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Thermo Scientific ARL EQUINOX LAUE

X-ray Diffractometers

ThermoFisher SCIENTIFIC



What is Laue X-ray Diffraction?

Today, the Laue method is predominantly used to determine the crystallographic orientation of fixed single crystals or wafers.

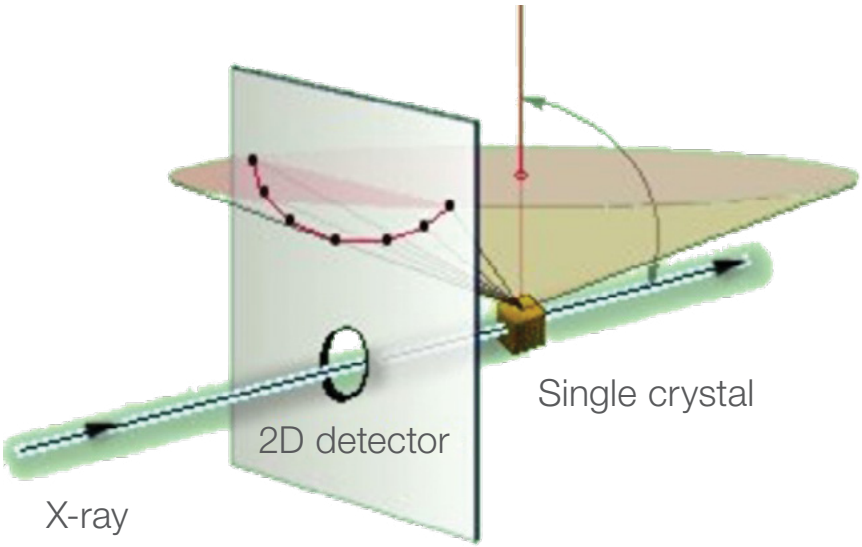
In contrast to a traditional powder diffraction experiment In Laue diffraction, white Bremsstrahlung is used instead of monochromatic radiation. The signals appear as arched arrays of reflections which are captured by a 2D detector.

Each set of lattice planes diffracts X-rays with a wavelength that satisfies Bragg's law. As white Bremsstrahlung is used, for each set of reflections the wavelength of the diffracted radiation is unknown which makes indexing of the signals difficult.

Back-reflection Laue Method

In the back-reflection method, the 2D detector is placed between the X-ray source and the crystal. The backwards diffracted radiation intersects the detector and is detected.

The transmitted beam defines the cone of Laue reflections, which generally resembles a hyperbolic shape upon intersecting the detector.



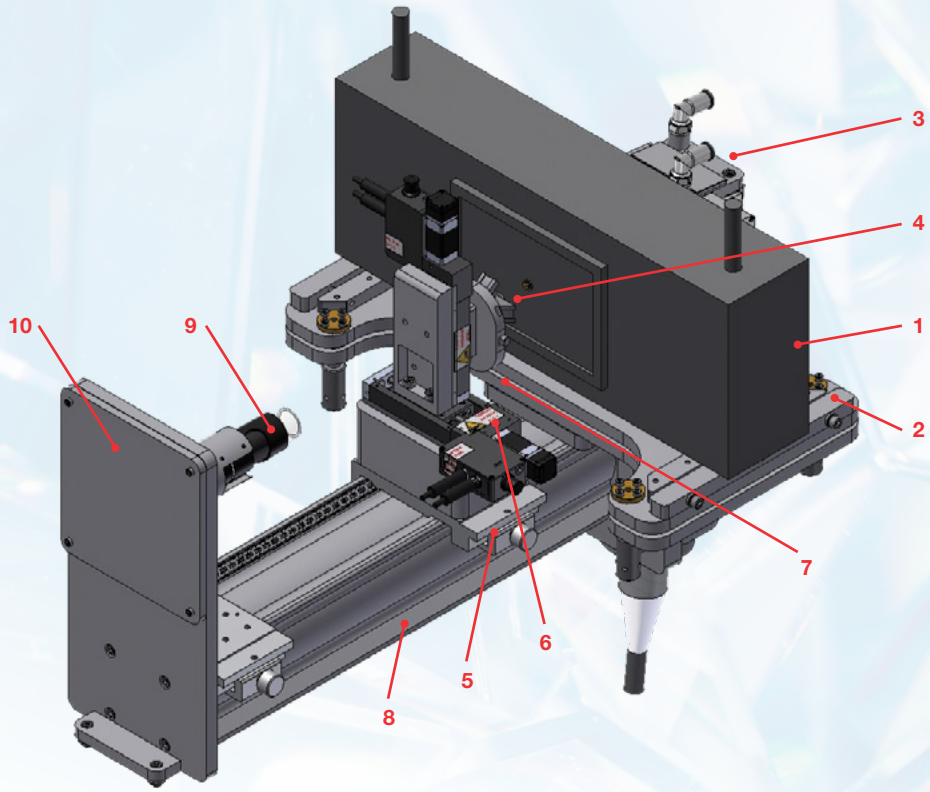
Schematic diagram of a diffraction assembly by the Laue method
Thermo Scientific ARL EQUINOX LAUE



