EDX Spectrometer

Model:EDX1800E

RoHS and Free Halogen Rapid Test

EDX1800E Spectrometer

According to the wide application of EDX2800B in various fields, EDX1800E is specially designed for better performance and higher safety protection class.

New-generation high-voltage power supply and High efficient tube improves the reliability of the product

Applications

RoHS testing and analysis

Performance advantages

Down-lighting style: capable for testing samples with various shapes

Collimator and light filter: electrically switch various collimators and light filters, applicable for different measuring methods

Mobile platform: refine platform can be moved manually, easily locate testing point

High-resolution detector increase the accuracy of the analysis

New-generation high-voltage power supply and industrial tube: stable and reliable performance, up to 100W power can achieve higher test efficiency

Streamlined man-machine design, ensuring operational safety

Super man-machine operation indicator, experiencing comfortable operation

A new generation tube with better shielding effect

Reliable performance, up to 100W power

Self-Locking

Upper-cover of the instrument providing all-round protection

Technical parameters

Analyzable elements: Sulfur (S) ~ Uranium (U)
Detection limit of the analysis: 2ppm~99.99%
Multiple analysis and cognition models selectable
Independent matrix effect correction models
Multi-variable non-linear regression procedure
Repeatability for multiple measurements up to 0.05% (more than 96% content)
Long-term working stability of 0.05% (more than 96% content)
Working temperature:15℃~30℃
Power supply: AC 110/220V±5V, purifying AC regulated power supply suggested
Energy resolution: 144±5eV
Sample chamber size: 439mm×300mm×50mm
Instrument dimension: 550mm×410mm×320mm
Instrument net weight: 45kg

Configuration

Mobile sample platform
Signal to noise ratio intensifier
SDD detector
Signal detection electronic circuit
High- and low-voltage power supply
High-efficient tube

EDX2800B and EDX1800E comparisons

Standard configurations

Item	EDX 2800B	EDX 1800E
Detector	Si-Pin semiconductor detector, electrical refrigerating instead of liquid-nitrogen refrigerating, stored at room temperature, easy to use. SNR intensifier can be attached.	New-generation SDD detector made in USA with internationally leading technology, improved resolution and test efficiency.
Pre-amplifier and main amplifier circuit	The detector contains pre-amplifier and main amplifier circuit, with integrated design ensuring better stability and higher reliability of the instrument	A whole-new design of pre-amplifier and main amplifier circuit, latest micro-electronics modular technology applied, unified design, ensuring more consistent and stable technical specifications of the instrument
Test and analysis softwar	Special RoHS test software, metal coating analysis software, and component analysis software	whole-new designed professional analysis software, including RoHS& halogen-free; alloy number; metal coating and other analysis software, embedded fundamental parameter analysis algorithm, support qualitative and quantitative analysis with no standard sample

Technical specifications

Item	EDX 2800B	EDX 1800E
Resolution of detector	Resolution can reach 160±5eV (measured with Fe55 at counting rate of around 1000/S), moreover, new type of detector greatly improves the detection line of measured hazardous substances	Resolution can reach 144±5eV (measured with Fe55 at counting rate of around 1000/S)
Precision of instrument	0.1% (measured sample with >96% content)	0.05% (measured sample with >96% content)
Working scope of tube	New style of structural design ensures the heat dissipation of the light tube, and increases the service life of the light tube. 5~50KV high-voltage with up to 1mA current (set through software as required by customer)	Copper shell ensures the heat dissipation of the light tube, and greatly increases the service life of the light tube. 5~50KV high-voltage; current increased to 1.5mA (the upper limit of the light tube power increased by 50%)
Applications recommended	RoHS, hazardous heavy metal detection; metal coating analysis; component analysis for alloy material;	RoHS& halogen-free; alloy number; metal coating and other element analysis

