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WDX-200

**Wavelength Dispersive
X-ray Fluorescence Spectrometer**



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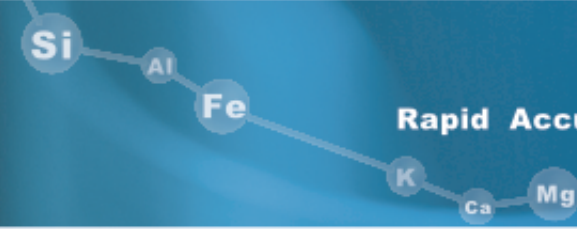
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WDX-200

Wavelength Dispersive Spectrometer



Rapid Accurate Non-destructive Intuitive Environment-friendly

Company Profile

Skyray Instrument, Beijing Bandwise Technology Development Co., Ltd., the sole one in China, specializes in the development, manufacture, sales and support of Wavelength Dispersive X-ray Fluorescence Spectrometers, located in Changping Science Park in Beijing Zhongguancun Science and Technology Park. The mother company, Jiangsu Skyray Instrument Co., Ltd. located in the scenery Tsinghua Science Park, Kunshan, Jiangsu Province, which has been recognized as China Excellent Private-Owned Science and Technology Enterprise and has been crowned with three World's No. 1 titles in the field of XRF analysis: No. 1 in Sales amount, No. 1 in Product Categories and No. 1 in Key Patented Technologies.

WDX-200 Wavelength Dispersive Spectrometer



■ Application Fields

Building materials

(cement, glass, ceramics)

Metallurgy

(steel, non-ferrous metals)

Petroleum

(trace elements S, Pb and so on)

Chemical engineering

Geography and Mining

Commodity Inspection

Quality Inspection

Human Body Trace Elements Inspection

Specifications

Model: WDX —200

Temperature control accuracy of constant temperature chamber: setting value $\pm 0.1^{\circ}\text{C}$.

Measurable elements: 10 arbitrary elements from Na to U.

Analysis algorithms: empirical coefficient algorithm and theoretical a -coefficient algorithm

AC220V power supply: 1KVA AC purified stabilized voltage power supply

High voltage supply: 200W (50KV4mA).

12-hour stability of tube voltage & tube current: less than 0.05 %.

Vacuum pump: biphasic-220V, 2 liters

Industrial computer: industrial 104 computer

Analysis accuracy: $n=1$ (24 hours, percent content) ≤ 0.05 %.

Measurement time of single sample: (including time for changing samples and vacuum pumping) $\leq 3-5$ minutes

X-ray tube: 400W thin Be end window X-ray tube made by Varian company, Rh anode (Pd anode optional).

Detector: gas proportional detector + sealed proportional detector; 10 path 1024 channel independent pulse height analyzer

Vacuum system: independent vacuum pump station, easy maintenance.

The highest vacuum degree: lower than 5 Pa.

Gas flow system: High Sophisticated Gas Density Stabilizer with pressure stability up to ± 0.003 KPa.

Analysis software: equipped with software for two quantitative analysis algorithms: empirical coefficient algorithm and theoretical a -coefficient algorithm. With innovative technology of full spectrum analysis, every spectrum line can be timely traced and corrected, which greatly improves the repeatability and stability of quantitative analysis and also serves as intuitive evidence of instrument status diagnosis. Complete measures for self-diagnosis are supplied. In-built RS-232 serial communication protocol, TCP / IP protocol (S/ C based on Socket) and OPC protocol (OPC server) all offer ways to share data with DCS or QCS system.

Excellent qualities

- Rapid and non-destructive analysis of powder and bulk samples
- Multi-channel high speed MCA offers timely measurement of every element peak, benefiting not only instrument debugging and failure diagnosis but also the enhancement of stability of the instrument.
- Compared with sequential scan large power spectrometers, WDX-200 gains adequate analysis precision even when lower power and equal measurement time are adopted, which not only endows the instrument with high cost performance, but also prevents wearing of the goniometer, prolongs the service life of X-ray tube, minimize failures of the high voltage power supply and reduce the maintenance cost of the whole instrument.

