MS01.04.06 A COMMERCIAL CCD DETECTOR FOR X-RAY DIFFRACTION FULLY IMPLEMENTED ON A THIRD GENERATION SYNCHROTRON SOURCE. James F. Fait, John L. Chambers, and James C. Phillips. Siemens Energy & Automation, Inc. 6300 Enterprise Lane, Madison, WI 53719-1173, U.S.A.. Eric Hovestreydt, Siemens AG, Analytical Systems, D76181 Karlsruhe 21, Germany

Based on experiments performed at SSRL and BNL with the Siemens SMART CCD detector, we have fully adapted the goniometer and detector system for synchrotron radiation use. The following major adaptations were made in the hardware and software:

- ω/2θ axis parallel to polarization direction (horizontal).
- New detector mount with drive for sample to detector distance.
- Fast, consistent shutter.
- Incident beam monitor and correction facilities.
- Polarization correction.
- In-Situ Phosphor change for improved efficiency at differ ent wavelengths.

With this system installed on ID11 at the ESRF, we were able to demonstrate the effectiveness of the SMART system for use at a third generation synchrotron source. Samples were measured with incident beam energies from 8 KeV to 62 KeV, with the results presented here.

MS01.04.07 MODULAR CCD-BASED DETECTOR FOR CRYSTALLOGRAPHY AT SYNCHROTRON BEAMLINES. Alexander Stewart, Walter Phillips, Martin Stanton and Daniel O'Mara, Rosenstiel Basic Medical Sciences Research Center Brandeis University, Waltham, MA 02254

The detector is assembled from an array of 4 modular units, each unit constructed from a fiberoptic taper (with a 4:1 demagnification factor) with a phosphor x-ray converter deposited on the large end of the taper and a CCD epoxy-bonded to the small end. Each of the 4 modules has an area of 100x100mm square imaged into 1000x1000 pixels. The 2000x2000-pixel detector image is readout in 1.6s at 16 bits and stored on disk. We describe the design of detector hardware, electronics and data-readout method, and calibration and data-collection software. We discuss detector performance in terms of the DQE, point response function, dynamic range, and XDCE, and discuss the advantages and limitations of this and similar CCD-based detectors. Results from data collected at several beamlines with a single module will be presented.

MS01.04.08 IMAGING PLATE ST-V AND LARGE IP READER IPR4080. N. Sakabe, N. Watanabe[1], M. Suzuki[1], J. Miyahara[2], K. Sasaki[3] & K. Sakabe[4], Institute of Applied Biochemistry, University of Tsukuba, Tsukuba, Ibaraki, 306 Japan, [1]PF, KKK. Tsukuba, Ibaraki, 305 Japan, [2]Fuji Photo FiLm Co. Ltd, Miyanodai, R&D Center, Ashigarakamigouri, Kanagawa, 258 Japan, [3]College of Medical Technology, Nagoya Univ.Higashi, Nagoya, 461 Japan, [4]Dep. of Chem. Nagoya Univ., Chikusa, Nagoya, 464 Japan

Imaging plate (IP) is one of the best detector for X-ray crystal analysis. It is necessarily to keep sample to detector distance large to get large signal/background noise ratio. This means the size of IP must be larger the better, however, the size is limited by many reasons such as availability of handling IP readers. The other important nature of IP is sensitivity, dynamic range and spatial resolution, and so on. In the PF, we have used the 400x200mm size of BASIII type of IP with BA100 and BAS2000 as the readers for protein crystallogrpahy. Recently we have examine ST-V type of IP and get good results. The imaging plate ST-V gives 20% high S/N ratio at wavelength being 0.7A in S/N ratio in comparison with that of BASm. An image reader(IPR4080) for Large IP (400x800mm) has been developed. Dynamic range of this IPR4080 is 10^5 order. Sensitivity is very similar to that of BA100; two X-ray photons can be detectable.

PS01.04.09 IMAGING PLATES AS AN INTEGRATING AREA DETECTOR FOR X-RAY SCATTERING AND DIFFRACTION OF POLYMERS. M. Dosiäre, C. Dammer, Universite de Mons-Hainaut, Laboratoire de Physicochimie des Polymäres, place du Parc, 20, B - 7000 - Mons, Belgium

Imaging plate (IP) initially developped for diagnostic radiography by Fuji Photo Co., Ltd.(1), has been used as a two-dimensional integrating X-ray detector(2). The image plate has a high quantum efficiency, a wide dynamic range of 4 to 5 digits and no counting rate limitation. Fuji plates have been substituted to X-ray films in a pinhole collimation camera allowing to record simultaneously wide and small angle patterns of polymers with conventional X-ray generators (sealed tube and rotating anode) available in a laboratory. The two large advantages of imaging plate with respect to the X-ray film is the availability of the intensity in the same time as the position of the diffracted spots and its quickness. The image plate is a 120 mm edge size square ; the pixel size is 50 Êm. The Fujix BAS 3000 device was used to read-out the image. Use-friendly computing programmes have been developped in C++ language in Windows environment for polymer physics. For isotropic polymer samples, the signal to noise ratio has been substancially increased by integrating the diffraction circles.A routine allows to determine with a precision of 1 pixel the center of the X-ray pattern. The experiment X-ray data are corrected for absorption of the sample, polarization, Lorentz factor,...

The following programmes concerning polymers has been developped and are available with reference samples (PE,PP,PEO,PEEK,...) to determine: a) the dhkl spacings and to calculate the unit cell parameters or their modification resulting from thermal dilatation, compression...; b) the degree of crystallinity from wide angle X-ray diffraction pattern; c) the orientation function of oriented samples (spherulite, stretched or rolled samples); d) the long spacing from SAXS patterns; e) the orientation of the chain axis with respect to the limiting faces of lamellar crystals in oriented samples; f) the integrated SAXS intensity (invariant); g) the correlation fucntion from SAXS intensity data. Demonstrations of these friendly use programmes will be presented.

References
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