Environmental indicators for heavy metals

Item	EDX 2800B	EDX 1800E
RoHS measurement accuracy	1.For about 1000ppm of sample, the accuracy deviation is ±100ppm (plastic sample as standard) 2.For about 100ppm of sample, the accuracy deviation is ±15ppm (plastic sample as standard)	1.For about 1000ppm of sample, the accuracy deviation is ±50ppm (plastic sample as standard) 2.For about 100ppm of sample, the accuracy deviation is ±10ppm (plastic sample as standard)
RoHS detection range	5 hazardous heavy metal elements stated in RoHS, including Cr, Hg, Pb, Br, Cd, can be detected. The highest detection limit can be 3ppm; moreover, can be applied to test other hazardous metal elements; the special test software can be upgraded for free permanently.	8 hazardous heavy metal elements stated in RoHS, including Cr, Hg, Pb, Br, Cd, Sb,As, Ba can be detected. The highest detection limit can be 2ppm; moreover, can be applied to test other hazardous metal elements; the special test software can be upgraded for free permanently.

Software		
Item	EDX 2800B	EDX 1800E
Component analysis software	Windows operating system, Chinese-version software (English-version software provide)	Windows operating system, Chinese-version software (English-version software provide)
	Can set password with technical management authority, better protecting test data from arbitrary modification	Can set password with technical management authority, better protecting test data from arbitrary modification
	Spectral analysis methods include five methods: total-area, net-area, Gaussian fitting, multi-component fitting, pure element fitting	Spectral analysis methods include five methods: total-area, net-area, Gaussian fitting, multi-component fitting, pure element fitting
	Curve types: linear, quadratic, interpolation; each of them can be combined with the method of "Normalization".	Curve types: linear, quadratic, interpolation; each of them can be combined with the method of "Normalization".
	The software has qualitative analysis and automatic element recognition function, easy to recognize and determine the sample element; qualitative analysis report with spectrogram can be printed.	The software has qualitative analysis and automatic element recognition function, easy to recognize and determine the sample element; qualitative analysis report with spectrogram can be printed.
	With the function of virtual spectrum superposition, easy for qualitative and comparative analysis of the sample	With the function of virtual spectrum superposition, easy for qualitative and comparative analysis of the sample
	Collimator and lighter filter can be switched automatically by the software, reducing measurement errors caused by mistakenly manual replacement of the collimator.	Collimator and lighter filter can be switched automatically by the software, reducing measurement errors caused by mistakenly manual replacement of the collimator.
		Achieve better results of testing mutually interfering elements
Coating analysis software	Windows operating system, Chinese-version software (English-version software provide)	Windows operating system, Chinese-version software (English-version software provide)
	Can set password with technical management authority, better protecting test data from arbitrary modification	Can set password with technical management authority, better protecting test data from arbitrary modification
	Standard sample-free analysis method (FP method); the test is not limited by standard samples. Can be used to test various complex coating.	Standard sample-free analysis method (FP method); the test is not limited by standard samples. Can be used to test various complex coating.
	The software has the function to standard sample calibrating function; both single standard sample and multiple standard samples can be used to check standard sample-free results, making test results approximate to actual value.	The software has the function to standard sample calibrating function; both single standard sample and multiple standard samples can be used to check standard sample-free results, making test results approximate to actual value.
	The software has qualitative analysis and automatic element recognition function, easy to recognize and determine the sample element; qualitative analysis report with spectrogram can be printed.	The software has qualitative analysis and automatic element recognition function, easy to recognize and determine the sample element; qualitative analysis report with spectrogram can be printed.
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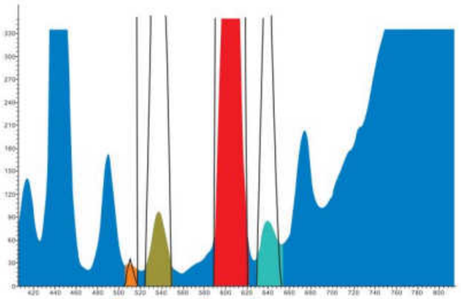
		Achieve better results of testing mutually interfering elements

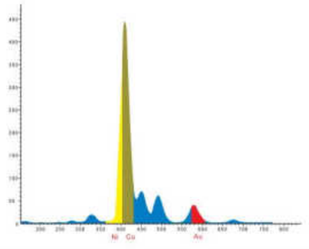
Examples of detection

RoHS detection

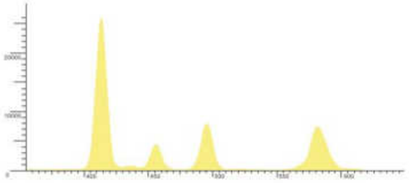


Spectrogram, the test result

Coating detection



Heavy metal detection



Rapid | Accurate | Non-destructive

Instrument Introduction:

With the widespread of EDX2800B over different fields, we design this type to meet the need of optimizing the product performance and improve the safety protection grade.

