



XRF-FM480

XRF PRECIOUS METALS ANALYZER



<https://m.insize.com/XRF-FM480.html>



EN -- Please scan the QR code or visit the website for operation manual.

IT --- Scansiona il codice QR oppure visita il sito web per il manuale d'uso.

CZ -- Pro návod prosím naskenujte QR kód nebo navštivte webovou stránku.

ES -- Por favor, escanee el código QR o visite la página web para ver el manual de instrucciones.

FR -- Veuillez scanner le QR Code ou visiter notre site web pour accéder aux manuels d'utilisation.

DE -- Bitte scannen Sie den QR-Code oder besuchen Sie die Website für die Bedienungsanleitung.

PT -- Para aceder ao manual de instruções, por favor, faça a leitura do código QR ou visite o nosso site.

Instruction Manual

Please read the instruction manual carefully before using the product. When using the product, follow the instructions in the manual.

Precautions for Instruments

Note the following when using:

1. Do not use this instrument in an explosive gas or dangerous environment, otherwise it will cause an explosion.
2. Do not use the instrument in a harmful environment.
3. Please do not remove the instrument cover without the permission of our engineer.

If you disassemble the instrument without the authorization of INSIZE, we will not be responsible for the safety and performance of the instrument.

4. Please keep the surface of the instrument clean and hygienic.

Warning

■ General Warning

1. Follow installation and operating procedures at all times.
2. Strictly adhere to safety warnings on the instrument and in the instruction manual.
3. Do not install replacement parts or modify the instrument without authorization.

■ Electrical Warning

Grounding Mandatory Before powering on the instrument, ensure its grounding terminal is connected to the protective conductor (earth wire) of the main power cable. **Approved Outlets Only** Insert the power plug only into a grounded outlet matching the rated voltage. **Prohibited** The use of extension cords without grounding protection is strictly forbidden to prevent loss of safety compliance.

Use only fuses with the exact current rating, voltage rating, and type (e.g., standard blow, slow-blow, or fast-blow) specified for the instrument. Substituting incorrect fuses may cause equipment damage or fire risks.

Never use repaired fuses or jumper-wired fuse holders. Violations may lead to electric shock or fire.

Immediately power off the instrument if grounding protection is compromised to prevent hazardous operation.

Connect only to the power source type specified on the rated label of the instrument.

■ X-ray Warning

Do not open, disassemble, or modify the internal components of the instrument. Doing so will not only severely damage the instrument, but also endanger the health of the user.



Storage and Transportation

■ Storage

XRF-FM480 Precious metal XRF analyzer is a precision instrument and must be stored with care. When the instrument is not in use, it needs to be disconnected from the power supply and stored in a suitable temperature and dry environment. Avoid using the instrument in a humid and high temperature environment, as this can prolong the service life of the instrument.

■ Transportation

The relevant radiation management agencies in China have not made any control or restriction on X-ray analyzers. When transporting the XRF-FM480 Precious metal XRF analyzer in China, we recommend that you pack the analyzer thickly to protect the precision parts inside the analyzer. If you use the analyzer outside of mainland China, please follow local laws.

Chapter1 Instrument Overview

1.1. Introduction to XRF-FM480

XRF-FM480 precious metal analyzer is equipped with multiple collimators and a large sample chamber for simple operation, enabling rapid determination of precious metal content as well as identification of sample authenticity - including gold-plated adulteration, elemental impurities, and cladding deception. This versatile instrument accommodates items of various forms and can easily measure minute individual components such as connectors, clasps, inlays and gem settings. It serves as an ideal solution for gold and silver hallmarking centers, gold refineries, smelting plants, and testing laboratories.

1.2. Components of XRF-FM480

A complete set of XRF-FM480 analyzer includes instrument components and analysis software system.

