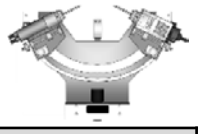
X-ray diffractometer equipped with an X-ray fluorescence spectrometer : DF

Example: Head of the DF-01



Detectable objects
[Measurement of diffraction and fluorescent X-rays] Corrosive compounds such as those used in cultural assets and metal alloys

1. Brief description

This instrument is a combination of a Si-PIN semiconductor detector designed for energy dispersive fluorescent X-ray analyzers and a goniometer integrated with the detector; it is capable of performing two types of analyses: X-ray diffraction analysis and fluorescent X-ray analysis. The instrument was developed in collaboration with Waseda University and commercialized by us.

2. Structure and principles

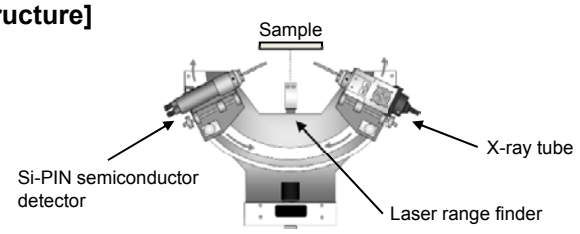
[Structure]

The instrument is structured with an X-ray tube and a Si-PIN semiconductor detector placed on a goniometer, which allows for angle driving, with the capability of adjusting the distance to the sample using a laser range finder.

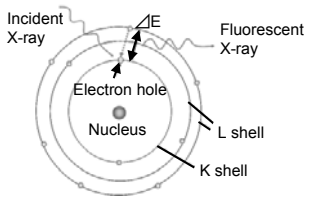
[Principles]

With a Si-PIN semiconductor detector having a high level of energy resolution, energy dispersive fluorescence X-ray analysis allows concurrent measurement of multiple elements. Based on this high energy resolution, this instrument obtains diffraction patterns by selectively retrieving only the energy (wavelength) equivalent to the characteristic X-ray (Crk alpha ray) component of the incident X-rays while changing the angles of the X-ray tube and Si-PIN semiconductor detector.

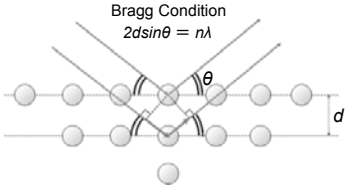
[Structure]



[XRF (X-ray fluorescence) analysis]



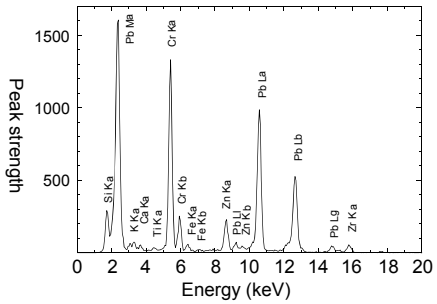
[X-ray diffraction analysis]



3. Features

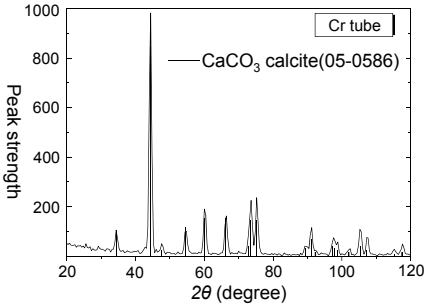
The instrument performs two different analyses, X-ray diffraction and fluorescent X-ray analyses, at the same point, and consequently provides more accurate information based on two different measurement methods. In addition, with the use of a compact X-ray tube and Si-PIN semiconductor detector, it can be used as a portable analyzer for on-site analysis. Since X-ray diffraction or fluorescent X-ray analysis is a nondestructive, non-contact method, the instrument can be used to measure large and irregular-shape test samples and remains and cultural assets, which are not allowed to be moved or carried out.

○ Fluorescent X-ray analysis of an over glaze color (reddish brown of Aritanishiki) (example)



The peak energy values (lateral axis) indicate what elements are contained in the sample and the peak strength values (vertical axis) provide an estimated quantity of each element.

○ X-ray diffraction on a white pigment (example)



The instrument performs analysis by searching the database for corresponding reference data. By narrowing down searches based on the element information obtained through fluorescent X-ray analysis at the same point, it provides accurate analysis results.

○ Tutankhamun's golden mask

Provided to Masayuki Uda, a professor emeritus at Waseda University

The photos show measurements made in the Cairo Museum in Egypt. The instrument is capable of performing on-site analyses even on pinpointed targets even if they are irregularly shaped as shown in the photos.

4. Applications (examples)

On-site diffraction and fluorescent X-ray analyses
- Analyses of archeological materials such as Tutankhamun's golden mask
- Analyses of cultural assets, identification of corrosive compounds such as metals and alloys, and estimation of crystallite diameters, degrees of orientation, and film thicknesses
- Initial examination for identifying any unknown material

5. Products of this type (examples)

○ Portable product

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DF-01