Features

Thermo Scientific™ ARL™ EQUINOX LAUE X-ray diffractometer (XRD) is a cost effective solution to meet at all requirements in both industrial and academic research laboratories as well as QC/QA or operations facilities.

- Full 3kW power instrument, Mo or W wavelength
- Back reflection 2D camera
- Integrated beam collimation
- Motorized sample positioning
- Sample positioning by camera
- Manually operated goniometer head, directly transferable to a wire saw



1. CCD X-ray detector
2. Detector adjustable holder
3. X-ray source
4. Collimator
5. Sample holder stand
6. YZ stage
7. Head goniometer
8. Optical X rail
9. Alignment camera
10. Beam stop

Camera specifications

Using the high resolution Thermo Scientific™ ARL™ EQUINOX LAUE camera it is possible to record digital Laue diffraction pattern with a resolution of 2774 x 1843 pixels and 14-bit digitization. The X-ray beam passes through the camera and is collimated. The active area input dimension is similar to that of Polaroid film i.e. 156 mm x 104.4 mm. Exposures from a few seconds up to >30 minutes can be adjusted during crystal orientations, before being cut for example.



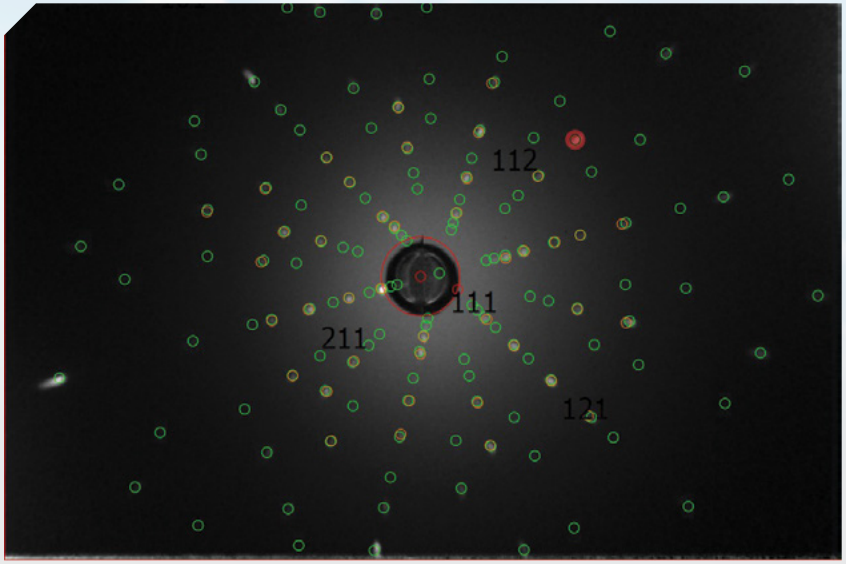
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Applications fields

The ARL EQUINOX LAUE is a versatile XRD instrument adapted to the determination of crystal orientation like ingots, wafer, turbine blades, precious stones, jewelry, etc.

