Wavelength Dispersion X-ray Fluorescence Spectrometer

(DW-BP-9010A)

I. Product overview

The wavelength dispersive X-ray fluorescence spectrometer (WDXRF) is a high-tech product developed by our company based on the experience and fruits of domestic R&D on similar instrument over years, and absorbing the international advanced technology, The technical performance indexes have reached the level of international similar products. It can be used in any field that requires analysis of elements or compounds from Na to U, such as building materials (cement, glass, ceramics), metallurgy (iron and steel, non-ferrous metals), petroleum (trace elements such as S, Pb, etc.), chemical industry, geological mining, commodity inspection, quality inspection and even human trace elements inspection and so on. It is a reliable tool for macroanalysis and microanalysis. It is also used in universities and research institutes.

DW-BP-9010A is well-designed laboratory equipment that absorbs foreign advanced experience and integrates domestic technical advantages. Its excellent performance can meet the analysis requirements of different customer. The extremely attractive enables the users to benefit from the low-cost analysis process.

At present, our instruments have been widely used in the building materials (cement, glass, ceramics) industry, non-ferrous metals, steel, petrochemical and other fields. The application effect is good and meets the actual needs of users.

II. Application scope:

- DW-BP-9010A is very suitable for quality process control in large, medium and small cement plants (single and double kilns). It can be used for the analysis of primary and secondary oxides in raw materials (such as limestone, sand, bauxite, magnesite and other minerals);Determination of CaO, Si02, A1203, Fe203, MgO, S03, K20, Na20, Cl and other conventional elements in raw materials, clinker and cement.
- Application in steel industry: measuring: The element Si, Mn, P, S, Cu, A, Ni, Cr, Mo, V, Ti, W and Nb can be determined according to GB/T 223.79-2007.
  Application in other industries: Determination of S and P in petroleum, glass, ceramics, non-ferrous metals, mining, chemical industry, quality inspection, etc.

III. Feature:

- **Highly automated analysis saves time and effort**

  Suitable for the research and management of raw materials, new materials, products, etc. It only takes about 3 minutes to complete the quantitative analysis of more than a dozen elements in one sample, as the high stability of the instrument fully ensures the automatic analysis.

- **Management analysis of production process**

  The analysis results can be obtained quickly. After data processing, the quality inspection and specification judgment can be made, which can be applied to the production management analysis (especially bath analysis).

- **Quality control**

  Quickly analyze the samples collected from the production line. The analysis result (proportion calculation) is used as the control data of raw material preparation for the feedback, which is used to improve and stabilize the quality

