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Product Information

X-Y Stage With a Mapping Function, and Curved PSPC Micro-Area X-ray Diffractometer with a Total Reflection Capillary Collimator

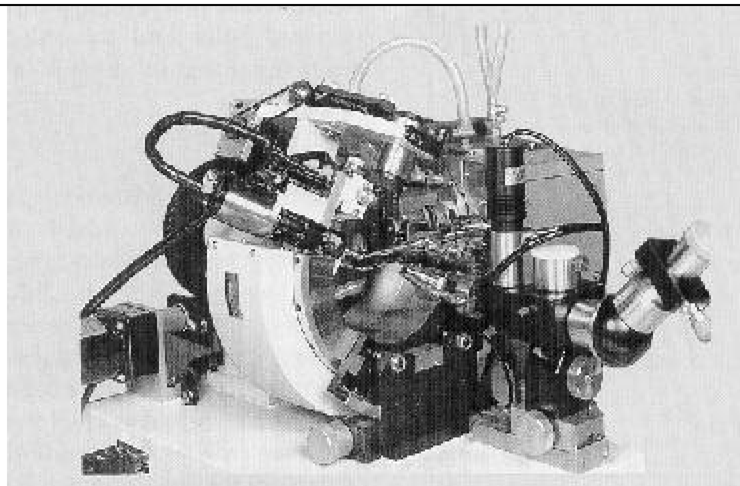


Fig. 1 Stepping motor driving X–Y stage mounted on PSPC/MDG.

1. Introduction

Acurved PSPC micro diffractometer is an effective way to obtain X-ray analysis of a micro area on a sample. Small sample size as well as small areas can be effectively analyzed and a variety of off-line programs (stress, etc.) can now be run on time date.

Upgraded functions include: (1) increased X-ray intensity and (2) automatic measurement with a stepper, both of which are desired in micro-area measurement. These functions can be a great aid to those X-ray analysts concerned.

2. Outline

As shown in Fig. 1 and Fig. 2, a total reflection collimator is mounted on the curved PSPC microdiffractometer (PSPC/MDG) to substantially increase the X-ray intensity. An X-Y stage (stepper) is added to provide a mapping function. As for the curved PSPC microdiffractometer, it is already described in THE RIGAKU JOURNAL (July/1984, Vol. 1, No. 1) and other relevant brochures. The X-Y stage with a mapping function is explained here.

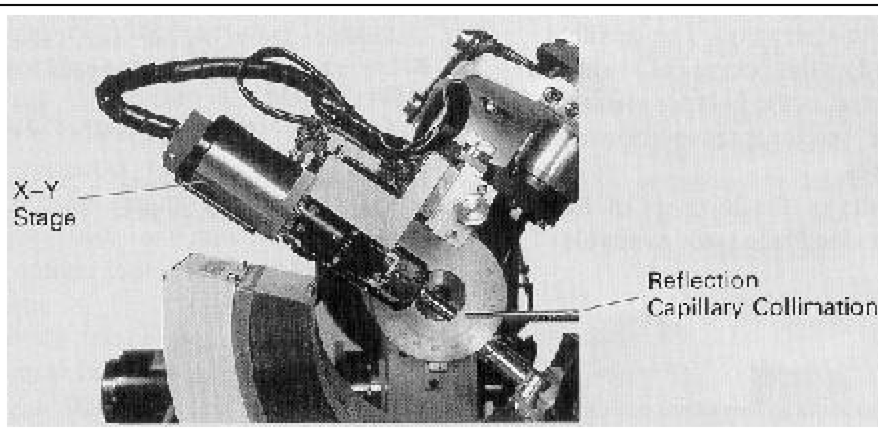


Fig. 2 Stepping motor driving X-Y stage.

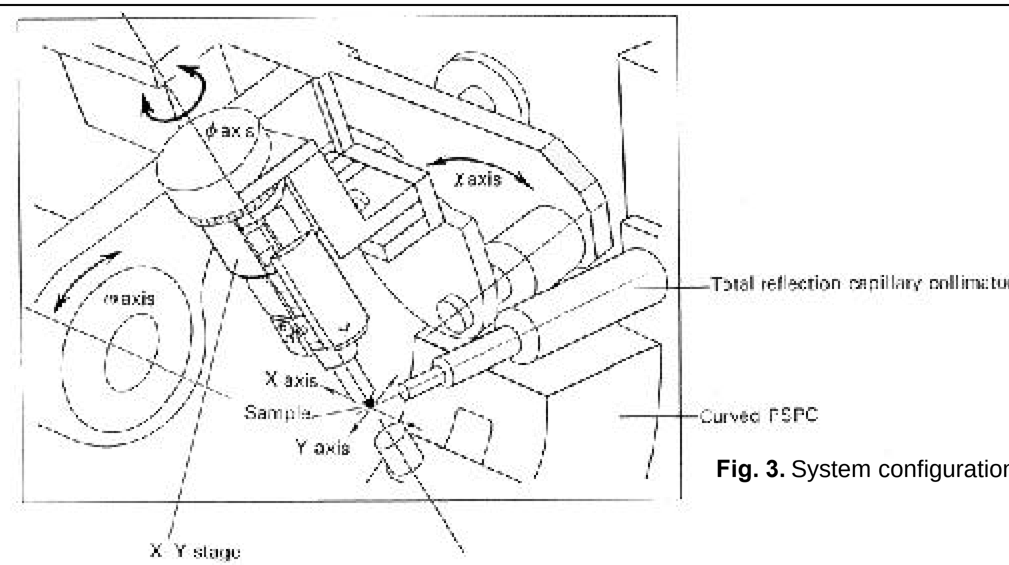


Fig. 3. System configuration

2.1 X-Y Stage with a Mapping Function

(1) The new stage is upgraded in that instead of manual operation, remote-controlled stepping is applied to the X-Y movement. An X-ray TV camera makes it possible to carry out more effective measurement of the composition, preferred orientation, stress distribution, etc. of samples upon simple alignment. Mapping mesurement can offer more information.