Examples of crystals : Al_2O_3, YAG, KTP, CdTe, Quartz, Tungsten, CaF_2, LiF, etc.

- Fast collection of Laue patterns of single crystals
- High intensity white radiation allows quick data aquisition
- High energy radiation leads to large measured volume due to high penetration depth
- High information density in Laue pattern due to multi diffraction



Diamond crystal

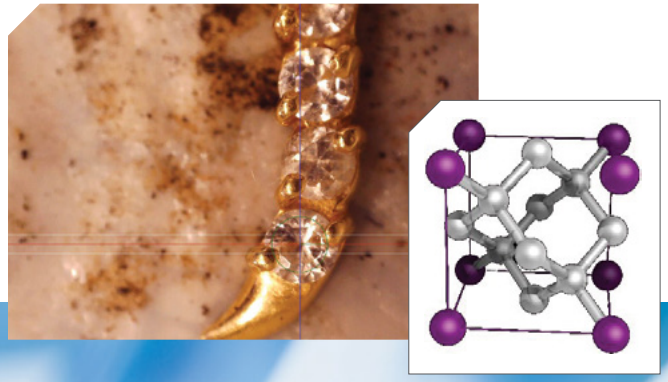
This diamond crystal is a cut fashion jewelry (few mm^3).

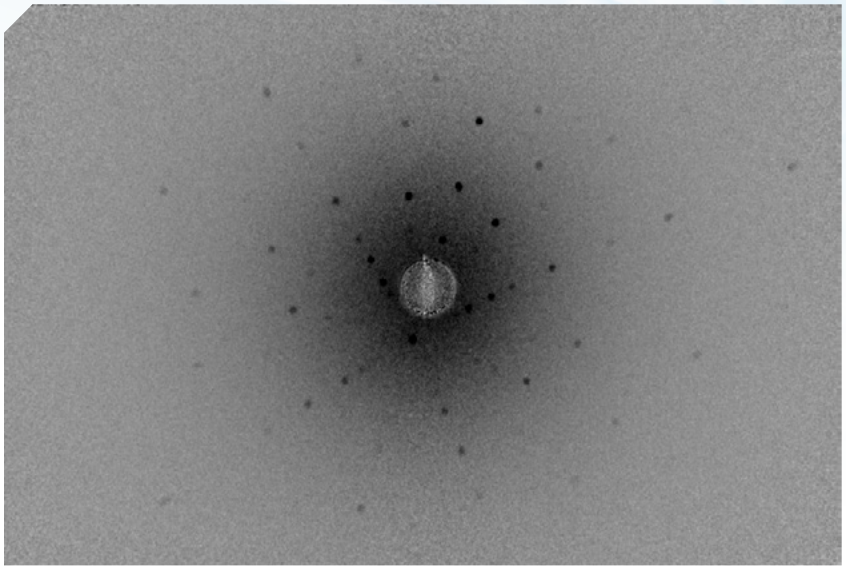
The dots are well defined and the orientation is (111).

Diamond on earing

With the video camera, one crystal can be adjusted, and then measured in Laue XRD. The size of the gemma is about 2 mm.

The Laue pattern shows the (100) axis of the diamond, evidenced by the fourfold symmetry.