IV. Advantage :

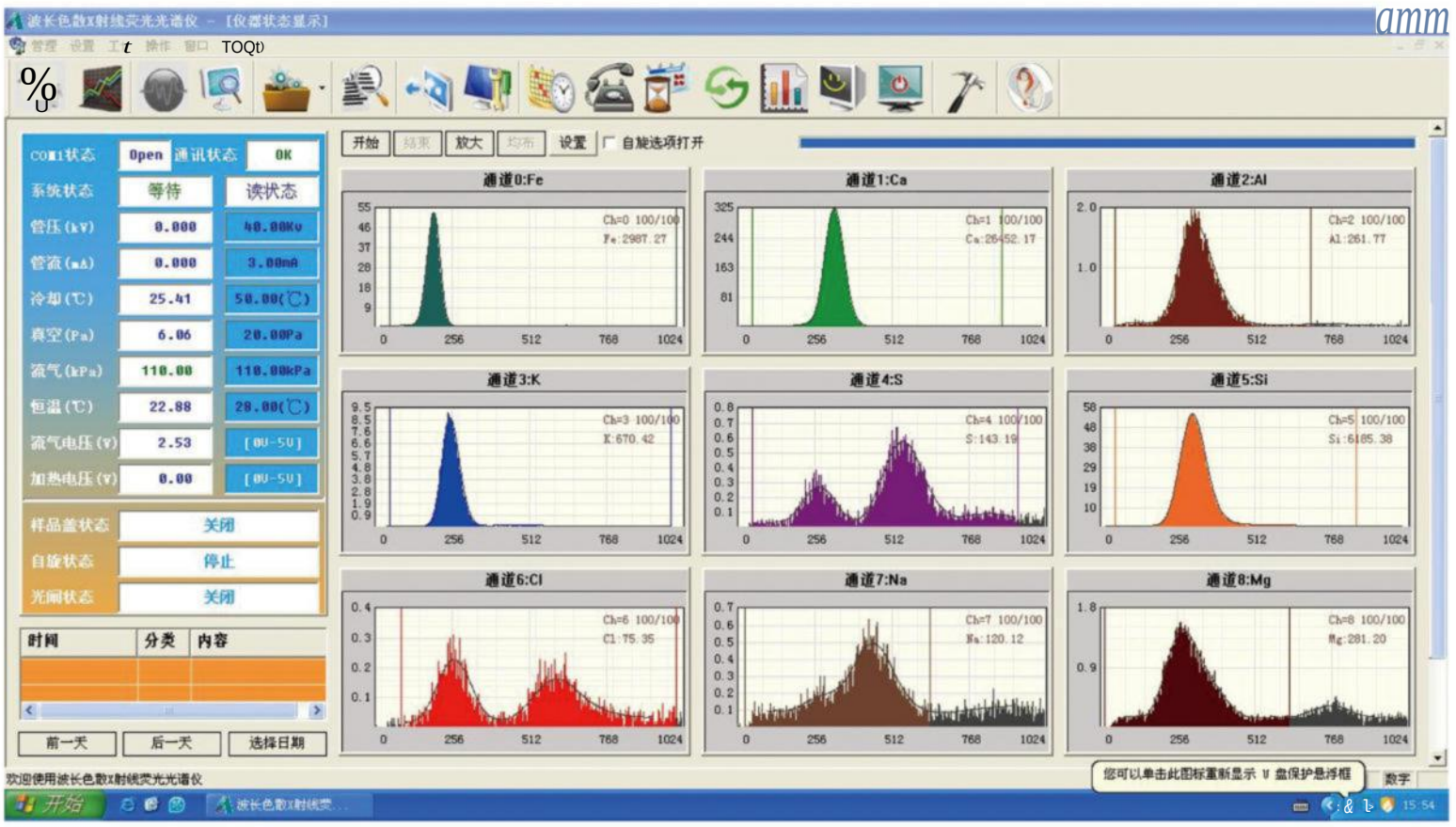
- Fixed multi-channel spectrometer: It is ingenious in the design of spectroscopic system, the collection and detection technology, and effectively improves the counting rate and stability of the instrument.
- Intelligent fault detection device: It can monitor the instrument parameters in real time, control and protect the instrument and automatically alann!
- Advanced collimation technique: The spectral collimator adopts the advanced design technology of Bruker in Germany to optimize the optical path.
- Ultra-short optical path: Using ultra-short optical path, the power of the X-ray tube is reduced, the service life of the X-ray tube is prolonged, and the structure of the cooling system is simplified. Greatly save maintenance costs.
- Stable regulating system of air flow density: It adopts American control component. It can automatically control the flow rate and density of air, greatly improves the control accuracy, the stability and repeatability of peak and element content detection.
- Electrical pulse signal acquisition card: It adopts the international advanced electrical pulse acquisition signal algorithm to eliminate the background noise and interference peak, and improves the reliability and effectiveness of peak position determination accuracy and peak position drift correction.
- Automatic safety protection device: It effectively protects the X-ray tube and high-voltage power supply.
- The Analyzing crystal adopts plane and bent configuration of PET, InSb, Ge, LiF, etc., which ensures the measurement accuracy of each element. For Na and Mg elements, the most high-grade multi-layer crystal, it effectively protects the crystal from moisture.
- Software: simple operation without any special requirements for operators.

