

Product Information

SSD-MOUNTED FULLY AUTOMATED RIGHT-LEFT POLE FIGURE DIFFRACTOMETER

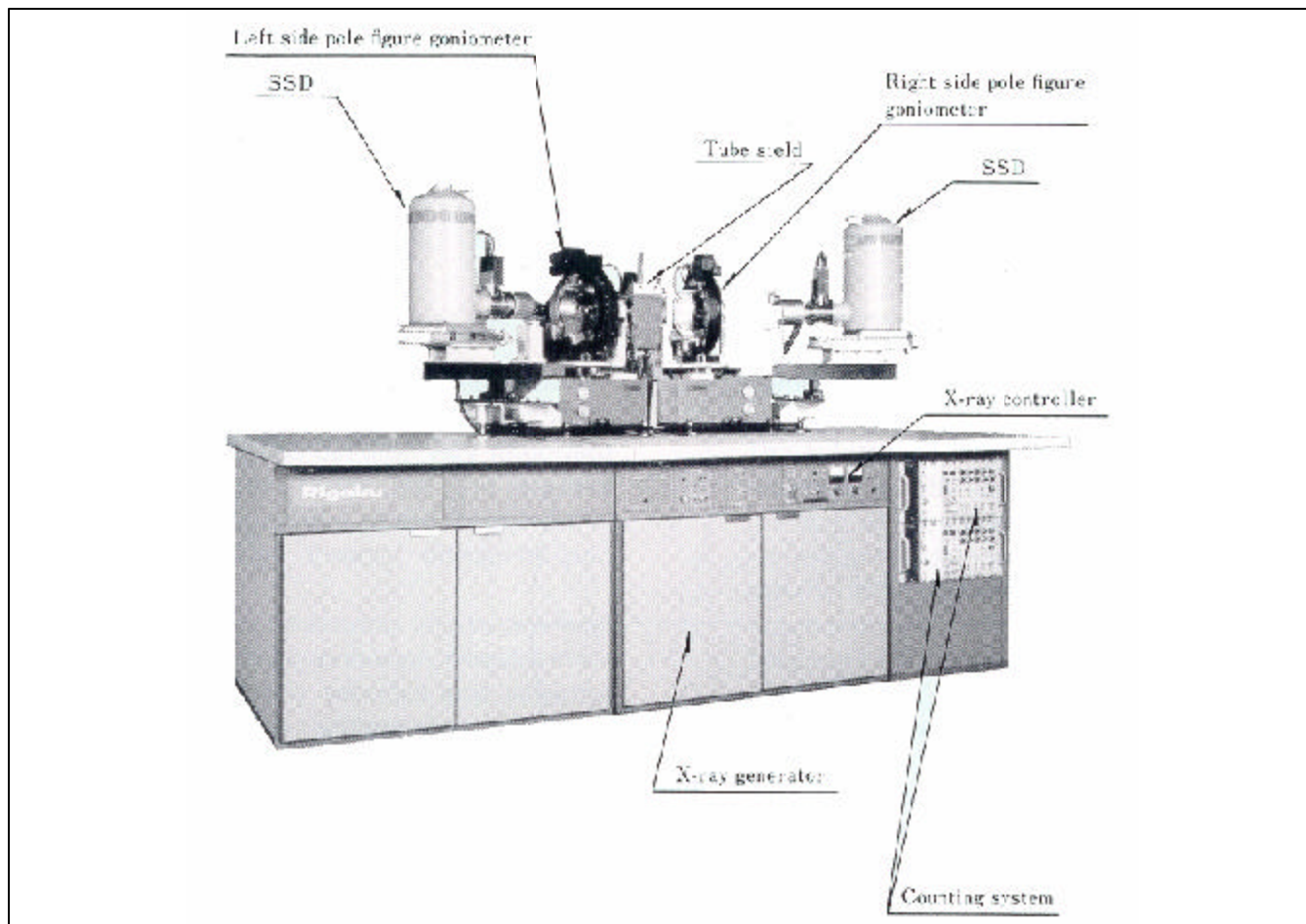
1. Outline

As one way of evaluating the characteristics of a material, the preferred orientation of the material is examined. X-ray diffraction techniques are often used for the purpose because this method permits non-destructive measurement of the preferred orientation of the crystal structure.