The reliability of the product is improved by using the high voltage source and Cu tube of the new generation and the testing efficiency is improved by the adopting the high power

RoHS

Application fields:

- RoHS testing
- Mining and alloy (Cu, stainless steel and so on) componential analysis
- Measurement of plating thickness, measurement of electroplate liquid and plating content
- The content test of precious metal such as gold, platinum and silver and different kinds of jewelry
- Mainly applied in RoHS directive industries, precious metals and jewelries processing industries; banks, jewelry shops and test institutes; electroplating industries

The performance is stable and reliable, achieving higher test efficiency

The automatic function of door sensor and high voltage lock gives you protection from all directions

Performance advantages:

Down-side X Source: meet the test requirements of samples of different kinds and shapes

Collimator and filter: the Auto-switch between various collimators and filters to meet the application of different testing methods

Movable platform: sophisticated manual movable platform is convenient for locating test point

High-resolution detector: improve the analyzing accuracy

High voltage source and X-ray tube of the new generation: the performance is stable and reliable, achieving higher test efficiency

Streamlined man-machine design, promising your operation security

Operation indicator makes you operate comfortably

Technical specifications:

Measurable elements: S to U.

Limit of detection (LOD) reaches 1ppm.

Element content: ppm to 99.99%

Arbitrary optional analysis and identification models

Independent matrix effect correction models

Multi-variable non-linear regression procedure

Ambient temperature: 15℃ to 30℃

Power supply: AC 220V±5V, AC purified stabilized voltage power supply.

Energy resolution: 160±5eV

Sample chamber size: 439mm×300mm×50mm

Instrument size: 550mm×410mm×320mm

Instrument weight: 45kg

Standard configurations:

Movable sample platform

Signal-to-Noise Enhancer (SNE)

Electric-cooling Si-PIN detector

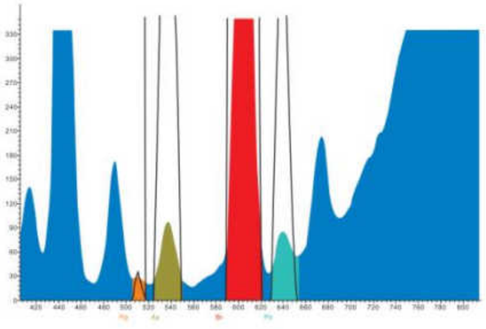
Signal detection electronic circuit

High and low voltage power

X-ray tube of high power

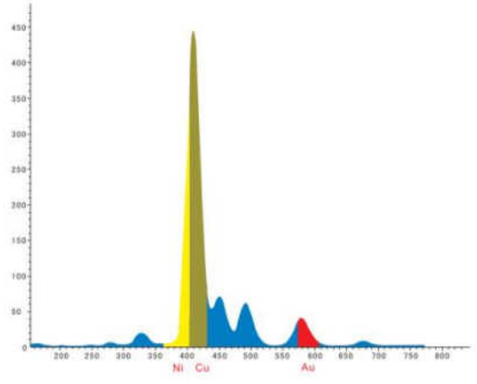
Test cases:

RoHS Testing



Test Results Spectrum

Plating Thickness Testing



Test Results Spectrum

What are RoHS and WEEE Directives?

The European Union has adopted Directive 2002/95/EC on the restriction of certain hazardous substances (RoHS) and Directive 2002/96/EC on waste electrical and electronic equipment (WEEE) with their publication in the Official Journal of the European Union on February 13, 2003. WEEE comes into effect on August 13, 2005 and RoHS requires the substitution of various heavy metals (lead, mercury, cadmium and hexavalent chromium) and brominated flame retardants (polybrominated biphenyls [PBB] or polybrominated diphenyl ethers [PBDE]) in new electrical and electronic equipment put on the market from July 1, 2006.