V. Technical parameters :

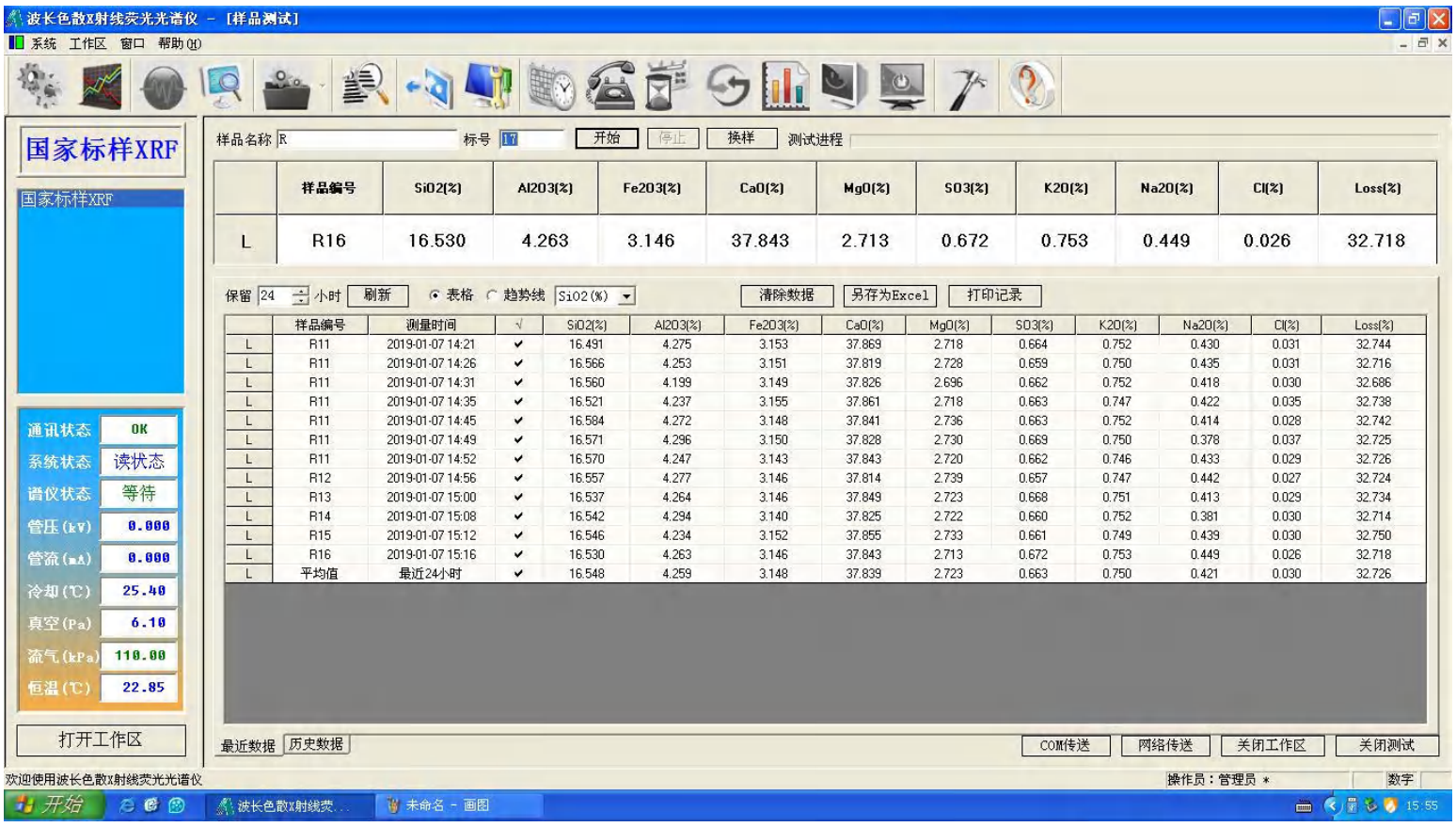
- Element measuring range: any 10 elements from 11Na～92U
- X ray tubes: 400W, Be window, Rh target(Pd optional)
- Tube cooling: Professional circulation refrigeration, no need for cooling water.
- Hgh voltage power supply： 400W (50kV8mA) , tube voltage and current stability within 12h: better than 0.05 % .
- Temperature control precision of thermostatic chamber: set value ±0.1°C
  Detector: proportional flow detector, proportional counter, or scintillation counter.
- Data processing system: 12-route 2048- channel independent pulse height analyzers
- Vacuum system: independent pump station structure, double vacuum chamber, easy to maintain, the highest vacuum of the measurement room: less than 7Pa。
  Detector gas flow system: using imported high-precision density flow control system, high-precision air flow density stability device, pressure stability is upto±0.01kPa.
- 220V AC power supply: 2kV A C purified and regulated current
- Stability: (24 h) ≤2%
- Energy resolution of the counter: ≤40%
- Linear counting of the counter: ≤1%
- Measurement time of a single sample: (including vacuuming and sample change) ≤(2-5)min
- Sample size：Φ 40mm x10mm(H)
- Sample analysis area: max 35mm2
- Sample rotation speed: 30rpm
- Software: qualitative analysis system automatic identification and analysis function (smooth, background correction)
- Quantitative analysis system: all kinds of matrix correction, standard analysis, application template
- Maintenance function: automatic diagnosis, remote diagnosis