The system introduced here is designed for carrying out automatic measurement of the preferred orientation of materials as quickly as possible. It employs a solid-state detector (SSD) and is configured in the following way.

A complete type goniometer for the conventional pole figure measurement, which is equipped with a device for automatic switchover of optics between the transmission method and reflection method, is mounted on the right window side of an X-ray generator (Model RU-300 in the present case).

Mounted on the left window side is a dedicated type goniometer for the same pole figure measurement by the reflection method, provided with an automatic 12-sample exchanging mechanism. The system is thus made up to serve as a fully automated right-left pole figure diffractometer.



Alpha-Fe samples were examined this time as the object of measurement, and three unit planes, (110), (200) and (211), were chosen as the diffracting plane for measurement. Compared with the existing method where a scintillation counter is used as the detector along with characteristic X-rays, this system employs the SSD and white X-rays in order to reduce the measurement time. This latter method is to measure plural diffracting planes by fixing the diffraction angle to a certain value.

2. Major Specifications

1) X-ray generator

Rotating anode X-ray generator RU-300

Output: 60 kV, 300 mA (18 kW)

Target: Mo

2) Pole figure sample stage

2) -1 Left-side pole figure sample stage

Measurable angle range α' : $10^\circ \sim 90^\circ$

Automatic sample changer:

Number of samples: 12 in max.

Sample thickness: 2 mm in max.

2)-2 Right-side pole figure sample stage

Measurable angle range α : $0^\circ\text{-}50^\circ$

α' : $30^\circ\text{-}90^\circ$

With an automatic optics switchover device for the transmission method and reflection method

3) Detection and counting section

Detector : GE-SSD

Counting system: SCA (Single Channel Analyzer, 4 units on the side)

