

X-ray Diffractometer System Introduction

1. Introduction

Rigaku's general purpose X-ray diffractometer systems are broadly classified into two series; the D/MAX series and the Miniflex series. The D/MAX series is a research grade tool which meets a wide range of X-ray analysis needs and can be configured with a variety of diffraction attachments and cameras.



According to diversified measurement purposes, attachments allow multiple axis rotation, mapping, stress loading, heating and cooling, and so on.

The Miniflex series is designed to be functionally simple while maintaining precision measurement capability comparable to the D/MAX series. It is ideally suited for teaching in the college /university environment and quality control and inspection in production. As examples, the Miniflex is widely used to control composition and mixture ratios as well as for quantitative measurement of environmentally hazardous materials. In these applications, the operational procedures are routine, the sample materials and the measuring conditions remain similar.

The Miniflex is the smallest, lightest weight diffractometer in the world. It fits easily on a desktop and simply plugs into the wall. It is rugged enough to load into a vehicle and be transported and used in the field. This capability is ideal for using at geological sites, quarries, or for sorting concrete skeleton materials. The Miniflex is a compact, portable X-ray diffraction system, which can be used in the laboratory and in the field at the sampling site. The Miniflex incorporates many sophisticated components, such as a vertical goniometer where one stepping motor scans both the θ and the 2θ axis. The automatic, variable divergence slit, a standard feature, keeps the area of irradiation constant on the sample regardless of the $\theta / 2\theta$ angle. This allows better intensity at the higher 2θ range when compared to a fixed slit system. The newest, high-frequency X-ray generator and a smaller sized scintillation counter are also standard features on the Miniflex. These innovative technologies have resulted in a substantially more compact size (~ 22" w x 14" d x 23" h) and lower price than conventional powder diffractometers. This system offers an overall excellent cost/performance ratio.

2. Features

- (1) **Radiation Enclosure & Safety**
When the radiation enclosure door is opened, the X-ray shutter will automatically close. This function completely protects the user from exposure.
- (2) **Display of Instrument Status**
Instrument status is available on demand to monitor the functions of the components.
- (3) **Continuously Variable Slit**
The continuously variable slit (patent pending) is linked to the θ becomes larger. This will improve the peak-to background ratio at low 2θ angles as well as increase the X-ray intensity at high θ angles. These improvement are important for the measurement of clay minerals, concrete skeleton materials, etc.
- (4) **Automatic Sample Changer with 8 Positions**
Up to 6 samples can be mounted and measurement with the automatic sample changer. Each sample can be made to spin to enhance data precision for qualitative and quantitative analysis. The changer option is helpful for routine sample analysis of geological samples, asbestos dust, row material consistency, etc.
- (5) **Sample Holders**
Two(2) types of holders, for powder and bulk samples, are available for use with the Miniflex's vertical goniometer.
- (6) **Standard Measurement Software**
The software is written in Windows for the PC, has multiple functions, and is easy to use.

Measurement condition parameters include the following:
 - Sample Name (ID)
 - Scan rang in degrees 2θ
 - Measurement mode (continuous scan, step scan, or skip scan)
 - Sampling width in degrees per step
 - Scanning speed
- (7) **Qualitative Analysis Software**
Identification of phases is achieved through accessing the ICDD databases. This is accomplished through the primary search/march to ICDD card information, a secondary search/march which compares the d-spacings and intensities with the measured data, and a residual search/march which is performed after excluding the major components.

3. Configuration

3.1 Standard Configuration

- (1) Goniometer
- (2) Tube shield
- (3) Detector
- (4) X-ray generator
- (5) Electronic circuit panel
- (6) X-ray proof console
- (7) Flow rate detection system
- (8) X-ray tube
- (9) Personal computer
- (10) Standard measurement software

3.2 Options

- (1) Air cooling system heat exchanger
- (2) Specimen rotation attachment
- (3) Auto sample changer
- (4) Autotransformer
- (5) Optional software
 - Multiple recording software
 - Qualitative analysis software
 - Simplified qualitative analysis (concrete skeleton material, qualitative analysis, compositive ratio, etc.)
 - ICDD database control
 - Database software for ICDD qualitative analysis
 - Environmental particle dust quantization (asbestos particle dust) software