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Product Information

DESKTOP DOUBLE CRYSTAL DIFFRACTOMETER

1. Introduction

Among a variety of remarkable technological innovations, the progress in the semiconductor field is particularly noteworthy. Along with this astound- ing rapid growth, the importance of research and production control of various single crystals used as semiconductor substrates is increasing.

To meet this need, different types of X-ray diffractometers, using a double crystal optical system have been developed. They are designed to evaluate the lattice mismatching, etc. of a single crystal thin film formed on the substrates such as GaAs, GGG, InP.

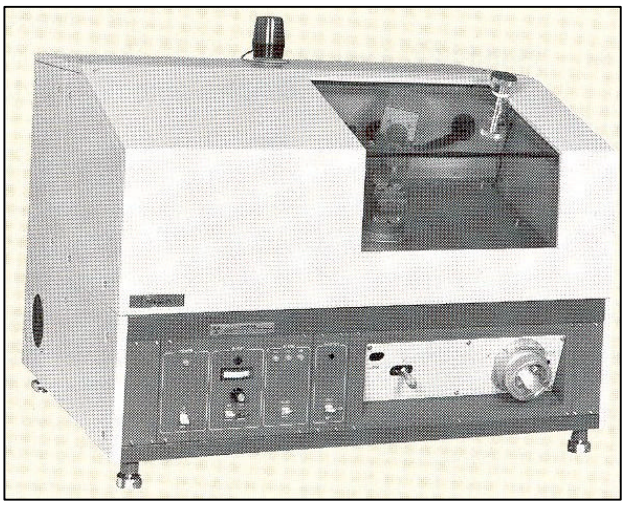
Generally, diffractometers are designed to handle a broad application range to cope with varied types of research. Consequently, they are not really appropriate for production control where a single kind of crystal should be measured in large quantities.

Thus there is a growing demand for simple, easy-to-use diffractometers suited to production control, in addition to the capabilities for laboratory use.

Introduced here is the outline of a new X-ray diffractometer oriented to such requirements. It offers a tool that permits even an unskilled operator to carry out easy and stable measurement.

2. Features

(1) A desktop design allows simple installation of the unit in any place. A double crystal optical system of the +, - parallel arrangement adjusted to the orientation of a crystal to be measured is compactly put together with the X-ray generator and detector sections.



(2) The operator is protected against X-ray exposure because the optical system is completely enclosed in a desktop type console. The operation is controlled externally.

(3) Sample loading and unloading is simplified by the unique design. The entire X-ray optical system is tilted at an appropriate angle. The sample can be simply mounted in a sample holder without causing a fitting distortion. Moreover, the sample positioning can be made so that it is stable. (No adhesive required).

(4) The desired measurement data can be obtained by simple instructions from a personal computer so that even a novice can easily operate the system. (See the measurement example).

3. Specifications

(1) X-ray generator

Input power required	:	Single phase AC 100 V, 15 A, 50/60 Hz
Output	:	30kV, 4.5 to 10 mA variable
X-ray tube target	:	a sealed-off X-ray tube (Cu)
X-ray tube cooling system	:	Water cooling
Cooling water required	:	A flow rate of 3lit/min or more at water head loss of 2 kg/cm^2

(2) 1st crystal section

Inclination adjustment	:	±5°
Crystal size	:	20 mm x 20 mm ~ 30 mm x 30 mm
θ rotation	:	360° rotation by releasing a clamp screw. Fine adjustment over a range of approx. 3°.
X-ray shielding	:	Prevents scattered X-rays emitting from the 1st crystal section.

(3) 2nd crystal section (sample measuring goniometer)

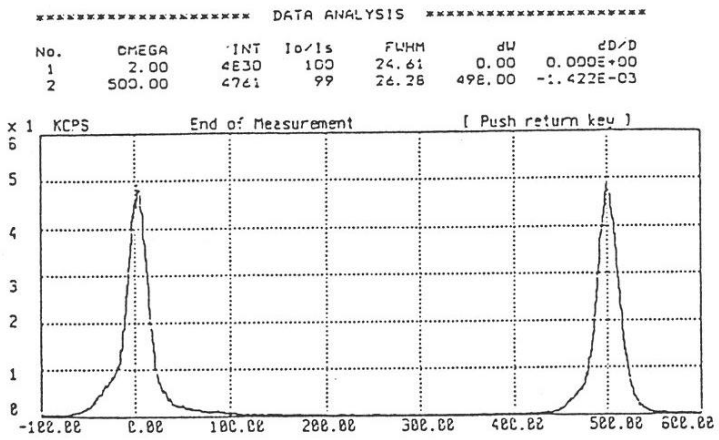
Sample size	:	1" to 2" diameter (max.)
Angle measuring range	:	Approx. 3°
(ω rotation angle)	:	• Manual (operation from outside of the console) • Remote control (with a stepping motor)
Inclination rotation		±1° • Manual (operation from outside of the console)

(4) Automatic axial alignment mechanism (option)

This mechanism enables automatic axial alignment (Orientation adjustment) of the sample for the best condition.
This mechanism replaces the above manual inclination.

(5) External dimensions : 830(W) x 610(D) x 590 mm(H).

4. Measurement Example



OMEGA : ω angle display (deg)
INT : X-ray intensity
Io/Ts : Intensity ratio between the substrate and the epitaxial layer
FWHM : Full Width at Half Maximum
dW : Angular difference between the substrate and the epitaxial layer
dD/D : Variation of the lattice constant of the epitaxial layer with respect to the substrate