VI. Software feature:

1. The self-developed Chinese (other language is also supported.) software system is suitable for Windows operating system. The software is simple and has no special requirements for operators;
2. Intuitive operation interface, permit conducting multitasks simultaneously, man-machine dialogue, easy to modify and set various parameters;
3. Using full spectrum detection, real-time intelligent correction of the instrument drift to the best running state;
4. Using the most advanced mathematical model algorithm to calibrate the work curve, easier procedure and more in line with the production process characteristics of users;
5. Powerful database system support, to achieve a variety of matrix, background interference correction;
6. Equipped with online batching ratio feedback adjustment & calculation and cement component measurement module for cement industry, statistical measurement of samples to help the process engineers to analyze the batching changes;
7. Powerful historical record inquiry function, master the change of production process dynamically at any time;
8. Powerful self-diagnosis function, real-time monitoring of instrument status, automatic protection function;
9. With the popular DCS communication protocol, which is convenient to share data with DCS system.
10. User-friendly operation interface



11.User does not need professional knowledge; One-touch operation.



VII. Application case in cement industry

The wavelength dispersion XRF system is mainly composed of sample preparation equipment (including vibrating mill and tablet machine), wavelength dispersion spectrometer, computer system (including host, monitor, printer, keyboard and data communication interface), and other related equipment to constitute the WDXRF raw meal quality control system. The WDXRF is mainly used for the analysis on the chemical composition of raw materials in order to achieve the online automation control on the ratio of raw materials and ensure the standard deviation of raw meal feed into the kiln reaches the specified index; meanwhile, XRF can be used for the offline analysis on various raw materials, fuels, clinker and cement.

This instrument is a simultaneous wavelength dispersive spectrometer, which can load more than 10 (including 10) analysis channels for simultaneous determination of multiple elements. The elemental analysis ranges from Na to U and 10 major elements in the cement, i.e., Ca, Fe, Si, Al, Na, Mg, S, K, Cl, P can be preset. The analysis speed is less than 2 minutes. The input power supply is single-phase 220/240vac, which also supply power to the PC and printer.

Accuracy index of each element:

Measuring accuracy （S）：

Na_2O	≤0.03%	SiO_2	≤0.03%
MgO	≤0.05%	CaO	≤0.10%
Al_2O_3	≤0.05%	Fe_2O_3	≤0.05%
SO_3	≤0.01%	K_2O	≤0.01%
Cl	≤0.01%	P	≤0.05%

VIII. Raw meal test example in cement industry

Raw meal component analysis: standard material repeated test 20 times.

Item	Component (%)							
	SiO_2	$A1_2O_3$	Fe_2O_3	CaO	MgO	SO_3	K_2O	Na_2O
Standard value	**11.71**	**2.95**	**1.84**	**44.64**	**0.97**	**0.06**	**0.62**	**0.09**
AVG value	**11.7095**	**2.95**	**1.845**	**44.6495**	**0.9725**	**0.0595**	**0.6245**	**0.0885**
Max value	**11.72**	**2.97**	**1.86**	**44.67**	**0.99**	**0.06**	**0.63**	**0.09**
Min value	**11.69**	**2.94**	**1.83**	**44.63**	**0.96**	**0.05**	**0.61**	**0.08**
Max-min	**0.03**	**0.03**	**0.03**	**0.04**	**0.03**	**0.01**	**0.02**	**0.01**
STDEV	**0.00945**	**0.009733**	**0.0109**	**0.01276**	**0.008507**	**0.002236**	**0.007452**	**0.03663**
Relative STDEV （%）	**0.0807**	**0.3299**	**0.5955**	**0.0286**	**0.8748**	**3.7581**	**1.1951**	**4.1395**

Certificate No.： 03203a-2008(Chinese standard)

IX. Clinker test case in cement industry

Cement clinker component analysis: standard material repeated test 20 times

Item	Component (%)							
	SiO_2	$A1_2O_3$	Fe_2O_3	CaO	MgO	SO_3	K_2O	Na_2O
Standard value	**11.71**	**2.95**	**1.84**	**44.64**	**0.97**	**0.06**	**0.62**	**0.09**
AVG value	**11.7095**	**2.95**	**1.845**	**44.6495**	**0.9725**	**0.0595**	**0.6245**	**0.0885**
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STDEV	**0.00945**	**0.009733**	**0.0109**	**0.01276**	**0.008507**	**0.002236**	**0.007452**	**0.03663**
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Certificate No.： 03204a(Chinese standard)

X. Silica test case

Using silica standard sample and compound standard sample as the calibration sample to set up Using silica standard sample and compound standard sample as the calibration sample to set up molten sample preparation determination of Si02, Fe203, A1203, CaO, MgO style,, Ti02, MnO, P205, K20 Na20 primary and secondary components in silica.

