international technology development

- **Terrestrial Solar Electricity**
 - 3rd generation terrestrial photovoltaics: super efficiency through advanced materials
 - already demonstrated > 40% efficiency (Spectrolab, Boeing – an OSU collaborator)
 - Hybrid PV: PV “skins” on arbitrary materials, shapes: e.g. airplane wings, cars, roof-tiles
 - Plastic solar cells
 - Integrated solar/thermal: solar conversion + heat recuperation
 - solar “eco-manufacturing” in collaboration with OSU Center for Automotive Research
- **Aerospace Photovoltaics**
 - Ultra-lightweight, high performance, ambient-tolerant solar cells
 - Solar “skins” for air vehicles and automobiles
 - Air Force and NASA vehicles
- **Low-Cost PV Manufacturing Process Development**
 - creating platform technology for global-scale PV manufacturing in silicon-foundry environment
 - Process test-beds in OSU research park/incubators – NanoTechnology West Laboratory
 - » dual use factories with “instant on/off” per order – “never go dark”
- **University-Industry interface/technology co-development & transfer/training**
 - Wright Center for Photovoltaics Innovation & Commercialization – PVIC
 - » \$18.6M from ODOD to UT, OSU, BGSU w/ 4 non-profits and 13 industry partners
 - » Goal: stimulate PV Ohio value chain of research-manufacturing-installation: jobs
 - Multinational corporations collaborating with OSU: integrate PV into products and/or provide products for PV
 - » Dupont, Owens-Corning, Boeing, Lockheed, Honda, Sharp, many others

OSU's Diversity in Advanced Energy Research: Primary Initiatives

- **Clean Coal**
 - Technologies designed to enhance both the efficiency and the environmental acceptability of coal extraction, preparation and use-
- **Transportation**
 - Developing new materials, devices and systems that maximize work and minimize energy loss in energy utilization of vehicles. Develop alternative drivetrains and new vehicles, Intelligent Highway design.
- **Photovoltaics**
 - “Third Generation” photovoltaics that exploits materials science to create super efficient energy conversion from sunlight to electricity. Additional focus on hybrid integration of high performance PV with high throughput, existing manufacturing industries – silicon, plastics
- **Biomass/Biofuels**
 - Develop cost effective, environmentally friendly biomass conversion technologies to improve our energy independence, air and water quality and support rural economies.
- **Hydrogen/Fuel Cells**
 - Continued development of Solid Oxide Fuel Cells (SOFC) with an emphasis on the development of thin film materials for SOFCs. Development of novel cost-effective hydrogen production and separation technologies
- **Materials for Energy Applications**
 - Develop novel materials and devices that will increase energy efficiency, utilization and production.
- **Environmental Protection, monitoring and remediation**
 - Observation, modeling, forecasting of environmental effects of human reactions, natural phenomena and the interactions of the two