1.2.1. Instrument Components

The following is the component table of XRF-FM480:

Component Name	Component Picture
XRF-FM480 metal XRF analyzer	Figure 1
USB cable	Figure 2
Power cord	Figure 3
Standard sample	Figure 4



Figure 1



Figure 2



Figure 3

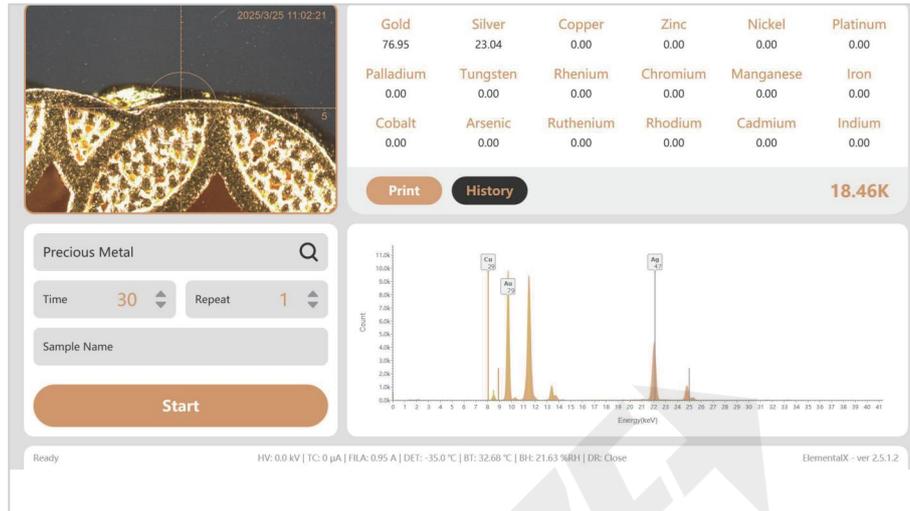


Figure 4

Note: The pictures on this page are for display only, and the specific accessories are subject to shipment.

1.2.2. XRF-FM480 Software

XRF-FM480 software system has intuitive interface enabling simple operation, which greatly reduces the requirements on users. The specific software application will be introduced in detail in Chapter 2.



1.2.3. Equipment Appearance



Exterior/Interior and Accessories Display

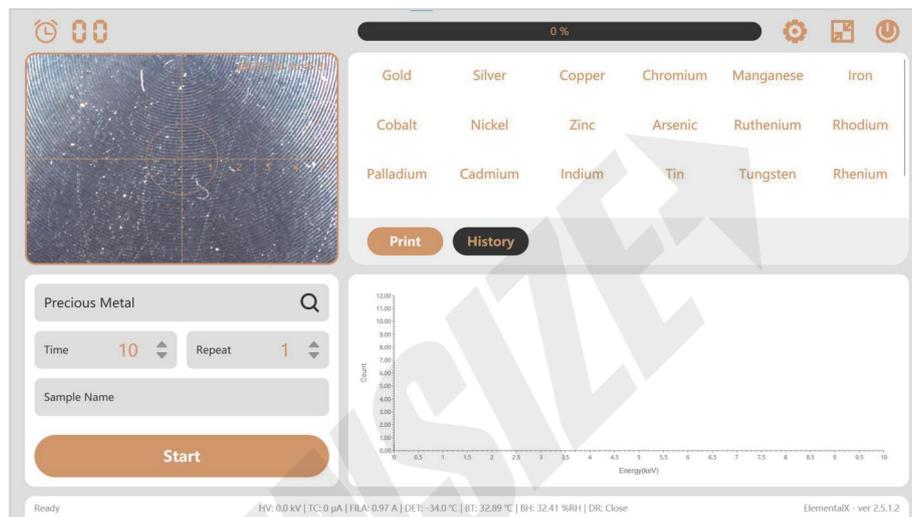
Item	Name	Item	Name
1	Power switch	5	Test window
2	USB interface	6	Display
3	High voltage lock	7	Radiation-Shielded Chamber Door
4	Cooling grid		

Chapter2 Software Features

2.1. Software Introduction

2.2. Launching the Software

Power on the instrument. Double-click the software icon on the screen to access the testing interface.