Testing standard of substances restricted by RoHS Directive

Hazardous substances	Standards (mg/kg)
Cd	100
Pb	1000
Hg	1000
Cr^{6+}	1000
PBBs	1000
PBDEs	1000

Restricted substances and their typical uses

Pb	
Solders	
Paints	Pigments and driers
Glass materials	Pb is allowed in fluorescent lamp
Ceramic materials	Pb is allowed in certain electronic ceramic materials
Iron, aluminum and copper materials	A certain amount of Pb is allowed
Plastics	PVC stabilizer and pigments
Batteries	Pb is allowed in acidic batteries for vehicles

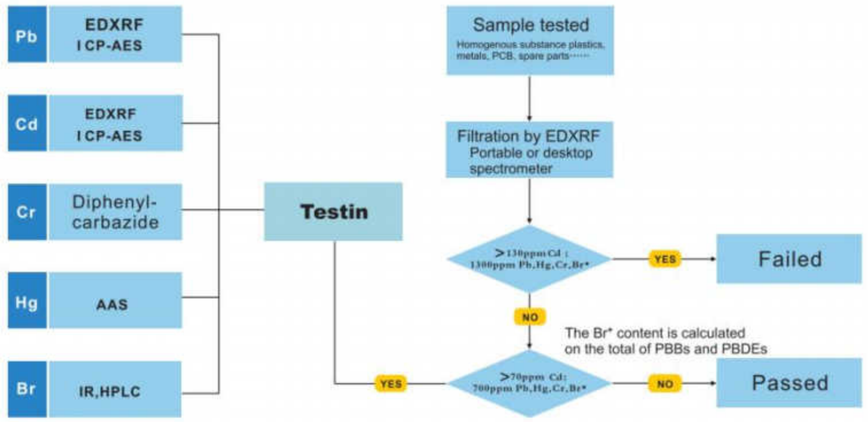
Cd	
Plastics	Stabilizer and pigments
Solders	Seldom used
Ceramics	Seldom used
Connectors	Relays and switches
Batteries	Cd is allowed in Ni-Cd batteries
Semiconductors	Optical sensors and solar cell panels

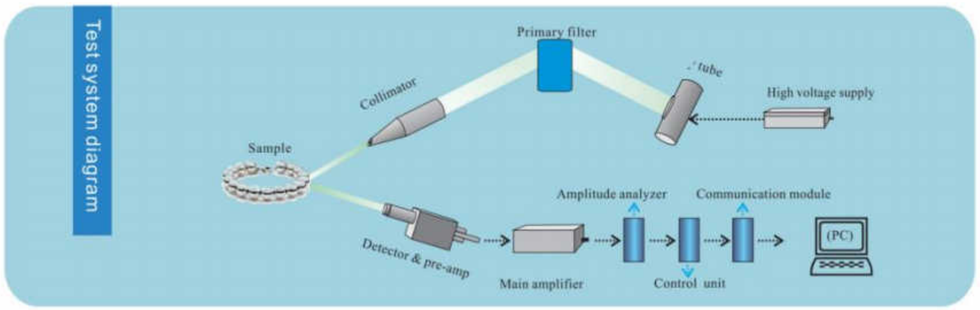
Hg	
Batteries	Prohibited (see battery directive)
Connectors	Relays and sensitive switches
Fluorescent lamps	A certain amount of Hg is allowed

Cr^{6+}	
Passivation layers	Commonly used for naked metal surfaces to enhance adhesion of plating layers
Anti-corrosive plating layers	Painting and plating layers
Chrome plating layers	Plating layer of chromium metal is not under control
Plasticizer	Commonly used to plastics plating process but not final products

PBBs & PBDEs	
Plastics	Brominated flame retardants

The analytical method of filtration for XRF to test RoHS substances





Scattering

It is the background of spectrum.

