

Argonne National Laboratory: An Overview

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*ITP Materials Project and Portfolio Review Meeting
June 1, 2005*

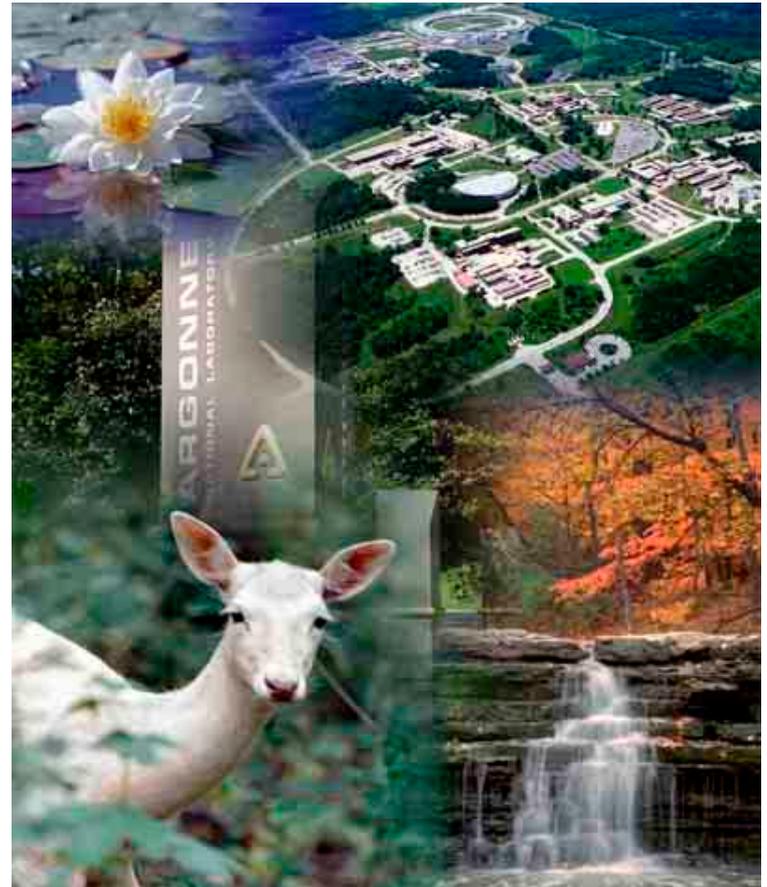
Argonne National Laboratory

*A U.S. Department of Energy Laboratory
Operated by The University of Chicago*

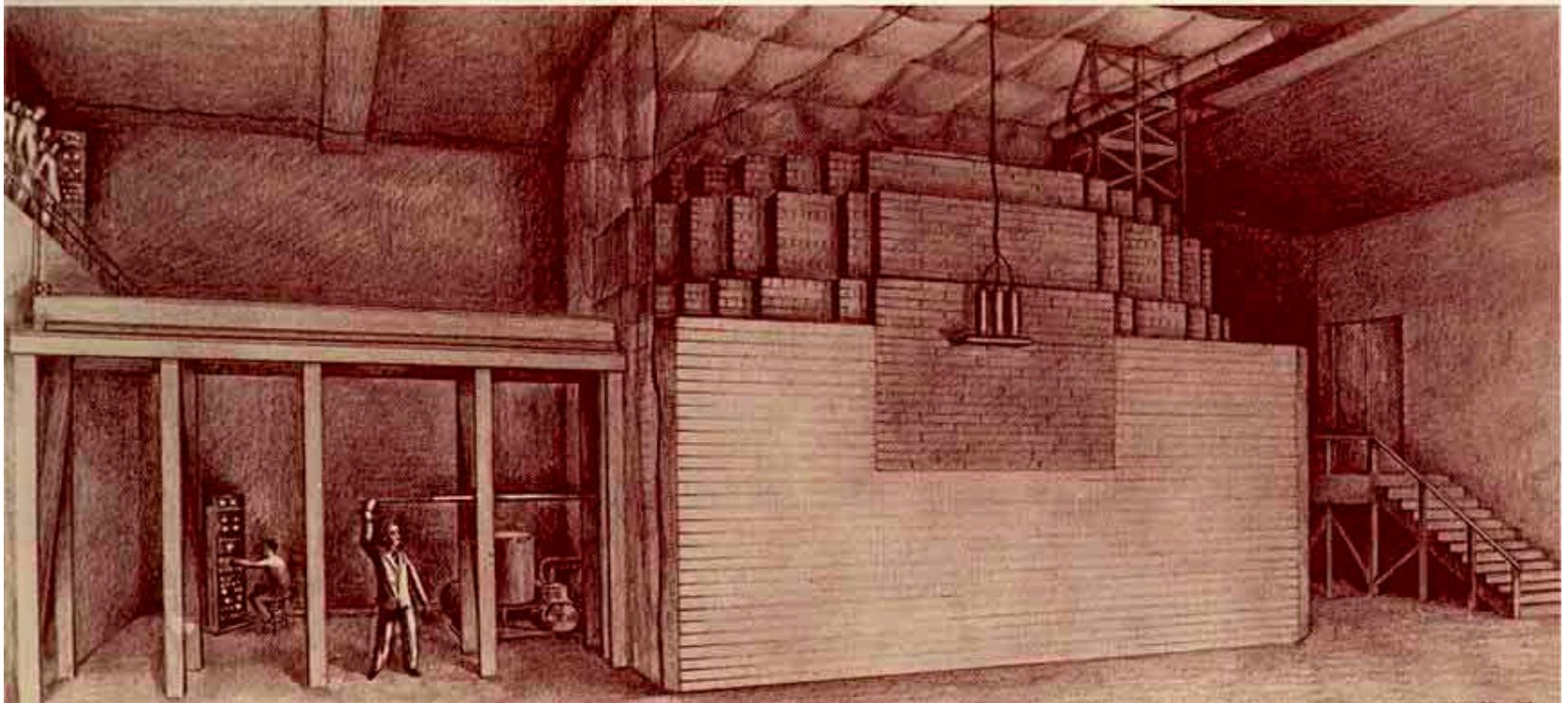


Argonne National Laboratory

Argonne is America's first national laboratory and one of the world's premier research centers



