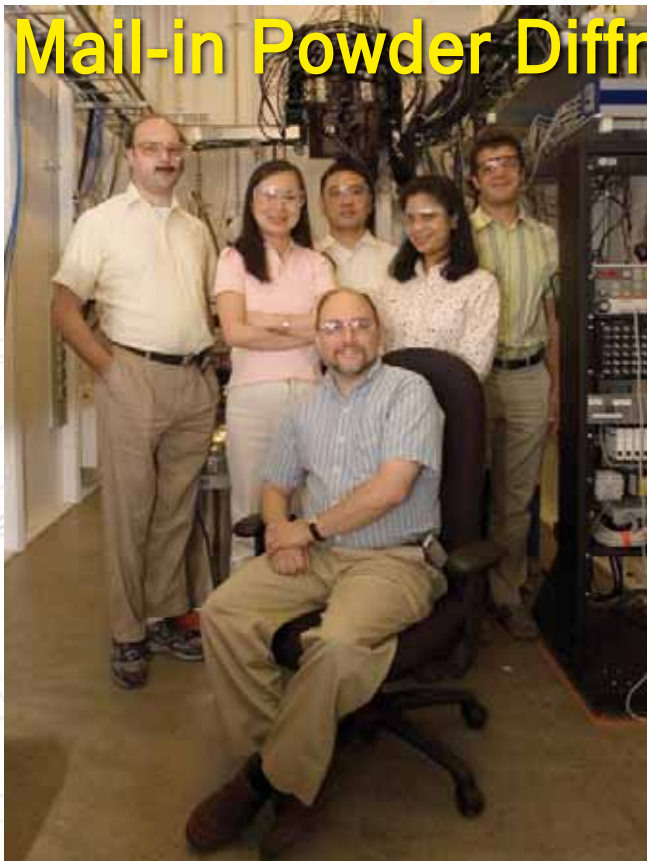


ADVANCED PHOTON SOURCE

Mail-in Powder Diffraction for General Users



Standing (left to right) in the 11-BM research station are Lynn Ribaud and Jun Wang (both beamline staff, X-ray Science Division Materials Characterization Group [XSD-MC]); software engineer Xuesong Jiao (APS Engineering Support [AES] Division Beamline Control Group); Sytle Antao (beamline staff, XSD-MC); and Curt Preissner (AES Mechanical Engineering and Design Group), who, with Deming Shu (AES Mechanical and Interlock Systems) designed the robotic sample changer for 11-BM. Seated: Brian Toby, XSD-MC Group Leader.

One of the newest dedicated beamlines at the Argonne Advanced Photon Source (APS), 11-BM aims to meet an emerging need in science—crystallographic structure determination of complex polycrystalline materials from powder diffraction—by providing high-resolution, high-energy, synchrotron powder diffraction data to researchers in materials science,

chemistry, physics, geosciences, pharmaceutical studies, engineering, and other fields. To meet requests expressed in these communities and to widen the utility to those who have never used a synchrotron, the instrument will be opened for use first in a high-throughput mode of operations where samples can be mailed to the APS.

High-resolution synchrotron powder diffraction allows for very precise measurements with optimal separation of peaks; this greatly simplifies the challenge of indexing new materials. Use of high-energy x-rays (30-40 keV, 0.3-0.4 Å) improves crystallographic accuracy by greatly reducing the impact of x-ray absorption effects.

The 11-BM beamline features a general-purpose diffractometer with a unique APS-designed 12-detector system. Each detector has an independently aligned analyzer, increasing throughput 12-fold with no degradation in data quality. A complete data set on a powder sample can be collected in an hour or less with an instrumental resolution under $4 \times 10^{-4} \Delta Q/Q$. Mail-in users will have a choice of data collected at either room temperature or 100K. Operation is further enhanced by a robotic sample exchange system that will allow the beamline to accommodate an anticipated 20 to 30 samples a day.

To best exploit high throughput, the beamline will be opened to general users in rapid-access, mail-in mode beginning with Run 2007-3 (fall 2007). Users will submit general-user proposals, specifying "rapid access" on the beam-time request. Upon acceptance, users will enter sample identification data through a Web interface and send samples prepared with special mountings and Kapton capillaries provided by the beamline. Beamline staff will make the measurements and return data via e-mail.

Like the APS, construction of the beamline was funded by the U.S. Department of Energy's Office of Basic Energy Sciences. It is operated by APS Materials Characterization (MC) Group in the X-ray Operations and Research Section, X-ray Science Division; the MC group is headed by Brian Toby, who will be glad to provide more information on the general user program and answer questions about the new beamline (brian.toby@anl.gov).

Note: To meet the needs of users new to crystallographic analysis of powder diffraction data, an educational outreach effort has been started to provide pedagogical materials via the APS Web site. A series of lectures and tutorials related to crystallographic analysis of powder diffraction data can now be found at http://www.aps.anl.gov/Xray_Science_Division/Powder_Diffraction_Crystallography/index.html. Presentations vary in content: Some are targeted for novices, while others are prepared for experts.

CALL FOR GENERAL-USER PROPOSALS

The Advanced Photon Source is open to experimenters from all scientific disciplines whose research requires the highest brilliance hard x-ray beams in the Western Hemisphere.

General-user proposals for beam time during Run 2008-1 are due by November 2, 2007.

Information on access to beam time at the APS is at http://www.aps.anl.gov/user/beamtime/get_beam.html or contact Dr. Dennis Mills, DMM@aps.anl.gov, 630/252-5680.

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