2.3. Enabling High-Voltage Lock

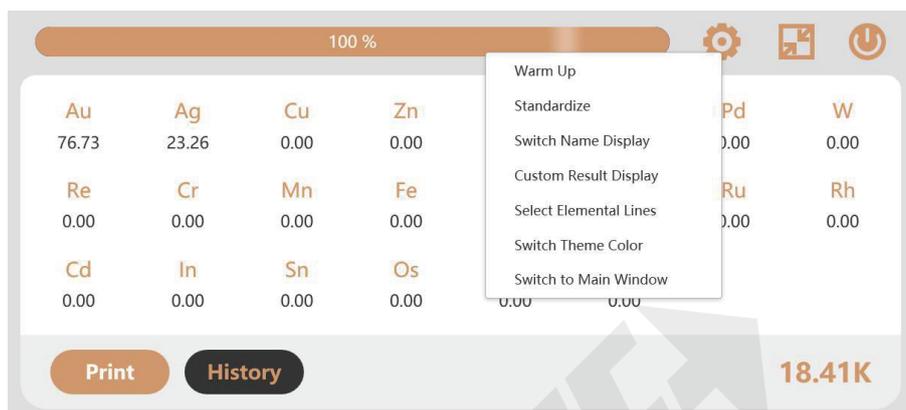
When the key is turned horizontally, it means the high-voltage is turned on and the instrument can work normally. When the key is turned vertically, it means the high-voltage is turned off and the instrument and the X-ray tube cannot work.



High-Voltage Lock Switch

2.4. Instrument Warm-Up

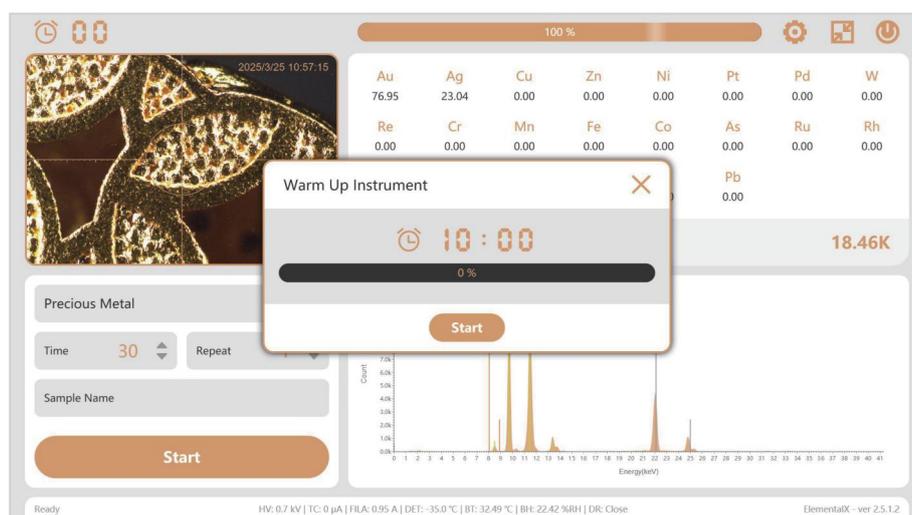
The high-voltage power supply and X-ray tube used in the XRF-FM480 require a preheating process. Material analysis can only be performed normally after the components reach thermal equilibrium. Therefore, the instrument must undergo preheating before opening the software for testing. This process typically takes 10 minutes.



2.4.1. Warm-up Steps

After closing the instrument cover, click the [Settings] shortcut button and select [Warm-up], as shown in the figure below.

1. Upon opening, the instrument preheat page will be displayed. Click [Start] to begin preheating, and the instrument will initiate a countdown, with the remaining preheat time shown on the right side. A completion prompt will automatically appear once preheating is finished.



Warm-up

2.4.2. Note

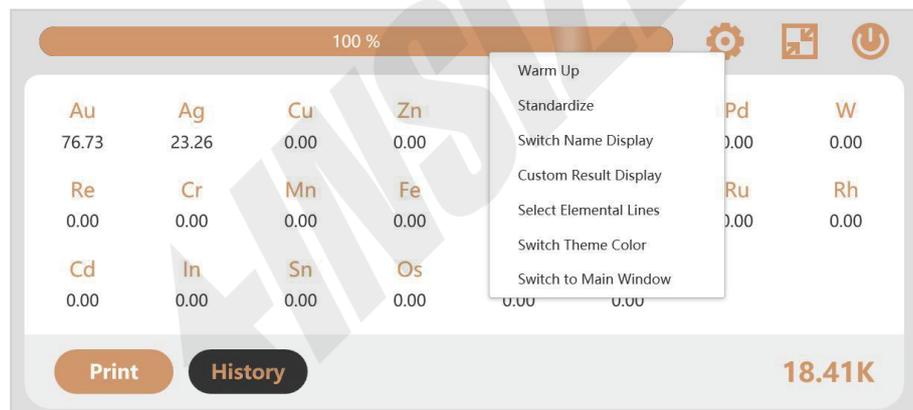
1. To ensure measurement accuracy, perform the preheating operation each time after powering on the instrument.
2. The instrument preheating only needs to be executed once per startup.