WDX-200 Compact Multi-channel X-ray Fluorescence Spectrometer, with configuration of 10 fixed channels and capability to analyze 10 elements simultaneously, is able to conduct elemental analysis of arbitrary ten elements from Na to U based on the users' requirements. This instrument is widely used in cement, steel, powder metallurgy, coal, petroleum, kaolin, glass, refractory materials, environment protection and accordingly an ideal choice for quality control in large and middle-scaled enterprises.

WDX-200

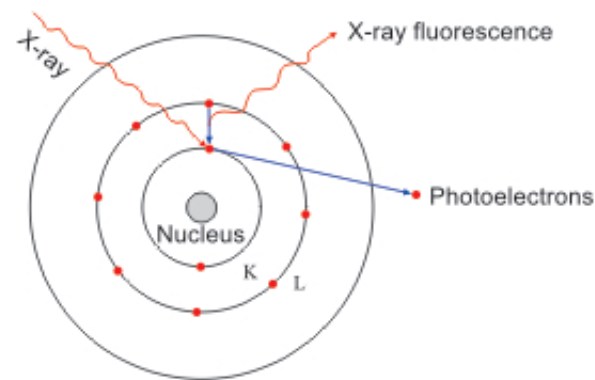
Wavelength Dispersive Spectrometer



Principle of X-ray Fluorescence Analysis

Element characteristic X-ray radiation

Different elements have extra-nuclear electronic orbitals of different binding energies, as a result, they give off X-ray photons carrying energies different from each other when excited, that is, each element emits X-ray at its own special energy, representing the characteristic of this element and accordingly called characteristic X-ray. Characteristic X-ray of each element has its specific wavelength; so when we detect X-ray of specific wavelength, we can identify the presence of the interested element in a sample.



Software Overview

Software Functions:



Advantages of the Software

1. Self-developed software system for X-ray Fluorescence Analyzers, applicable to windows operating system
2. Easy manipulation realized by operating interface in all Chinese language
3. With innovative technology of full spectrum analysis, every spectrum line can be timely traced and corrected, which greatly improves the repeatability and stability of quantitative analysis and also serves as intuitive evidence of instrument status diagnosis.
4. Equipped with software for two quantitative analysis algorithms: empirical coefficient algorithm and theoretical α -coefficient algorithm, among which the latter algorithm reduces the number of standard samples and retains adequate accuracy at the same time
5. Analysis data treatment including linear fitting and all kinds of matrices correction
6. Calculation of characteristic value based on analysis value
7. Man-machine interaction, allowing you to set and modify parameters
8. Timely output of analysis data and report
9. Complete self-diagnosis measures

Principle of Wavelength Dispersive Spectroscopy

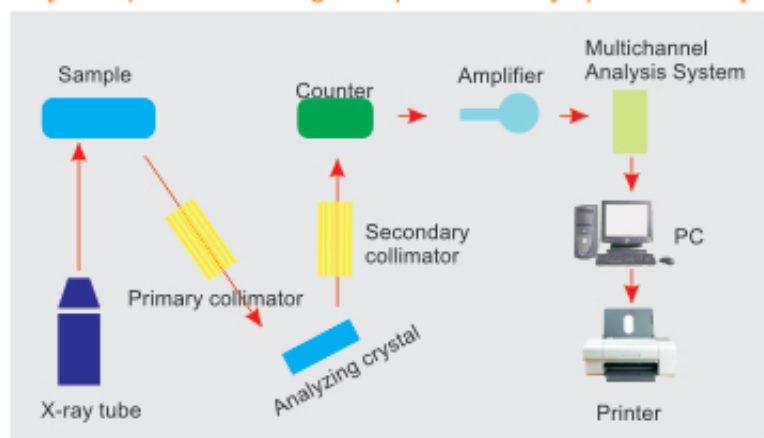
When many elements coexist in a sample and get irradiated by primary X-ray emitted from the X-ray tube, they will emit their corresponding characteristic X-rays, which in general are termed as X-RAY FLUORESCENCE. To separate and measure characteristic X-ray of these elements is called X-ray Fluorescence Spectroscopy.