Photoelement

The photoelectron is the foundation of detector. In the sample, the X-ray intensity of every element is expressed as I1,I2,I3,I4,I5 ····· respectively. The element content C is the function of X-ray fluorescence intensity I, expressed as follows:

$$C=f(I_1,I_2,I_3,I_4,I_5\cdots\cdots)$$

This equation is too complicated and can be simplified as:

$$C=K_1I_1+K_2I_2+K_3I_3+K_4I_4+K_5I_5\cdots\cdots$$

Where

C is the element content in the sample; I1,I2,I3,I4,I5 ····· are X-ray intensity of element respectively; K1,K2, K3,K4,K5 ····· are coefficients which can be determined by measuring known standard sample to calibrate.

PERIODIC TABLE OF EIEMENTS

Characteristic X-Ray energy table

Per	IA												IIIA	IVA	VA	VIA	VIIA	0
1	1 H 1.008	IIA																2 He 4.008
2	3 Li 6.94 0.052	4 Be 9.012 0.110											5 B 10.81 0.185	6 C 12.01 0.282	7 N 14.01 0.392	8 O 15.99 0.523	9 F 18.99 0.677	10Ne 20.17 0.861
3	11Na 22.99 1.041	12Mg 24.31 1.254	III B	IV B	V B	VI B	VII B	VIII			I B	II B	13 Al 26.99 1.487	14 Si 28.09 1.740 1.838	15 P 30.97 2.015 2.142	16 S 32.06 2.307 2.468	17Cl 35.45 2.622 2.817	18 Ar 39.94 2.957 3.191
4	19 K 39.1 3.312 3.589	20 Ca 40.08 3.690 4.012 0.341 0.344	21 Sc 44.96 4.088 4.459 0.395 0.399	22 Ti 47.90 4.508 4.931 0.452 0.458	23 V 60.94 4.949 5.427 0.51 0.519	24 Cr 51.99 5.411 5.947 0.571 0.581	25Mn 54.94 5.895 6.492 0.636 0.647	26 Fe 55.84 6.400 7.059 0.704 0.717	27 Co 58.93 6.925 7.649 0.775 0.790	28 Ni 58.7 7.472 8.265 0.849 0.866	29 Cu 63.54 8.041 8.907 0.928 0.948	30 Zn 65.38 8.631 9.572 1.009 1.032	31 Ga 69.72 9.243 10.26 1.096 1.122	32 Ge 72.5 9.876 10.98 1.186 1.216	33 As 74.92 10.53 11.73 1.282 1.317	34 Se 78.9 11.21 12.50 1.379 1.419	35Br 79.90 11.91 13.29 1.48 1.526	36 Kr 83.8 12.63 14.12 1.587 1.638
5	37 Rb 85.47 13.38 14.97 1.694 1.752	38 Sr 87.82 14.14 15.85 1.806 1.872	39 Y 88.91 14.93 16.75 1.922 1.996	40 Zr 91.22 15.75 17.69 2.042 2.124 2.302 1.792	41 Nb 92.91 16.58 18.65 2.166 2.257 2.462 1.902	42Mo 95.94 17.44 19.63 2.293 2.395 2.623 2.015	43 Tc #(99) 18.33 20.65 2.424 2.538 2.792 2.122	44 Ru 101.0 19.24 21.69 2.558 2.683 2.964 2.252	45 Rh 102.9 20.17 22.76 2.696 2.834 3.144 2.376	46 Pd 106.4 21.12 23.86 2.838 2.990 3.328 2.503	47 Ag 107.9 22.10 24.99 2.984 3.151 3.519 2.633	48 Cd 112.4 23.11 26.14 3.133 3.316 3.716 2.767	49 In 114.8 24.14 27.38 3.287 3.487 3.92 2.904	50 Sn 118.6 25.19 28.60 3.444 3.662 4.131 3.044	51 Sb 121.7 26.27 29.85 3.605 3.843 4.347 3.188	52 Te 127.6 27.38 31.13 3.769 4.029 4.570 3.335	53 I 126.9 28.51 32.44 3.937 4.220 4.800 3.484	54 Xe 131.3 29.67 33.78 4.111 4.422 5.036 3.636
6	55 Cs 137.3 30.85 35.15 4.286 4.620 5.280 3.794	56 Ba 137.3 32.07 36.55 4.467 4.828 5.531 3.953	Ln	72 Hf 178.4 55.38 63.56 7.898 9.021 10.51 6.958	73 Ta 180.9 57.11 65.56 8.145 9.341 10.81 7.172	74 W 183.8 58.86 67.59 8.396 9.670 11.28 7.386	75 Re 186.2 60.66 69.66 8.651 10.01 11.68 7.602	76 Os 190.2 62.48 71.78 8.910 10.35 12.09 7.821	77 Ir 192.2 64.35 73.93 9.173 10.71 12.51 8.040	78 Pt 195.0 66.25 76.13 9.441 11.07 12.94 8.267	79 Au 197.0 68.19 78.37 9.711 11.44 13.38 8.493	80 Hg 200.5 70.16 80.66 9.987 11.82 13.82 8.720	81 Ti 204.3 72.18 82.99 10.27 12.21 14.28 8.952	82 Pb 207.2 74.23 85.36 10.55 12.61 14.76 9.183	83 Bi 208.9 76.32 87.77 10.84 13.02 15.24 9.419	84 Po #(209) 78.46 90.24 11.13 13.44 15.74 9.662	85 At #(210) 80.64 92.75 11.42 13.87 16.25	86 Rn #(222) 82.86 95.32 11.72 14.32 16.77
7	87 Fr * (223) 82.12 97.93 12.03 14.77	88 Ra # 226.0 87.44 100.6 12.34 15.23 17.8 10.60	An															