2.4.3. Standardization

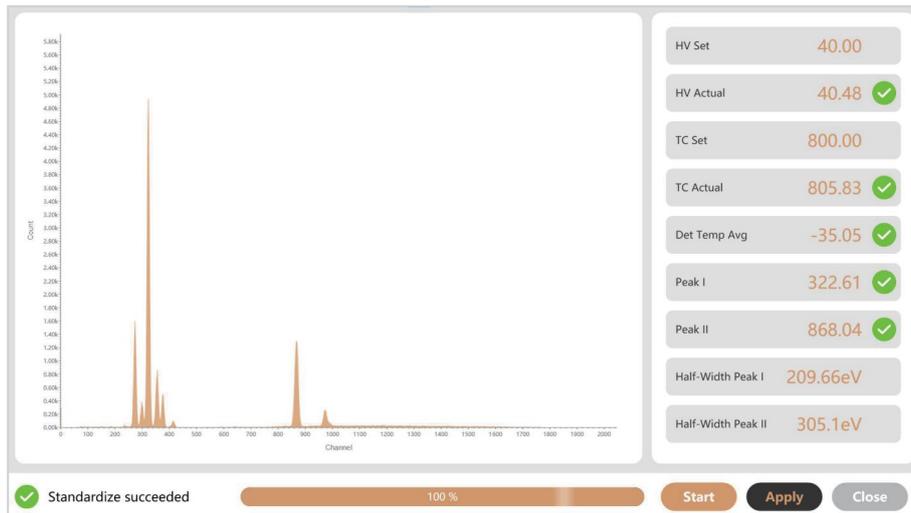
Drift refers to the slow variation in a measuring instrument's metrological characteristics over time under specified measurement conditions. During prolonged use, changes in various conditions and factors may lead to this "drift phenomenon." Standardized measurement calibration serves as one of the effective methods to eliminate drift.

2.4.4. Standardization Steps

1. After warm-up is completed, place the 316SS standard material onto the test window and click the [Standardization] button on the quick-access toolbar.



2. Enter the Standardization page.
3. Click the [Start] button. Upon test completion, the system will automatically navigate to the standardization results page, concluding the process. The standardization outcome will display either: Standardization Success or Standardization Failure.
4. Upon completing standardization, the system will display the standardization results page as shown in the figure below. After successful standardization, click 'Apply' to proceed.



Standardization Success

Notice!

If standardization fails, the failed parameters will be marked with a red 'NG' (No Good indicator). First, verify that:

The standardization reference sample is properly placed on the sample stage, and the correct sample type is used.

If both conditions are confirmed but the issue persists, please contact INSIZE.

2.5. Test Configuration

2.5.1. Instrument Settings

Open the instrument cover, place the sample in the test window position, and then close the cover securely. The instrument must remain closed during testing as it generates X-rays during operation. The system will automatically stop functioning if the cover is opened during the testing process.

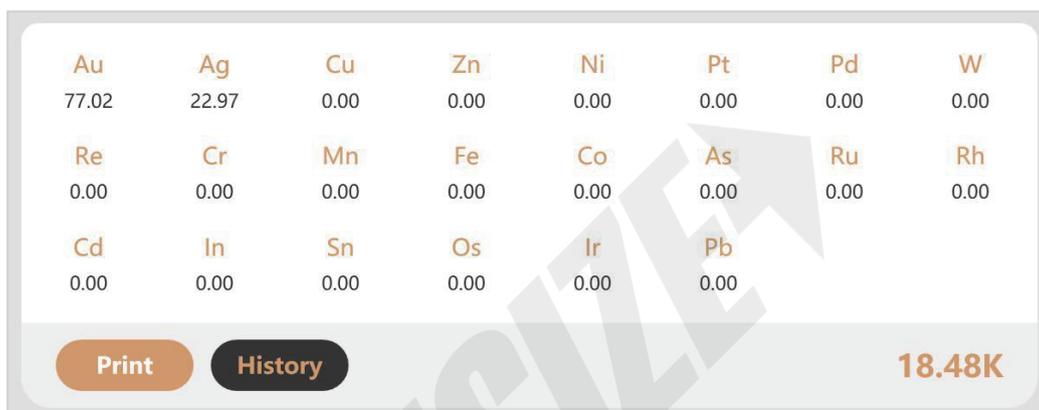
2.5.4. Stop The Test

During the testing process, test can be terminated by clicking the [Stop] button.

