



ANALYTICAL INSTRUMENTS GROUP

Monochromators



Secondary graphite monochromator

Secondary flat and curved graphite monochromators suitable for Ag, Cr, Fe, Cu, Co and Mo radiations

This attachment is installed in the X-ray detection unit. It is designed to remove continuous X-rays, $K\beta$ rays as well as fluorescent x-rays emitted from the sample. It can selectively take out monochromatized X-rays required for analysis ensuring diffraction patterns with an excellent signal to noise ratio.



Johansson $K\alpha_1$ monochromator

Johansson focusing germanium, quartz, silicon $K\alpha_1$ monochromators

By means of focusing monochromators it is possible to obtain powder diffractograms with strictly monochromatic peak profile. The use of focusing X-ray monochromators leads to a considerable decrease of the background scattering level as well as to an improvement in resolution. Many organic and inorganic compounds have complicated diffraction patterns with overlapping lines. For high precision crystallographic studies it is necessary to have pure $K\alpha_1$ radiation for optimum line separation. It is ideal for crystallographic analyses such as cell searching, indexing, unit cell refinement and structure solution from powder data.



Parabolic monochromator

Parabolic monochromators

For parallel beam applications, a single parabolic monochromator can be mounted as attachment on the incident beam.

It makes the beam parallel in one dimension while letting it diverge in the other dimensions.

The resulting parallel beam is directed onto samples mounted on the theta stage of the APD 2000 PRO diffractometer.

With the parabolic monochromator, exact positioning of the sample is not necessary, and irregularly-shaped, non-flat specimens can be examined without difficulties.



ANALYTICAL INSTRUMENTS GROUP

Detectors

Dynamic scintillation NaI/YAP(Ce) detectors

The Dynamic Scintillation NaI/YAP(Ce) Detectors are our standard detectors with low background (0.4 cps) and high dynamic range up to 2×10^6 (NaI) or 2×10^7 (YAP(Ce)) cps.



Dynamic scintillation NaI detector

BLITZ – Silicon drift detector



BLITZ – Silicon drift detector

| | |
|-------------------|--|
| Sensor | SDD (silicon drift detector) droplet type |
| Active area | 5 – 30 mm ² |
| Shaping time | Standard: 1µs or 250ns Customable: 10 µs – 100 ns |
| Energy resolution | Shaping time 1µs: 124eV FWHM @Mn Kα Shaping time 250ns: 136eV FWHM @Mn Kα |
| Cooling | Air |



ANALYTICAL INSTRUMENTS GROUP

CELERIX – One-dimensional silicon strip detector

Designed for simultaneous data collection, allows to reduce the acquisition time by a factor of 100 to 1000. It can measure the intensity distribution of a region of 20° or more with very good spatial resolution.

The CeleriX is a silicon strip detector operating in single-photon counting mode suitable for the applications where a high dynamic range and an excellent data quality are required. It is like having several hundred of detectors working simultaneously. The silicon strip technology offers direct detection of the X-rays and the ability to efficiently process high count rates, without any sacrifice in resolution. It is a perfect solution for an application such as quantitative Rietveld analysis with short data collection times.

The CeleriX detector is air-cooled and therefore very simple in the operation and handling.

Main specifications:

| | |
|-------------------------|---|
| Sensor | Reverse-biased silicon diode array |
| Active area | 8 x 64 mm ² |
| Format | 1280 strips |
| Strip size | 50 μm +/- 3 μm |
| Energy range | 5 – 30 keV |
| Quantum efficiency | 5 keV: 90%; 8 keV: 96%; 15 keV: 49%; 30 keV: 8% |
| Counting rate per pixel | > 2 x 10 ⁵ per strip |
| Readout time | 0.3 ms |
| Cooling | Air cooled |
| Power consumption | 5 W |



Features:

- Direct detection of X-rays in single-photon-counting mode
- High dynamic range
- High counting rate
- Adjustable threshold to suppress fluorescence
- Short readout time
- No cooling
- Maintenance free



ANALYTICAL INSTRUMENTS GROUP

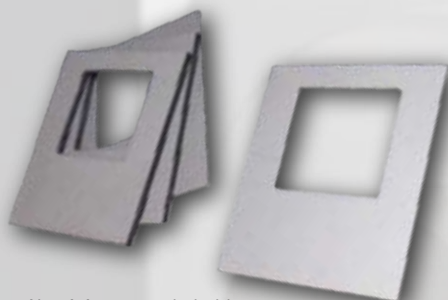
Sample holders

Standard sample holders

X-ray diffraction is a non-destructive analytical method which determines the properties of solid or fluid matter in a few microns and a nanometre length scale. In comparison with other complementary methods X-ray diffraction does not require any complex sample preparation.

The following aluminium and Si low background sample holders are supplied as standard with the APD 2000 PRO diffractometer.

| Description | Sample area | Application |
|---------------------------------|-------------|------------------|
| Aluminium sample holder | 20x15 mm | General purpose |
| Si low background sample holder | 20x15 mm | Lattice constant |



Aluminium sample holder



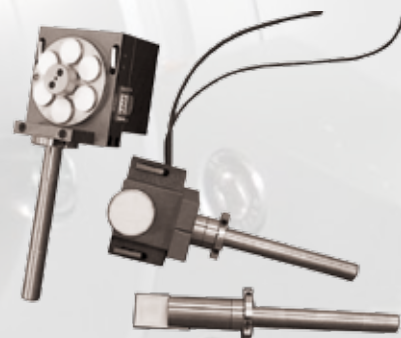
Si low background sample holder

Rotational sample stage

Usable to lower the scatter in diffraction pattern intensities attributable to the sample crystalline orientation, and therefore increase the precision in most type of quantitative analysis.

