Argonne National Laboratory: An Overview

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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
Pioneering Science and Technology

- 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

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
- \texttt{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*
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.
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
**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.