rays on a femtosecond time-scale has been highly prized by the scientific community because, at room temperature, atomic motion takes place, in most cases, on a time-scale of approximately 100 femtoseconds. With femtosecond x-ray pulses, it would be possible, for example, to track the movement of atoms in a sample of material during a phase transition (solid to liquid to gas), a chemical reaction, or any other process of physical change.

The directed beams of femtosecond x-rays were produced at a branch line off the 50 MeV linear accelerator that feeds electrons into the synchrotron booster. Atop this branch line is a femtosecond terawatt near-infrared laser. The laser provides a tightly focused electron beam that is about 90 μm in width; the laser produces photons in 100 femtosecond pulses.

"By crossing the photon and electron beams at a right angle, we obtain scattered x-ray pulses lasting about 300 femtoseconds that travel along the direction of the electron beam," said Robert Schoenlein of the Materials Sciences Division. "The duration of the x-ray burst is determined by the transit time of the laser pulse across the waist of the focused electron beam."

Once femtosecond pulses of x-rays are generated, a magnet is used to remove the electron beam. What is left are pure femtosecond pulses of x-rays. The research team detected these pulses using an x-ray sensitive phosphor screen. Visible photons from the phosphor were then imaged onto a charged-coupling device camera.

The images showed that the x-ray photons arrived as an elliptically shaped beam, similar to the shape of the electron beam from which they were generated. Additional measurements indicated that the beam was delivered at an energy of 30 keV and flux of about 10^5 photons per pulse. These results were in accordance with theoretical predictions. □

CONFERENCE REPORT

Major Topics of Small-Angle Scattering Discussed in Brazil at SAS-96

The X International Conference on Small-Angle Scattering (SAS-96), chaired by Aldo Craievich, took place on July 21–25, 1996 at Campinas, São Paulo State, Brazil. The choice was mainly motivated by the excellent development of this technique in Brazil and by the conclusion of the synchrotron radiation facility of the Brazilian National S. R. Laboratory at Campinas (LNLS), the first equipment of this kind in the southern hemisphere.

The conference was held at the Telebras R&D Center. The exciting and pleasant conference was full of new scientific results and conducted in a friendly atmosphere. The number of participants and scientific contributions were the highest so far: 220 scientists, from 25 countries, presented 215 scientific papers and submitted 90 manuscripts for the proceedings of the Conference, to be published by the *Journal of Applied Crystallography*.

The different sessions, microsymposia and poster sessions received a high level of attendance. The field of small-angle scattering continues to develop rapidly, both in the extension of the scientific fields covered and in the depth of the analysis and of the theory. Several people organized, in parallel sessions, eight short microsymposia in particularly "hot," but necessarily less general, fields. The microsymposia were centered on a number of subjects, including the following.

Impressive results were presented on simultaneous use of wide- and small-angle techniques, for example, time-resolved experiments of x-ray scattering during crystallization. This progress is mainly due to the high flux available at the synchrotron sources.

Important achievements obtained recently in the understanding of the structure of complex liquids, such as microemulsions and bicontinuous and lamellar phases, were reported. The progress in this field is mainly due to improvements in the theory of data analysis.

The use of perfect-crystal cameras allows measurements with very high resolution, at least at facilities where a large flux is available. The microsymposium dedicated to this subject provided an opportunity to discuss recent devices.

Ill-ordered materials and anisotropic studies is another topic where many original studies continue to appear, namely, in the field of liquid crystals. Here, too, the technique plays an important role through the generalized use of high-definition, two-dimensional detectors.

Associating polymers, block copolymers, and gels, the fields where small-angle scattering is probably the dominant technique, correspond to many new materials. Their structural properties are the object of new experiments where isotropic substitution plays a major role.

In the growing field of biology, structures and conformations and their modifications under the action of external parameters have been the object of detailed studies and many possibilities remain open for specific studies by x-rays of tiny samples, using the focusing possibilities and the high fluxes of synchrotron sources.

The general sessions of the conference and the poster session were divided into four classical large domains where small-angle scattering is important: General Interest, Inorganic Materials, Polymers and Complex Fluids, and Biology.

SAS applications to solid-state physics and biology are rapidly developing fields and interesting original results have been reported, for instance, in the case of time-resolved experiments on superalloys, nanocrystalline material characterization, and the use of x-ray standing waves for investigations of thin films.

A satellite workshop was held just after the end of SAS-96, focusing on Instrumentation and Industrial Applications of SAS. Papers on these subjects were presented and discussed in two short microsymposia which took place at LNLS on July 26. Reports on new developments of neutron SAS sources, status reports of a number of new synchrotron SAS beamlines, and x-ray detectors were presented. The talks on industrial applications dealt with the industrial use of large academic facilities and on SAS applications such as on-line characterization of fiber processing. The participants recommended inclusion of these subjects in forthcoming SAS conferences.

The number of students present at the scientific sessions, coming from many universities in Brazil, is encouraging for the future development of the technique in South America. The visit to the new synchrotron radiation facility at LNLS showed that the necessary heavy technology around such a large instrument already exists in Brazil, that new and original technical ideas are under development, and that the forthcoming years can be seen with optimism.

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