Main specifications:

| | |
|-----------------------|--------------------|
| Sample rotation speed | 100 rpm |
| Sample size | 40 mm dia. maximum |



Standard, rotational and multi sample changer

Automatic sample changer for six samples

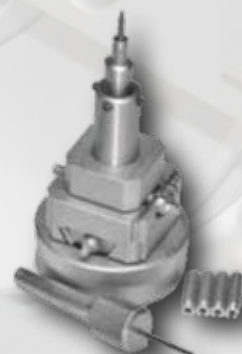
This stage is used in order to automatically measure up to six samples.

Sample size: 22 mm dia. maximum

Capillary sample holder

The capillary technique is ideal for examining small sample quantities or air-sensitive samples in a closed environment.

A precise goniometer head which is aligned under microscope control guarantees coincidence of capillary and diffractometer axis.



Specimen carrier for capillaries



ANALYTICAL INSTRUMENTS GROUP

High and Low Temperature Chambers



TTK 450 Low Temperature Chamber

The TTK 450 Low Temperature Chamber is designed for X-ray diffraction studies in the temperature range from -193°C to 450°C. Tests can be carried out either under vacuum, air or inert gas.

To work at low temperature liquid nitrogen is transferred by insulated hoses from a dewar to the chamber. The hoses are connected with a special designed two-pipe ball connector

which can be turned by approx. 180°, even if the apparatus is frozen.

The TTK sample holder is easily accessible. No realignment is necessary for high and low temperatures of for different sample holders.



Cryo and Humidity Chamber - CHC plus+

CHC plus+ is a unique combination of the multi-purpose CHC Cryo & Humidity Chamber for in situ X-ray diffraction (XRD) studies and an advanced humidity generator. This new combined set-up is focussed on powder XRD studies of pharmaceuticals and building materials at low and high temperatures as well as under controlled humidity conditions.

The gas humidifier is controlled with a calibrated RH sensor located inside CHC plus+ close to the sample. The chamber housing is temperature-controlled with a water bath.

This set-up together with the excellent control performance of the MHG generator provides uniform and well defined humidity conditions around the sample.

| | |
|--|---|
| Humidity | 2 to 95%RH from 10 to 60°C 2 to 70%RH at 80 °C |
| Temperature range with compressed-air cooling | Dry air: -5 to 300 °C Vacuum: -5 to 400 °C |
| Temperature range with liquid nitrogen cooling | Vacuum: -180 to 400 °C Dry air: -120 to 300 °C |
| Atmospheres | Air, nitrogen, inert gas, vacuum |
| X-ray geometry | Reflection |



ANALYTICAL INSTRUMENTS GROUP

Polycapillary collimators



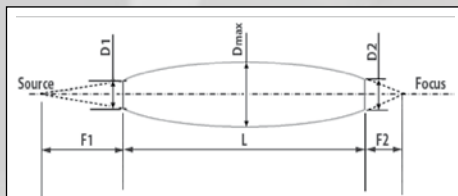
Polycapillary collimator

Polycapillary collimators operate by collecting X-rays and efficiently propagating them by total external reflection to form focused and parallel beams.

These optics can dramatically enhance the performance of conventional X-ray equipments and are becoming integral components of state-of-the-art instruments rather than an optional part.

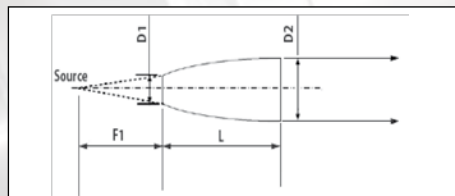
Polycapillary X-ray optics have variety of applications by which the scattered X-ray input radiations can be focused and intensified to your special needs.

Technical Specifications – Full Lens



| | |
|----------------------------|---------------------|
| Inlet focal length F1 | > 40mm |
| Lens length L | 100 – 120mm |
| Outlet focal length F2 | > 40mm |
| Face diameter D1 | 3.5 - 5.0mm |
| Maximum lens diameter Dmax | 6 – 8mm |
| End diameter D2 | 3.5 - 5.0mm |
| Capture angle | 0.05 - 0.1rad |
| Energy range | 5 – 22KeV (Cr – Ag) |
| Optimal source size | >70µm |
| Focal spot size | 75 - 150 µm |
| Transmission | 5 - 35 % |

Technical Specifications – Half Lens



| | |
|----------------------------------|---------------------|
| Inlet focal length F1 | > 40mm |
| Lens length L | 30 – 65mm |
| Face diameter D1 | 3.5 - 5.0mm |
| Exit diameter D2 | 3 - 8mm |
| Capture angle | 0.05 - 0.1rad |
| Energy range | 5 – 22KeV (Cr – Ag) |
| Optimal source size | >70µm |
| Angle of divergence /convergence | 1 - 10 mrad |
| Transmission | 10 - 50 % |