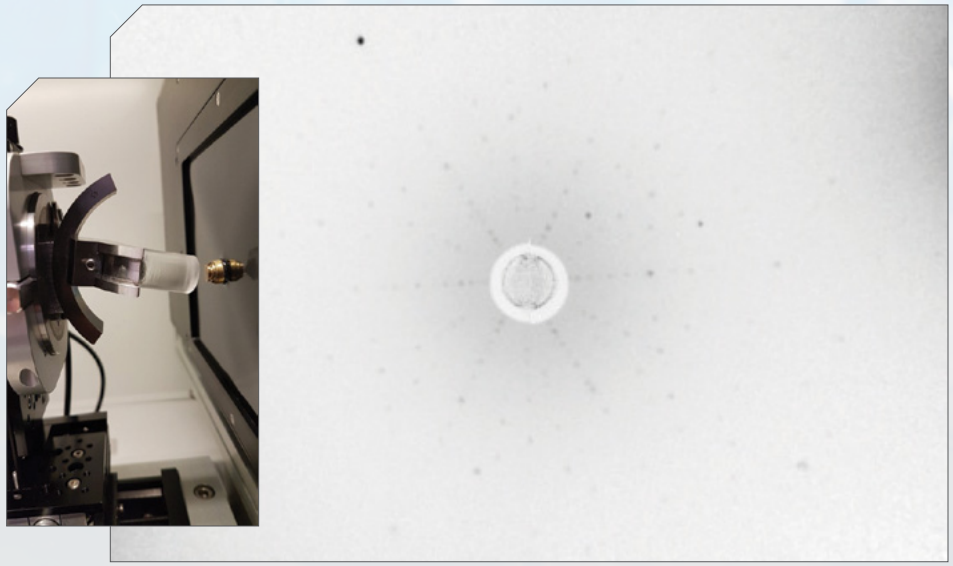


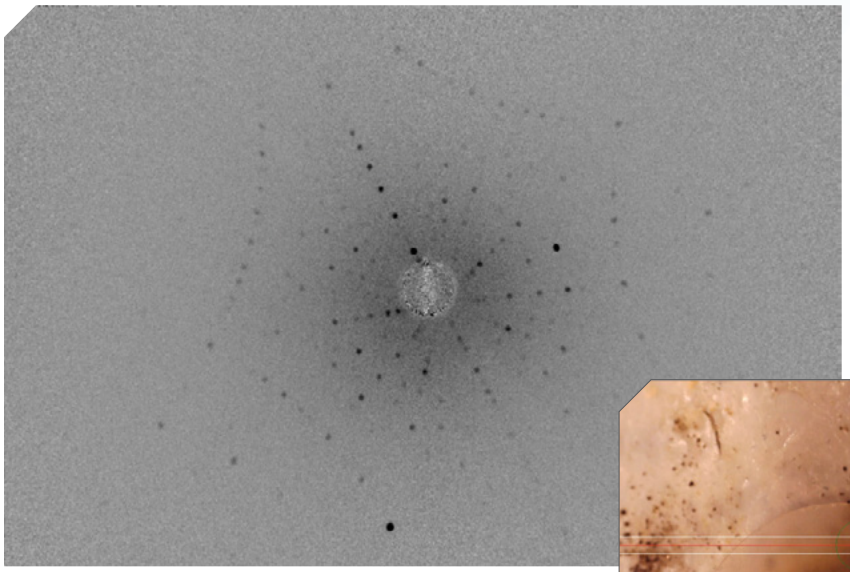


Fluorine crystal

A Fluorine crystal (used for laser emission) is synthesized and transfered to a goniometer head, which is compatible with the ARL EQUINOX Laue and a wire saw.

Therefore, after precisely determining the (111) direction by means of Laue measurements direct cutting of the crystal is possible.



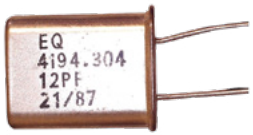


Quartz resonator

The electrical contacts are visible on each side of the picture. The cross-hair indicates the position of the X-ray beam.

A quartz resonator is a single crystal which is able to vibrate along a crystallographic axis by applying an oscillating voltage.





Notes

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X-ray diffraction portfolio

Thermo Fisher Scientific offers a broad X-ray diffraction portfolio using Position Sensitive Detectors (PSD) from simple bench-top instruments to the most advanced platforms which enable material scientists and engineers to perform qualitative, quantitative and advanced structural investigations on a variety of materials. Applications vary from routine QC/QA related phase quantification in industrial process control to real-time determination of structures, polymorphism, reactivity or kinetics of advanced materials in the form of powders, solids, or thin films. Thermo Scientific X-ray Diffraction products are designed to exceed your analytical needs.



ARL EQUINOX 100



ARL EQUINOX 3000



ARL EQUINOX 5000

Find out more at **thermofisher.com/xrd**

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