As characteristic X-rays of different elements have specific wavelengths, they can be separated by using Crystal Diffraction based on Bragg Equation. This kind of spectroscopy is called Wavelength Dispersive Spectroscopy

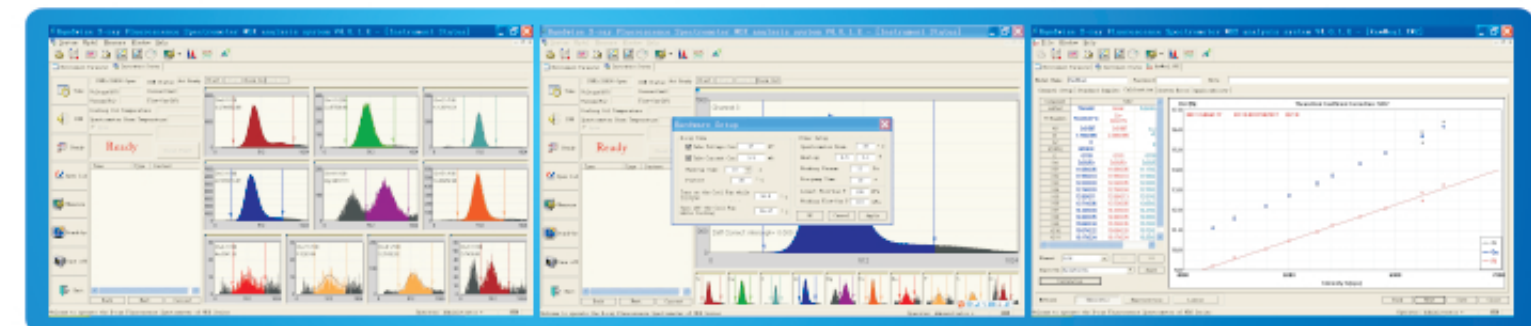
Bragg Equation: $2d\sin\theta = n\lambda$

Where d is the interplanar spacing of the lattice planes of the crystals, θ is the angle of incidence and diffraction, λ is the wavelength of the incident radiation, N is the order of diffraction and is integer.

[Principle of wavelength dispersive X-ray spectrometer]



Spectrum of Wavelength Dispersive Spectrometer



Results of Cement Measurement

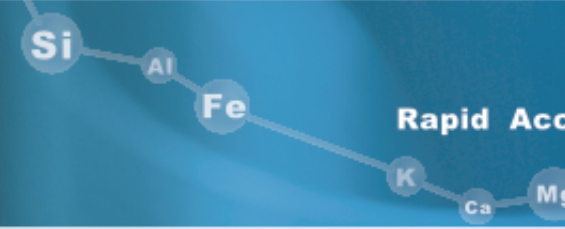
Cement Standard XS04-2

XS04-2	Si	Al	Fe	Ca	Mg
Standard value	12.71	2.86	3.09	43.29	1.6
Average value	12.724	2.862	3.074	43.318	1.584

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Continued

XS04-2	Si	Al	Fe	Ca	Mg
Max value	12.79	2.98	3.11	43.35	1.69
Min value	12.66	2.83	3.06	43.3	1.62
Range	0.03	0.15	0.05	0.05	0.09
SD	0.015391	0.01091	0.004891	0.017776	0.014327
RSD(%)	0.120967	0.36987	0.160313	0.041037	0.875739

Results of Agglomerate Measurement

Below are the Results of Repeated Tests of the unknown sample:

No.	Sample No.	Measurement Time	Fe(%)	CaO(%)	MgO(%)	SiO ₂ (%)	So ₃ (%)
1	17#	2007-11-09 13:35	53.85	12.13	3.44	5.76	0.041
2	17#	2007-11-09 13:39	53.87	12.09	3.44	5.75	0.041
3	17#	2007-11-09 13:42	53.90	12.07	3.43	5.73	0.039
4	17#	2007-11-09 13:46	53.91	12.10	3.43	5.75	0.040
5	17#	2007-11-09 13:50	53.92	12.08	3.45	5.73	0.039
6	17#	2007-11-09 13:53	53.87	12.08	3.44	5.74	0.043
7	17#	2007-11-09 13:57	53.91	12.06	3.43	5.76	0.041
8	17#	2007-11-09 14:01	53.86	12.07	3.43	5.79	0.040
9	17#	2007-11-09 14:05	53.88	12.08	3.44	5.78	0.039
10	17#	2007-11-09 14:08	53.89	12.09	3.46	5.74	0.041

