

Low-Angle X-ray Diffraction with the GADDS System

Low angles - anisotropy - area detector - GADDS

This example describes the use of the GADDS System with the HI-STAR Area Detector to measure samples that diffract at low angles. The advantages of this Area Detector include

- 1) short exposure times,
- 2) low intrinsic background,
- 3) data in digital form, and
- 4) a two-dimensional diffraction pattern providing information about anisotropic diffraction.

The experimental conditions consist of a standard instrument configuration with a small modification of the size and positioning of the primary beamstop.

The experimental results from a wax sample (Fig. 1) and a soap sample (Fig. 2) show excellent system performance for low-angle diffraction measurements.

The low angle peak for the wax sample at $2\theta = 1.18^\circ$ is well resolved. Generally, diffraction peaks down to at least $2\theta = 0.5^\circ$ can be observed. With further optimizing of the pinhole collimator and the beamstop size, this value can be further reduced.

The experiment results from a soap sample show an additional feature which can be observed with the HI-STAR Area Detector: the anisotropy of the diffraction rings. This feature is clearly shown in the outer rings (Fig. 2) and is quantitatively displayed in an Intensity versus χ plot for the lowest peak at $2\theta = 2.1^\circ$.

Experimental Conditions

System:	GADDS System with HI-STAR area detector
Source:	sealed tube, Cu anode
Monochromator:	flat graphite
Collimator:	0.5 mm pinhole
Beamstop:	4 mm diameter, in front of the detector
Count time:	600 seconds/frame for the soap; 60 seconds/frame for the wax
Sample-detector distance:	30 cm
Sample:	soap and wax
Sample rotation:	none
Measurement mode:	transmission

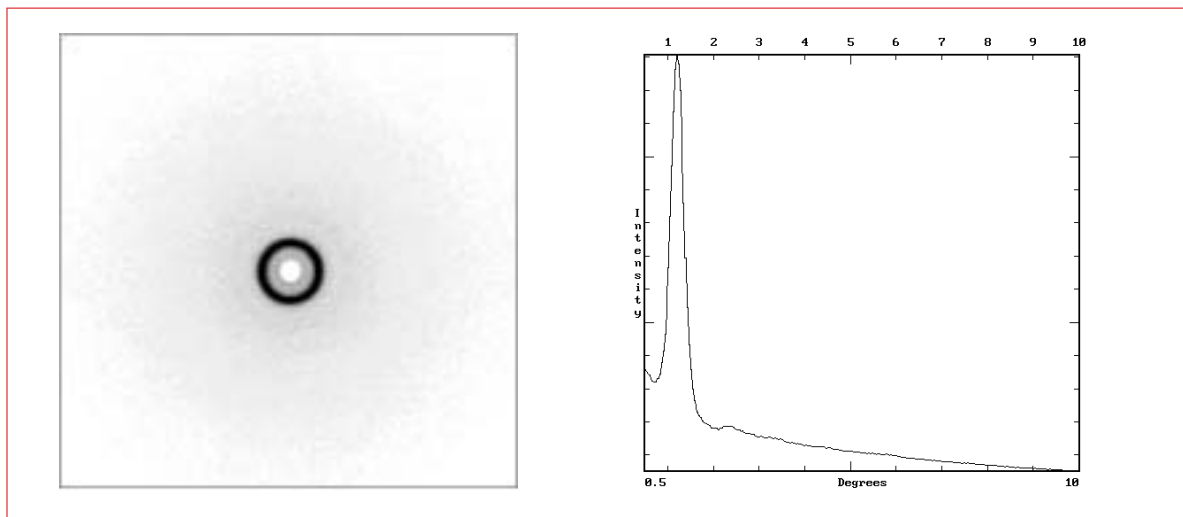


Figure 1 – Area detector data (left) and the resulting 2θ diagram (right) for a wax sample.

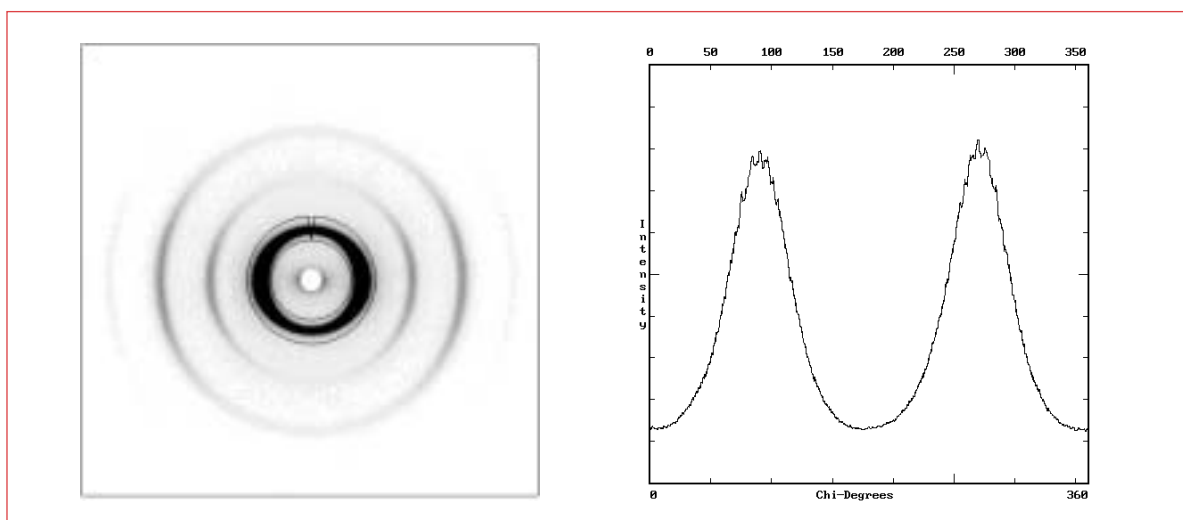


Figure 2 – Area detector data (left) and the anisotropy of the peak at $2\theta = 2.1^\circ$ shown by I versus χ diagram (right) for a soap sample. The border lines of the integration range are also shown.

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