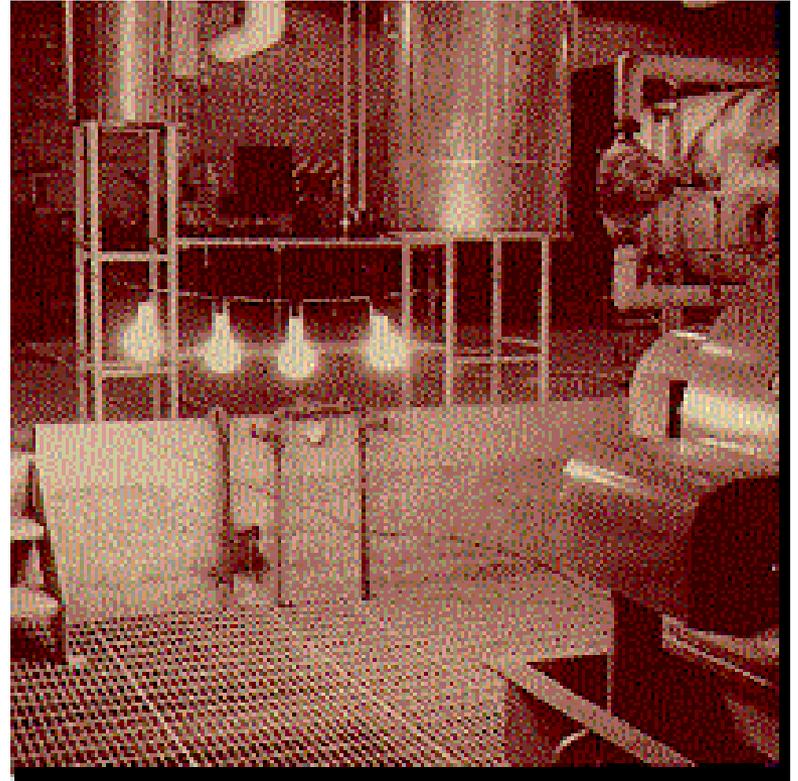
Argonne's History



Argonne began with Chicago Pile 1 in a squash court under Stagg Field at the University of Chicago.

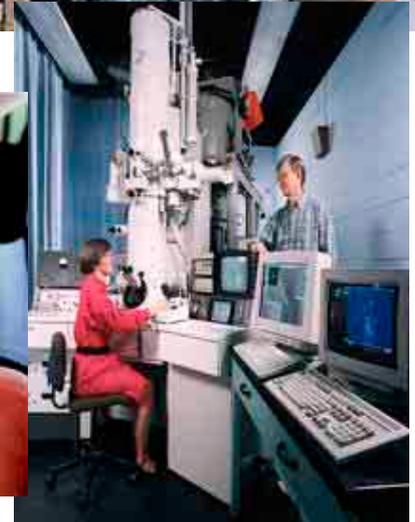
Argonne's History

The world's first usable amount of electricity from nuclear energy was produced by Experimental Breeder Reactor 1 (EBR-1) in Southeastern Idaho on December 21, 1951.



