Argonne NATIONAL LABORATORY

INDUSTRIAL RESEARCH AT THE ADVANCED PHOTON SOURCE

In fiscal year 2017, more than 260 users from industry carried out research at the U.S. Department of Energy Office of Science's Advanced Photon Source (APS), not counting university researchers doing industry-supported experimentation. They utilized the APS high-brightness x-rays to study a broad range of industrially relevant technologies, including new forms of artificial lighting; improved cement for commercial and residential construction; failure-resistant steel for bridges and turbine engines, and failure-resistant lead-free solder; better ferroelectric materials for a wide range of electronics applications; and, of course, batteries: From lithium-ion to "beyond-lithium" multivalent metals, from improved cathode materials to solutions for battery degradation, the race to better energy storage is always on at the APS.

Better Materials for Better Devices

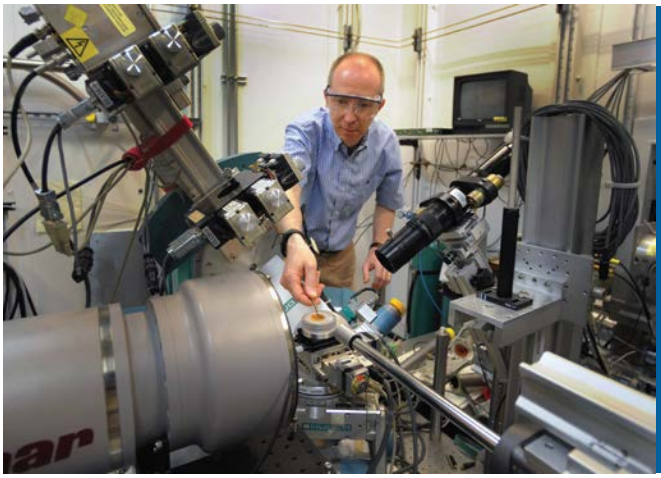
APS high-brightness x-rays are being utilized by researchers who are investigating properties of matter that promise the development of new and improved materials for next-generation optoelectronic devices such as inexpensive, yet highly-efficient, solar cells, photonic lasers, photodetectors, and light-emitting diodes.

Cummins Fuel Injectors

The APS and the Argonne Leadership Computing Facility provided Cummins, Inc., with a crucial new software tool to model the fluid dynamics of fuel injectors in modern engines. Convergent Science, Inc., used the powerful supercomputer to model the complex fuel spray internal and external dynamics simultaneously, and then tested their models against revolutionary fuel-spray images obtained at the APS, yielding a new software system that Cummins is using to increase fuel injector efficiency.

Improved Catalysts for Chevron

Scientists working at the APS helped Chevron Corporation refine, test, and patent a new catalyst and new techniques for analyzing reservoirs to optimize extraction methods used to access shale oil and natural gas. X-ray scattering experiments at the APS enabled the team to test candidate catalysts for the development of a new method of extraction that naturally liquefies and frees trapped reserves. These new catalysts have been patented by Chevron.



Denis Keane, Director of the DuPont-Northwestern-Dow x-ray facility at the APS readies a sample for study at the beamline.

DuPont's Suva® Refrigerants

DuPont's Freon™ set the standard for refrigerants; but as the environmental impacts of Freon and other chlorofluoro-carbons raised concerns, there was a move to replace these widely used chemicals with new refrigerants: chlorine-free hydro-fluorocarbons. To develop a more environmentally friendly, next-generation refrigerant, DuPont came to the APS to characterize the metal oxide contents of candidate catalysts for greener refrigerants. By controlling the metals used in the processing and product mix of the refrigerant, DuPont scientists were able to reduce energy consumption and manufacturing waste byproducts and design a more ozone-friendly product. The results were used in the design of Suva®, a replacement refrigerant. Today Suva® refrigerants are accepted globally as safe, high-performance alternatives for automotive, residential, and commercial building air conditioning systems; home refrigerators; supermarket display cases; and other refrigeration uses.

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