4) Controll data processing unit

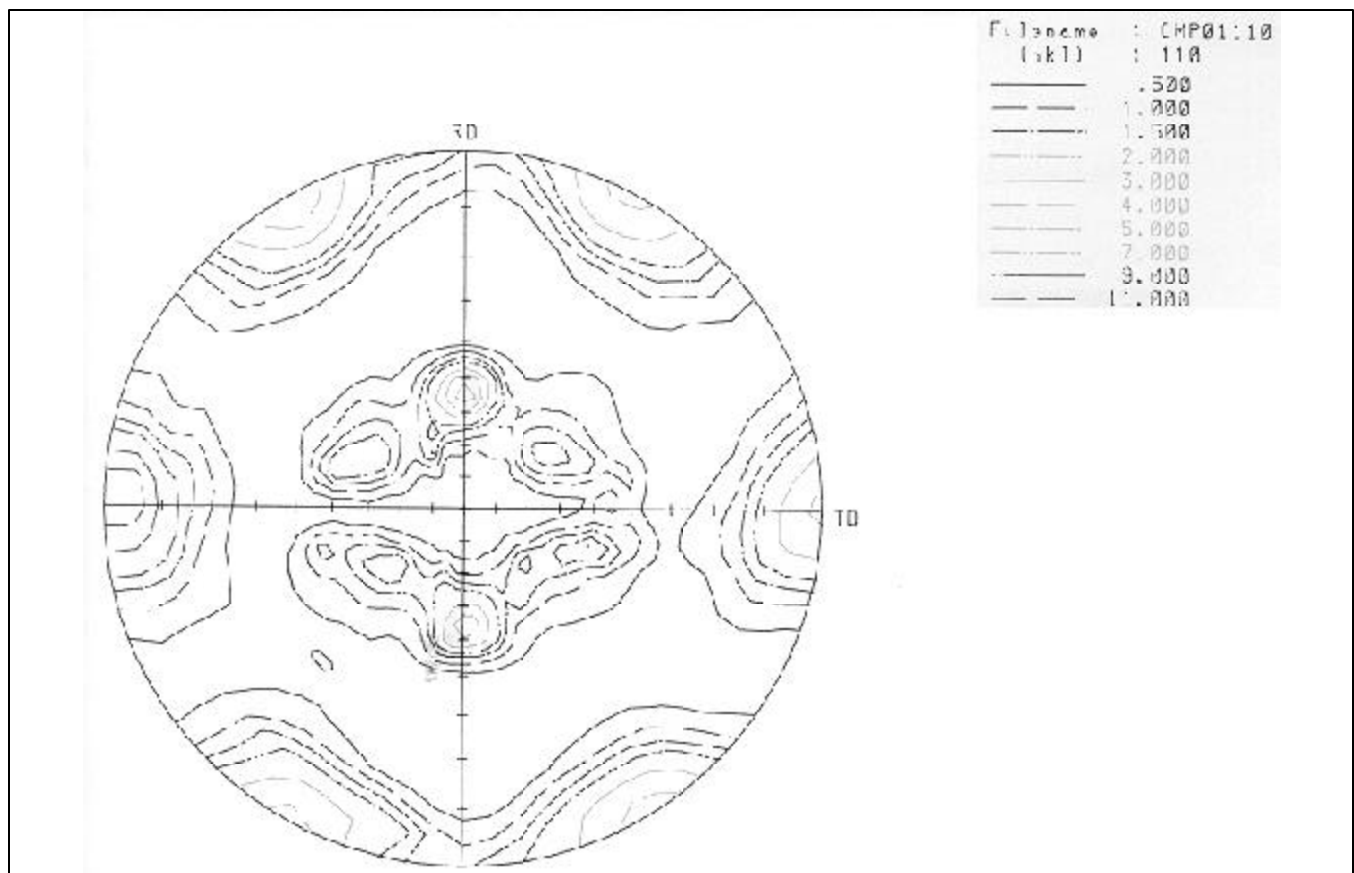
A personal computer for D/max-C X-ray diffractometer system.

A data conversion device is provided for the right-side operation for three-dimensional display (ODF) processing by a host computer.

3. Preparations for Measurement

Specific preparations due to the use of the SSD should be made prior to measurement.

- 1) Because white X-rays are used, the peak-to-background ratio is not so good as when characteristic X-rays are used. As a result, the back-



ground value cannot be neglected and should be subtracted without fail. Since, however, it would be bad economy to assign the SCA to cope with all background values, the determination of the background value is to be made in a different way by means of the coefficient of the measured Sach value with respect to each diffracting plane. Then the true diffracting-plane intensity is to be determined by subtraction.

- 2) Intensity correction for the diffracting-plane intensity of the escape peak.

The escape peak position is not negligible in the case of the GE-SSD. An intensity correction is therefore needed for such diffracting planes that overlap with escape peaks. Measurement should be made beforehand to this end to determine the coefficient, etc.

4. Measurement Result

- 1) Due to simultaneous measurement of plural diffracting-plane intensities, a contraction was effected in the direction of:

Right side 1/5

Left side 1/3.5

- 2) Comparison to pole figures measured by the existing method

Because a short-wavelength radiation was used for measurement, the resulting penetration was better than that by the existing method. Excepting the case that the degree of preferred orientation differs in the direction of the sample thickness, a good agreement was achieved in terms of 10 percent or less in intensity about those samples whose degree of preferred orientation differs in the direction of the sample thickness, a good agreement was achieved in terms of 10 percent or less in intensity about those samples whose degree of preferred orientation is uniform. Hence each of the pole figures appears to be exactly the same.

- 3) Now that thick samples are measurable, sampling has become convenient that much.