About Argonne

- **Founded in 1943, designated a national laboratory in 1946**
- **Managed by The University of Chicago for the Department of Energy**
 - More 2900 employees and 5,000+ facility users
 - About \$475M budget
 - 1,500-acre, wooded site in DuPage County, Illinois
- **Broad R&D portfolio**
 - From Archeology to Zoology
 - From concept to commercialization
- **Numerous sponsors**



Evolving Mission

- **Serve DOE and national security**
 - Advance the frontiers of knowledge
 - Create and operate forefront scientific user facilities
 - Provide innovative and effective tools and solutions for energy and environmental challenges to national and global well-being, in the near and long term.
- **In accomplishing its mission, Argonne partners with DOE, other federal labs, academia, and the private sector.**

User Facilities

The Advanced Photon Source (APS) is the nation's brightest source of X-rays for research



Advanced Photon Source

- **Nation's most brilliant hard x-ray beams**
- **Materials science, chemistry, biology, protein crystallography, earth & environmental science, physics...**
- **42 beamlines in operation**
- **Over 3000 users**
- **Operates year-round, 5000 hours/year**
- **Reliability over 95%**
- **Innovative X-ray instrumentation and operating modes**
- **www.aps.anl.gov/**



Intense Pulsed Neutron Source (IPNS)

- Pulsed thermal and cold neutron beams
- Materials science, chemistry, biology, physics, geology, nuclear science, engineering sciences
- 13 instruments
- 250+ users/visitors per year
- Reliability greater than 95%
- Instrument and technique innovation
- Instrumentation and user-community development for Spallation Neutron Source (SNS) being built at Oak Ridge
- www.pns.anl.gov/

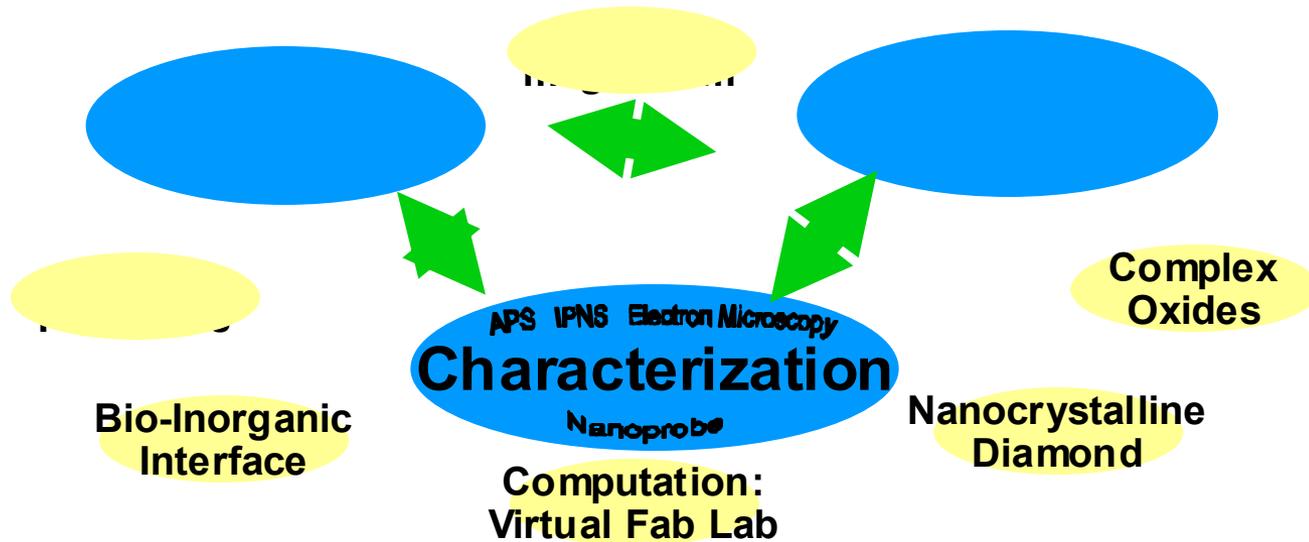


Center for Nanoscale Materials

- **Illinois Gov. Rod Blagojevich, U.S. Rep. Judy Biggert and Energy Secretary Samuel Bodman participated in a May 6 cornerstone-laying ceremony for the Center for Nanoscale Materials (CNM)**



Center for Nanoscale Materials



- One of DOE's five new Nanoscale Science Research Centers
- Forefront, interdisciplinary scientific themes
- State-of-the-art facilities and instrumentation; exploiting Advanced Photon Source and Intense Pulsed Neutron Source
- <http://nano.anl.gov/>