component （%）	SiO_2	Fe_2O_3	$A1_2O_3$	CaO	MgO	K_2O	TiO_2	MnO	P_2O_5	Na_2O
Measured value	95.523	1.532	0.231	0.892	0.321	0.732	0.052	0.421	0.0053	0.142
	95.541	1.534	0.234	0.865	0.325	0.735	0.051	0.423	0.0058	0.143
	95.483	1.548	0.214	0.843	0.345	0.736	0.053	0.425	0.0056	0.151
	95.524	1.568	0.215	0.871	0.342	0.734	0.054	0.426	0.0057	0.145
	95.514	1.543	0.258	0.861	0.362	0.752	0.052	0.452	0.0054	0.146
	95.492	1.584	0.264	0.892	0.328	0.742	0.051	0.463	0.0052	0.148
	95.567	1.512	0.254	0.872	0.329	0.762	0.053	0.425	0.0054	0.147
	95.485	1.564	0.259	0.832	0.352	0.721	0.052	0.432	0.0058	0.154
	95.564	1.527	0.243	0.852	0.345	0.751	0.052	0.428	0.0052	0.136
	95.475	1.536	0.218	0.842	0.361	0.734	0.051	0.425	0.0055	0.144
AVG value	95.517	1.5448	0.239	0.8622	0.341	0.7339	0.0512	0.432	0.00549	0.1456
STDEV	0.0322	0.0216	0.0193	0.0204	0.0148	0.0120	0.0010	0.0140	0.0002	0.0050
Relative STDEV （%）	0.0348	1.3997	8.082	2.368	4.3321	1.6186	1.9087	3.2389	4.1581	3.4142

XI. Application in steel industryApplication.

The wavelength dispersion XRF system is mainly composed of sample preparation equipment (including high frequency melting furnace and grinding machine), wavelength dispersion spectrometer, computer system (including host, monitor, printer, keyboard and data communication interface), and other related equipment to constitute the WDXRF analysis system applied in the steel industry.

This instrument is a simultaneous wavelength dispersive spectrometer; over 10 analysis channels can be loaded for simultaneous determination of multiple elements. The elemental analysis ranges from Na to U and 8 major elements of iron ore, i.e., Ca, Mg, Si, Al, Mn, Ti, Ba, P of can be preset. The analysis speed is less than 2 minutes. The input power supply is single-phase 220/240vac, which also supply power to the PC and printer.

Accuracy index of each element：

Measuring accuracy(S):

MnO	≤0.03%	SiO_2	≤0.03%
MgO	≤0.05%	CaO	≤0.10%
$A1_2O_3$	≤0.03%	TiO_2	≤0.05%
BaO	≤0.03%	P	≤0.05%

XII. Application cases in steel industry

Sinter: Repeat test **10** times for samples taken from the steel plant

No.	Sample No.	Fe(%)	CaO(%)	SiO_2(%)	$A1_2O_3$(%)	MgO(%)	SO_3(%)
1	0203	56.62	11.26	5.86	13.75	3.36	0.035
2	0203	56.65	11.25	5.87	13.74	3.35	0.036
3	0203	56.59	11.24	5.82	13.75	3.33	0.035
4	0203	56.66	11.23	5.84	13.75	3.35	0.034
5	0203	56.64	11.26	5.88	13.74	3.36	0.037
6	0203	56.63	11.22	5.89	13.75	3.35	0.036
7	0203	56.64	11.25	5.86	13.76	3.34	0.035
8	0203	56.67	11.23	5.85	13.78	3.35	0.038
9	0203	56.62	11.24	5.88	13.76	3.36	0.036
10	0203	56.65	11.26	5.85	13.75	3.34	0.035

XIII. Slag: Repeat test 10 times for samples taken from the steel plant

No.	Sample No.	Fe(%)	CaO(%)	SiO_2(%)	MgO(%)	TiO_2(%)
1	0305	11.41	53.23	6.81	8.97	0.85
2	0305	11.42	53.26	6.85	8.96	0.87
3	0305	11.42	53.22	6.83	8.92	0.85
4	0305	11.45	53.25	6.84	8.93	0.86
5	0305	11.43	53.28	6.88	8.96	0.87
6	0305	11.43	53.29	6.89	8.96	0.86
7	0305	11.45	53.26	6.82	8.95	0.85
8	0305	11.48	53.22	6.83	8.97	0.88
9	0305	11.42	53.23	6.89	8.99	0.90
10	0305	11.46	53.262	6.84	8.96	0.85