2.6. Test Results

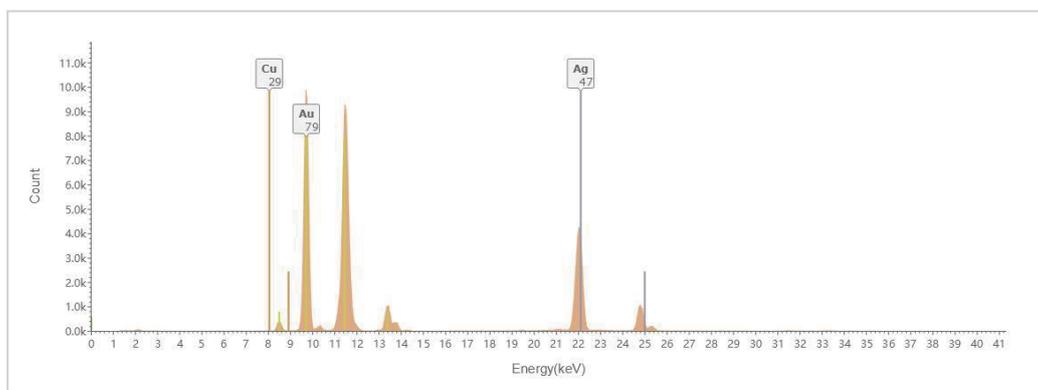
2.6.1. Result Display

Upon test completion, the test results will appear as shown in the figure below.



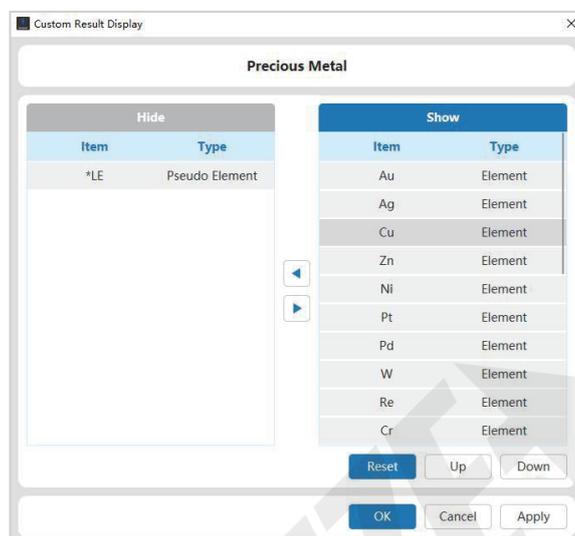
2.6.2. Spectrum Display

After testing, qualitative element analysis is performed by examining the energy spectral peaks in the spectrum graph. The software provides convenient functions such as element labeling and zooming in/out of the spectrum for detailed inspection, as illustrated in the figure below. The X-axis of the spectrum graph represents energy values (in keV), while the Y-axis displays photon counts.



2.7. Customized Results Display

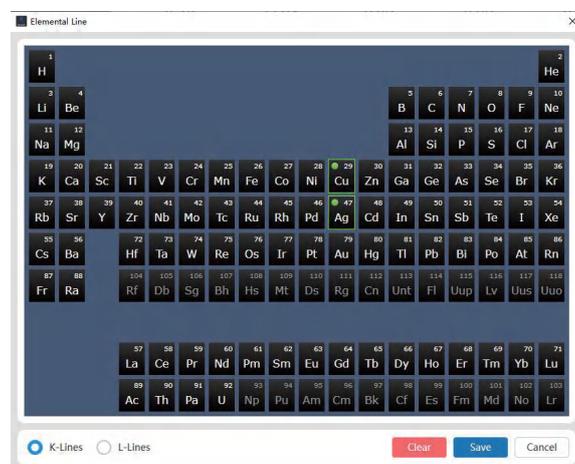
Click the [Settings] shortcut button and select [Custom Display]. As shown in the figure below, element sorting can be flexibly adjusted to meet personalized analysis requirements.