Pump Seals Coated with UNCD Surpass Previous Best in Industrial Wear Tests

- Challenge

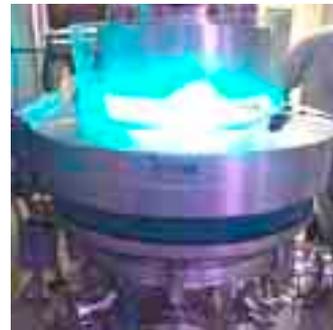
- Develop technology to take UNCD from laboratory to market application

- Project Participants

- Argonne National Laboratory
 - *Energy Systems*
 - *Energy Technology*
 - *Materials Science*
- Industrial Partners
 - *Advanced Diamond Technologies, Inc. (ADT)*
 - *John Crane, Inc.*
 - *IPLAS Innovative Plasma Systems*

- Sponsor

- DOE-EERE Industrial Technologies Program
 - *Industrial Materials for the Future Program*

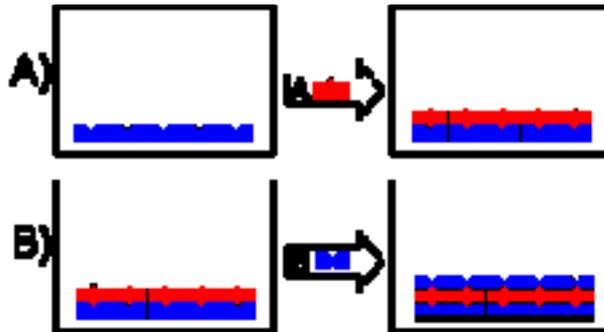


UNCD deposition

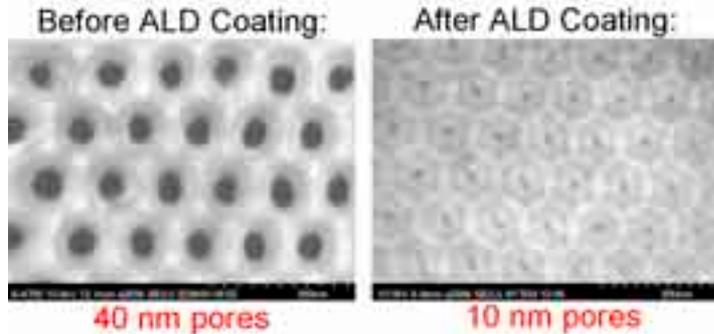


Atomic Layer Deposition Process for Catalyst and Membrane Development

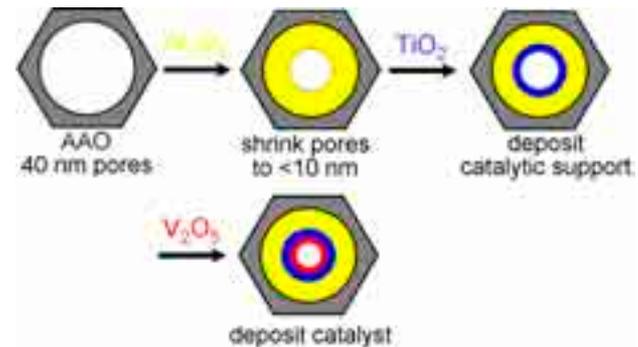
ALD Process



- Binary reaction sequence (ABAB...)
- Atomic layer-by-layer growth
- Conformally coat membranes, powders
- Can deposit nearly any material
- Readily scalable



- Anodic Aluminum Oxide (AAO) template
- Tune pore size (± 0.1 nm) using ALD
- Modify surface composition and properties
- Separate hydrocarbons, organics, ions



New “Recycle” CRADA Signed in August 2003

- **CRADA Partners: Argonne, USCAR’s Vehicle Recycling Partnership, American Plastics Council**
- **Argonne’s new recycling pilot-plant serves as the CRADA focal point and will demonstrate Argonne technology**
- **CRADA funding: \$10 million over 5 years**
- **Argonne commercialization partners:**
 - 21st Century Polymers, Inc.,
 - OmniSource Corp.,
 - Alter Trading Corp.



Physical Separation Pilot-Plant



Plastics Recovery Facility

Argonne Improves and Demonstrates New Electrodialysis Process

- **BASF Corp. contracted Argonne to demonstrate a new process for production of a specialty chemical**
- **BASF licenses Argonne process control technology**
- **Argonne achieves commercial demonstration production in 18 months**
- **Process receives 2004 Federal Lab Consortium Award for Excellence in Tech Transfer**
- **Commercial plant to be built**

ED Membrane Pack Change-out



Argonne's Electrodialysis Demonstration Plant



White Deer

Fallow deer, native to north Africa, Europe and parts of Asia, roam Argonne-East and have become one of the laboratory's symbols