Alkali Metals | Non-Metal | Transitional element
Halogen | Lanthanoids | Actinides
Alkaline earth | Rare gases | Main group metal

Mark 1：#Radioactive Elements *Man Made Elements
2：All the Numbers are ordered one by one in this way, Atomic Number
Element Symbol, Atomic Weight, αK Kβ ,Lα ,Lβ ,Lγ ,Le

Ln	57 La 138.9 33.30 37.99 4.651 5.043 5.789 4.124	58 Ce 140.1 34.57 39.45 4.840 5.262 6.052 4.287	59 Pr 140.9 35.86 40.95 5.034 5.489 6.322 4.452	60 Nd 144.2 37.19 42.48 5.230 5.722 6.602 4.632	61 Pm #(147) 38.54 44.05 5.431 5.956 6.891 4.816	62Sm 150.4 39.91 45.65 5.636 6.206 7.180 4.994	63 Eu 152.0 41.32 47.28 5.846 6.456 7.478 5.176	64 Gd 157.2 42.76 48.95 6.059 6.714 7.778 5.361	65 Tb 158.9 44.23 50.65 6.275 6.979 8.104 5.546	66 Dy 162.5 45.73 52.38 6.495 7.249 8.418 5.742	67 Ho 164.9 47.26 54.16 6.720 7.528 8.748 5.942	68 Er 167.2 48.82 55.96 6.948 7.810 9.089 6.152	69Tm 168.9 50.41 57.81 7.181 8.103 9.424 6.341	70Yb 173.0 52.04 59.69 7.414 8.401 9.779 6.544	71 Lu 175.0 53.59 61.61 7.654 8.708 10.14 6.752
An	89 Ac # (227) 89.79 103.3 12.65 15.71 18.41	90 Th # (232) 92.19 106.1 12.97 16.2 18.98 11.12	91 Pa # 231.0 94.64 108.9 13.29 16.7 19.55 11.36	92 U # 238.0 97.14 111.8 13.61 17.22 20.16 11.62	93 Np # (237) 99.69 114.7 13.95 17.74 20.77 11.89	94 Pu # (244) 102.3 117.7 14.28 18.28 21.40 12.12	95Am #* (243) 104.9 120.8 14.62 18.83 22.04 12.38	96Cm #* (247) 107.7 123.9 14.96 19.39 22.69	97 Bk #* (247) 110.5 127.1 15.31 19.97 23.37	98 Cf #* (251) 113.3 130.4 15.66 20.56 24.06	99 Es #* (252) 116.2 133.7 16.02 21.17 24.76	100Fm #* (257) 119.2 137.2 16.38 21.79 25.47			