SOL-X ENERGY DISPERSIVE X-RAY DETECTOR

One of the main influences on the quality of day-to-day X-ray diffraction experiments is the level of background obtained. The sample itself contributes to the overall background level particularly where the incident beam causes it to emit secondary X-rays (i.e. fluorescence). The source produces emission lines characteristic of the anode material and these are responsible for the diffraction peaks observed. In addition the source produces a broad continuum (white radiation) which can also fulfil the Bragg condition and therefore contributes to the background. The Sol-X energy dispersive detector, which has excellent energy resolution, is the ideal means of removing these unwanted background features.

Also, the Sol-X's energy window can be set to remove undesired diffraction peaks (e.g. K-βs) and it avoids the intensity losses associated with filters or monochromating crystals placed in the beam path. The resulting improvement in intensity can significantly reduce the measuring time required.

The heart of the Sol-X detector is the uniquely sized Li-drifted Silicon sensor featuring 4 x 15 mm surface and 3 mm active depth. This enables the use of X-ray energies between 2 KeV and 30 KeV, which includes all the commonly used wavelengths between Cr-Kα_1 and Mo-Kα_1. The Lithium drifted Silicon detector (Si(Li)) sensor is cooled down to about -100° C thermoelectrically by Peltier elements. The Sol-X detector is seamlessly integrated into a D8 or D4 diffractometer system in the same way as a conventional scintillation counter.

Features

- Large sized X-ray sensor for shorter measurement times – no photons are missed.
- High energy resolution with low background noise for outstanding lower limit of detection.
- High linear count rate capability for high throughput diffraction analysis.
- Maintenance-free design for ease of use in demanding industrial and scientific applications.

Analytical Background

The quality of an X-ray diffraction analysis is crucially affected by the peak width (FWHM), the peak-to-background ratio (PTBR) and the absolute count rate (ACR). Therefore, it is essential to select the most appropriate diffraction system setup in order to obtain the most detailed sample property measurements.

FWHM is basically defined by the mechanical configuration and the X-ray optical components used, whereas the detector is the essential component for the appropriate PTBR and ACR.

The PTBR determines the lower limit of detection – in other words - whether or not a minor crystalline phase can be detected. Furthermore, a quantitative phase analysis will be more reliable if the PTBR is big.

On the other hand the accuracy of an analysis gets better if the ACR is higher due to the fact that the statistical counting error varies with the square-root of count rate.

Specifications	
X-ray energy operating range	E = 2 keV - 30 keV
Energy resolution ΔE	ΔE ≤ 300 eV at 10^3 cps
Energy resolution ΔE	ΔE ≤ 350 eV at 5×10^4 cps
Linearity range	up to 7.5×10^4 cps energy integral events
Detection efficiency	> 90 % for Cr-, > 98 % for Cu-, and > 98 % for Mo-radiation
Active area	4 x 15 mm^2
Crystal thickness	3 mm
Rectangular Be-entrance window with thickness	140 μm
Selectable pulse shaping time	6 μs or 3 μs

Order numbers	
Sol-X solid state detector for D8 DIFFRACTION SOLUTIONS and SUPER SPEED SOLUTIONS	C79298A3244D300
Sol-X solid state detector for D4 ENDEAVOR	C79298A3244D301

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