Test of 18-hour stability taken by unknown sample 17#; the results after total 306 times are:

Constituent	Average	Min	Max	SD
Fe(%)	53.890	53.851	53.920	0.013
CaO(%)	12.082	12.06	12.130	0.015
MgO(%)	3.443	3.430	3.470	0.011
SiO ₂ (%)	5.750	5.730	5.790	0.011
So ₃ (%)	0.0401	0.038	0.043	0.001

Results of Converter Slag Measurement

Below are the results of repeated tests of the unknown sample:

No.	Sample No.	Measurement Time	Fe(%)	SiO ₂ (%)	CaO(%)	MgO(%)
1	D1-2702A	2007-11-12 16:52	12.74	7.73	50.42	9.17

Continued

2	D1-2702A	2007-11-12 16:56	12.74	7.73	50.38	9.17
3	D1-2702A	2007-11-12 17:00	12.72	7.72	50.33	9.16
4	D1-2702A	2007-11-12 17:04	12.71	7.71	50.32	9.15
5	D1-2702A	2007-11-12 17:08	12.75	7.76	50.37	9.17
6	D1-2702A	2007-11-12 17:11	12.73	7.85	50.29	9.12
7	D1-2702A	2007-11-12 17:15	12.71	7.83	50.26	9.16
8	D1-2702A	2007-11-12 17:19	12.73	7.81	50.27	9.12
9	D1-2702A	2007-11-12 17:22	12.74	7.87	50.26	9.17
10	D1-2702A	2007-11-12 17:26	12.75	7.86	50.25	9.20

Test of 15-hour stability taken by unknown sample D1-2702A#; the results after total 253 times are:

Constituent	Average	Min	Max	SD
Fe(%)	12.773	12.710	12.750	0.019
SiO ₂ (%)	7.836	7.710	7.850	0.018
CaO(%)	50.227	50.420	50.250	0.027
MgO(%)	9.231	9.120	9.200	0.038

Name list of some customers

- Anhui Tiepeng Seal Cement
- Hunan Yunfeng Cement Co., Ltd.
- Qujing Xuanwei Yuheng Cement Co., Ltd.
- Fujian Quanzhou Meiling Cement Co., Ltd.
- Hunan Yushan Cement Co., Ltd.
- Fujian Cement Co., Ltd. Cement Plant.
- Fujian Yongan Wannian Cement Co., Ltd.
- Yunnan Binchuan Jinxin Building Materials Co., Ltd.
- Yunnan Lijiang Yongbao Cement Co., Ltd.
- Xinjiang Qingsong Cement Co., Ltd.
- Inner Mongolia Xishui Venture Co., Ltd.
- Sanhe Yanxin Cement and Building Materials Co., Ltd.
- Zhaoshan Xinxing Group. Hunan Liuyang Cement Co., Ltd.
- Hainan Changjiang Hongqi Industrial Co., Ltd. Chahe Cement Branch.
- Shandong Shanshui Group. Jinan Century Innovation Cement Co., Ltd.
- Shandong Shanshui Group. Liaoyang Qianshan Cement Co., Ltd.
- Guangdong Tapai Group Co., Ltd. Huizhou Longmen Branch.
- Gansu Jiuquan Iron & Steel Group Hongda Building Materials Co., Ltd.
- Shandong Laiwu Steel Group. Lubi Building Material Co., Ltd.
- Hebei Luquan Quzhai Cement Co., Ltd.
- Hebei Funing Xinxhe Cement Factory
- Anhui Chaohu Tiedao Cement Factory
- Anhui Jingpan Cement Co., Ltd.
- Anhui Runji Cement Co., Ltd.
- Zhejiang Hushan Group Co., Ltd.
- Zhejiang Juhua Import & Export Co., Ltd.
- Hubei Songzi Shuangqi Cement Co., Ltd.
- Sichuan Hongya Yasen Cement Co., Ltd.
- SDIC Hainan Cement Co., Ltd.
- Hainan Changjiang Huasheng Tianya Cement Co., Ltd.

Names of customers are too many to be listed, which are not arranged in particular order.