Moreover, the total reflection capillary collimator has brought about a remarkable increase in X-ray intensity and a drastic reduction in measurement time, which has heightened the effect of mapping measurement.

(2) Mapping measurement by 3-axis oscillation with the step width of 50 micron minimum can be made over the sample surface of 5 mm's maximum. Analysis at several positions on the sample surface can be made because the stepping motor permits movement in the X-Y directions.

(3) With mapping software, the X, Y and ϕ axis are controlled from a personal computer to perform measurement on X and Y. Integrated intensities are calculated, and a map of the intensities is drawn on each X and Y.

(4) This stage may be the world-smallest among those designed to be driving by a stepping motor. It forms a cylindrical shape of about 35 mm O.D. and 93 mm length, and houses two stepping motors. Its construction is such that there is no protrusion of a motor, etc. beyond the outer diameter so that no particular space is required for the ϕ axis rotation (utility model applied for). Aimed at high precision and durability, ball bearings are used in all bearing portions for rotary shafts, and a cross roller is used for the X, Y straight-advance guides.

(5) For aligning, the center of a 30-micron diameter alignment jig is positioned with the center of the 3-axis oscillation. The manual type has been found disadvantageous in that a force exerted by manual screwing of X, Y tends to move center position during alignment. The newly introduced stage is remote-controlled, being free from an external force, to make the alignment easier. It is also easy to move X-Y by remote operation while rotating the ϕ axis to perfect the alignment with a minimum of eccentricity.

Specifications of the X-Y Stage:

Moving range X, Y:	-2.5 ~ +2.5 mm (±2500μ)
Min. position setting width:	2.5μ (1 pulse feed amount)
Min. stepping width in mapping measurement :	5μ
Backlash on X, Y axis:	Corresponding type
ϕ axis:	±330° approximately
Stage controller:	With X, Y fast feed and slow feed mechanism

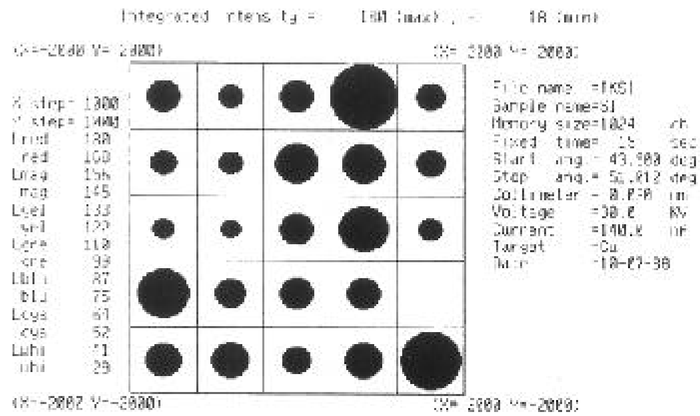
2.2 Measurement Example 1

X-Y map example

The intensity is depicted by color and circle size.

The difference between the highest intensity and lowest intensity is divided by 14, and thereby the variations in intensity are given in 14 colors.

The intensity variation is also expressed by the circle size (by varying the size continuously)



Measurement Example 1

2.3 Measurement Example 2

X-ray intensity measurement with the total reflection collimator:

A comparison of the X-ray intensities obtained when a sample Si was measured under the same measuring conditions.

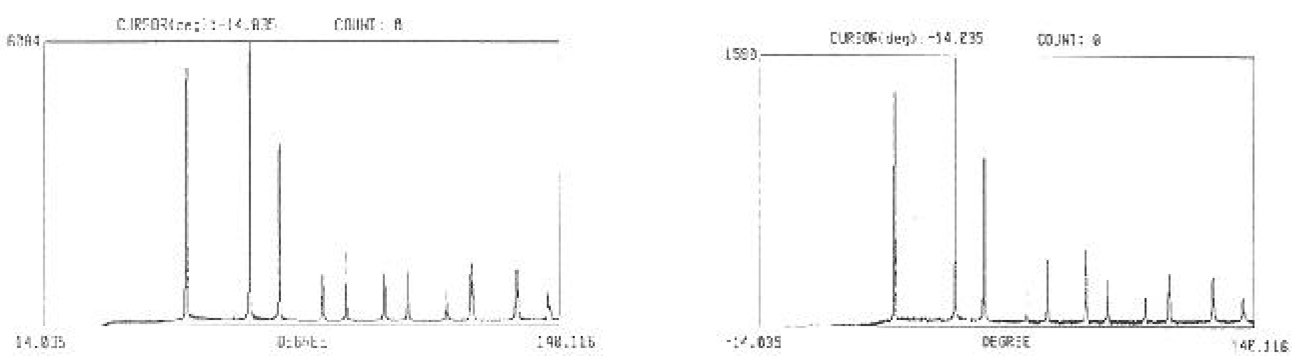
(A) By use of the total reflection collimator

(B) By use of the conventional collimator

About 4 times as much X-ray intensity was obtained with (A) as compared with B).

[Measuring conditions]

Target:	Cu with Ni filter.
Focal spot size:	0.3 x 0.3 mm^2
kV, mA:	40 kV, 100 mA
Collimator dia.:	100 $\mu\phi$
Measurement time:	200sec



(A) With the total reflection collimator (B) With the conventional collimator

Measurement Example 2