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RICHARD ROTH
J. PLETCHER
M. SAX

Department of Crystallography
University of Pittsburgh
Pittsburgh
Pa. 15260
U.S.A.

Biocrystallography Laboratory
Veterans Administration Hospital
Pittsburgh
Pa. 15240
U.S.A.

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T. T. HITCH*
J. J. NUNES†

Materials Engineering Department
J. L. KATZ

Laboratory for Crystallographic
Biophysics
Department of Physics
Rensselaer Polytechnic Institute
Troy
New York 12181
U.S.A.

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References


* Present address: RCA Laboratories, David Sarnoff Research Center, Princeton, New Jersey 08540, U.S.A.
† Present address: Ceramics Division, Knolls Atomic Power Laboratory, General Electric Company, Schenectady, New York 12309, U.S.A.


A method for the rapid orientation of back-reflection Laue X-ray photographs for zinc

A particularly fast method of orienting zinc single crystals with a standard back-reflection Laue X-ray camera and relatively short exposures is described. The method, similar to one described by Barrett (1952), depends on the identification by inspection of the location of the (0001) pole and superposition of the other strong poles on a special standard projection (Fig. 1).

In back-reflection films for zinc crystals, most poles of strongly reflecting planes lie on a number of rather obvious zones which intersect at the (0001) poles. Orientation of the crystal requires that the two or three zones most densely populated with Laue spots (‘major zones’), intersections of more than two zones, and all the zone axes be mapped from the Laue film onto a stereographic net with the help of a Greninger chart.

The major zones are then extended until they intersect at a point presumed to be the (0001) pole. All poles and fiducial marks are then rotated so that the chosen major-zones intersection is brought to the center. If the poles of the stereographic projection can then be made to superimpose on those of the standard projection (Fig. 1), the orientation is uniquely determined. When a few spots on the stereographic projection will not match with the standard projection in the five simplified segments, but coincidence is otherwise good, rotation of the difficult poles to the more nearly complete segment will usually show coincidence.

The more nearly complete segment of the standard projection, plotted from computer calculation by Skelton (1967), includes all poles with h and k from 0 through 5 and l from 0 through 10, as well as certain others seen sufficiently often to be included by more extensive calculations. The other five segments include only the poles of strongly reflecting planes which were noted again and again in these analyses.

The X-rays used were from Cu-target tubes operated at 35 kV. The method has been used on cadmium directly; the maximum angular discrepancy incurred by using Fig. 1 with cadmium is one degree.

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T. T. HITCH*
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Materials Engineering Department
J. L. KATZ

Laboratory for Crystallographic
Biophysics
Department of Physics
Rensselaer Polytechnic Institute
Troy
New York 12181
U.S.A.

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T. T. HITCH*
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Materials Engineering Department
J. L. KATZ

Laboratory for Crystallographic
Biophysics
Department of Physics
Rensselaer Polytechnic Institute
Troy
New York 12181
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An inexpensive X-ray warning device*

An inexpensive, long-life X-ray-ON indicator based on a conventional high-intensity, goose-neck lamp has been designed to operate in a fail-safe mode on many different types of X-ray diffractometers, including the older ones. The increasing general concern about the safe operation of X-ray diffraction equipment has prompted the design of this warning device.

Since more than 50 different generators of disparate ages were involved in this laboratory, it was clearly essential that the indicator design be flexible as well as inexpensive. An additional design criterion of reliability was mandatory; it is necessary that the X-ray machine be automatically turned OFF should the indicator fail.

* This work was performed under the auspices of the United States Atomic Energy Commission.
The device which has been fabricated consists of a modified high-intensity lamp fixture interlocked with the X-ray machine via a relay circuit. The lamp fixture has a magnetic base and a goose-neck holder. These features make it easy for one to position the lamp at the point of maximum concern. Many types of visible indicators such as xenon lamps, neon lamps, and solid-state light emitting diodes were considered; none could compete with the incandescent lamp for the combination of low cost, high visibility, and long life. The best combination of brilliance and long life found was a 1815 fourteen-volt lamp derated to ten volts.

The interlock circuit (Fig. 1) consists of a DC power supply that energizes a series lamp-relay combination used to turn OFF the X-ray machine in the event of a lamp failure. DC power was used because power consumption is lower than with AC and there is no annoying relay noise. The possibility of an electric shock was eliminated by transformer isolation and a low-voltage interlock chain.

Both the relay and the power supply are packaged in a conventional cast electrical outlet box which is mounted on the outside of the X-ray machine.

For most X-ray generators, the installation is simple and quick. Three wires are connected to the X-ray ON’ power source and the ‘X-ray ON’ relay. The lamp fixture is plugged into the circuit box with a phone jack. The magnetic base of the lamp fixture is usually placed on the steel table top but can be placed on top of the X-ray tube if desired.

This device has been in use for several months, is low in cost and can easily be assembled from parts usually available in the shop or laboratory. Further details will be supplied on request.

A. Kirkeywood

Lawrence Livermore Laboratory
University of California Livermore
California 94550
U.S.A.

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Letter to the Editor
Synergistic identification by energy-dispersive diffractometry

Sir,

Energy-dispersive diffractometry offers the possibility of sample characterization with simultaneously obtained X-ray diffraction and X-ray fluorescence data.

Identification of materials by means of their X-ray powder pattern is the object of the card file published by the Joint Committee on Powder Diffraction Standards. Ideally identification requires only the powder pattern, but any chemical information is helpful in choosing between two or more similar patterns. The convenient use of chemical information is provided for in both the Matthews coordinate index and the Johnson computer tapes. Wavelength-dispersive diffractometry provides no chemical information, but energy-dispersive diffractometry may provide positive evidence of the presence of certain elements, and, by implication, negative information about the absence of others.

Fukamachi, Hosoya & Terasaki (1973) have shown that interplanar distances can be measured by energy-dispersive diffractometry with a precision of about 0.01%, which should be adequate for identification. Lauriat & Pério (1972) have noted that the pattern recorded will contain peaks corresponding to the characteristic radiations of the elements present in the specimen; whether these are actually observed will depend on the range of energies recorded and on the percentage of the element present. As noted by Wilson (1973), these characteristic-radia-

Fig. 1. The interlock circuit.