

## Meeting Report:

# School on Synchrotron X-ray Scattering Techniques in Materials and Environmental Sciences: Theory and Application

*May 15-17, 2007, SSRL*



Modern synchrotron-based X-ray scattering (SR-XRS) techniques offer the ability to probe nano- and atomic-scale structures, interfaces, and order/disorder relationships that govern the properties of advanced technological and environmental materials. Important materials studied at the Stanford Synchrotron Radiation Laboratory (SSRL) include thin films and interfaces, nanoparticles, amorphous materials, solutions, polymers, and bacteriogenic minerals. Good planning and a working knowledge of beam lines and techniques are required to successfully conduct SR-XRS measurements. This second annual School at SSRL on Synchrotron X-ray Scattering Techniques in Materials and Environmental Sciences, held at the Stanford Linear Accelerator Center (SLAC) on May 15-17, 2007, provided a practical users' guide to planning and conducting scattering measurements at SSRL beam lines, with an emphasis on information that cannot be found in text books. More than 45 researchers, mostly graduate students and postdocs, participated in this cross-cutting workshop. Attendees represented a variety of fields including, material sciences, applied physics, environmental sciences, and chemistry.

Twelve speakers (ten from SSRL/Stanford and two invited) presented lectures and demonstrations in the workshop. The morning of the first day started out with an introduction to synchrotron scattering techniques (Bridget Ingham, SSRL & Industrial Research, Ltd.), followed by introductory level talks on reciprocal lattice (John Bargar, SSRL), peak widths and intensities

(Arturas Vailionis, Stanford), and SAXs (John Pople, SSRL). The afternoon of the first day consisted of parallel sessions. One of the sessions focused on bulk-structure techniques, and covered structure characterization (Aparva Mehta, SSRL), In-situ scattering (Sam Webb and Jen Leisch, SSRL), and amorphous materials (Todd Hufnagel, Johns Hopkins University). The other parallel session concentrated on surface/thin film techniques, and presentation included epitaxial thin film scattering (Arturas Vailionis, Stanford), polycrystalline and textured polycrystalline thin film scattering (Mike Toney, SSRL), and interface x-ray scattering (Tom Trainor, University of Alaska Fairbanks). The second day started with morning talks about data collection strategies and detectors (Sean Brennan, SSRL), SSRL beam lines (Cathie Condron, SSRL), and an introduction to data collection software (Aparva Mehta, SSRL). The talks are available to download at:

<http://www-ssrl.slac.stanford.edu/conferences/workshops/scatter2007/talks.php>

and will form the basis for an ongoing curriculum.

The afternoon of the second day and morning of the third day involved "on-the-experiment" training at four of SSRL's beam lines (BL1-4, BL2-1, BL11-3, and BL 7-2). These practical sessions were well attended and those that participated benefited greatly from these demonstrations. The afternoon of the third day was devoted to hand-on data processing and analysis; this was in response to suggestions after the first School held in May, 2006.



Based on the comments received, the workshop was tremendously successful in meeting its objectives. All of the attendees came away with new knowledge about how to efficiently collect data at SSRL's scattering beam lines. We are presently deciding on the topics for next year's Workshop; this will likely be x-ray absorption spectroscopy for materials and environmental sciences, and we would appreciate any comments on this.

Many thanks to the DOE, Office of Basic Energy Sciences, and Office of Biological and Environmental Research for supporting this cross-cutting and practical workshop!

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Sam Webb  
John Bargar  
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SSRL