2.8. Select Elemental Lines

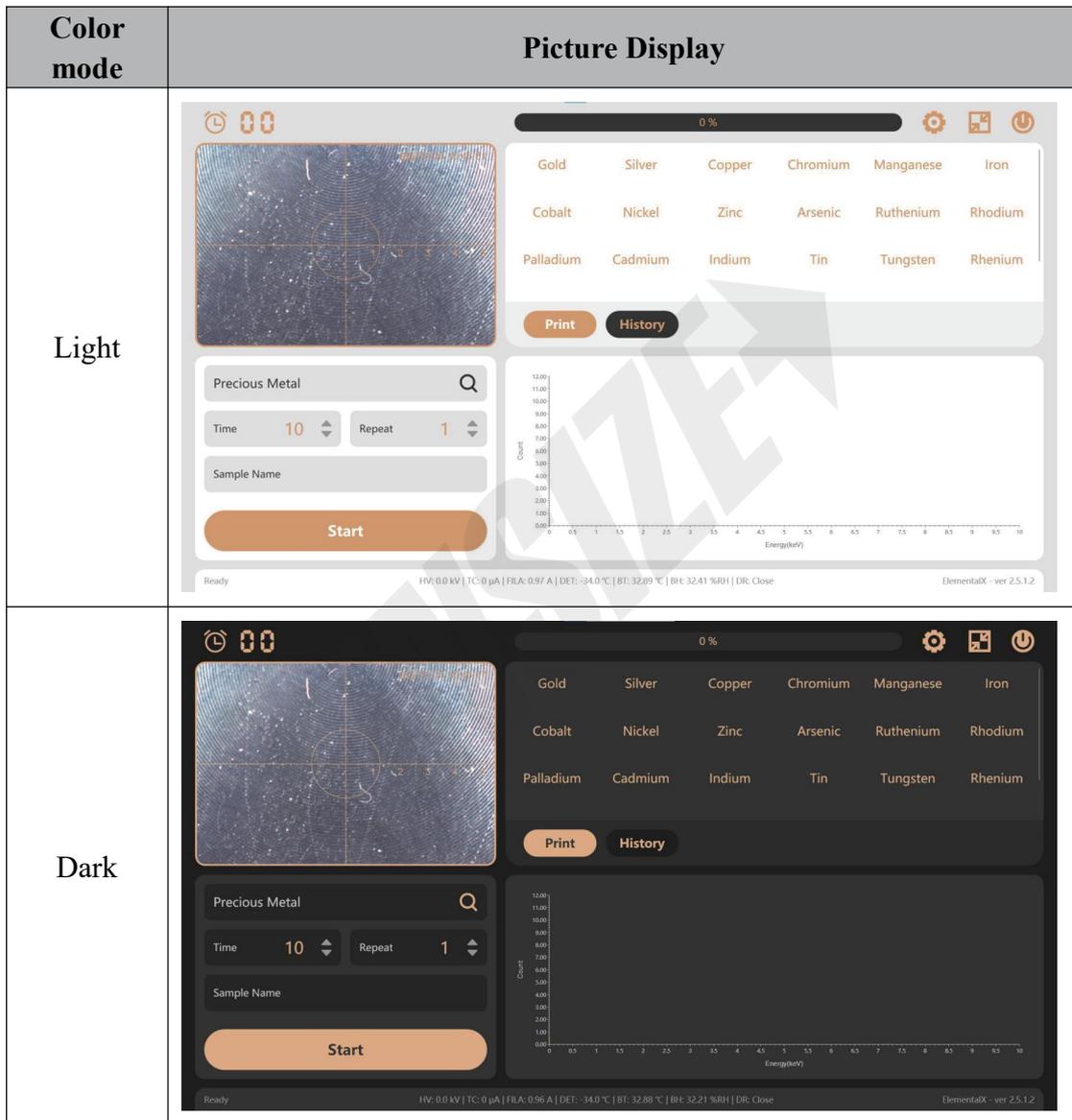
Click the [Settings] shortcut button and select [Select Elemental Lines] to access this page, where elements can be labeled.

First, check the K-series and L-series elements of interest on the periodic table and save the settings. As shown in the figure below, the K-series elements Cu and Ag have been selected and appear highlighted in green. When returning to the spectrum view, the selected Cu and Ag elements will be marked on the original spectrum.



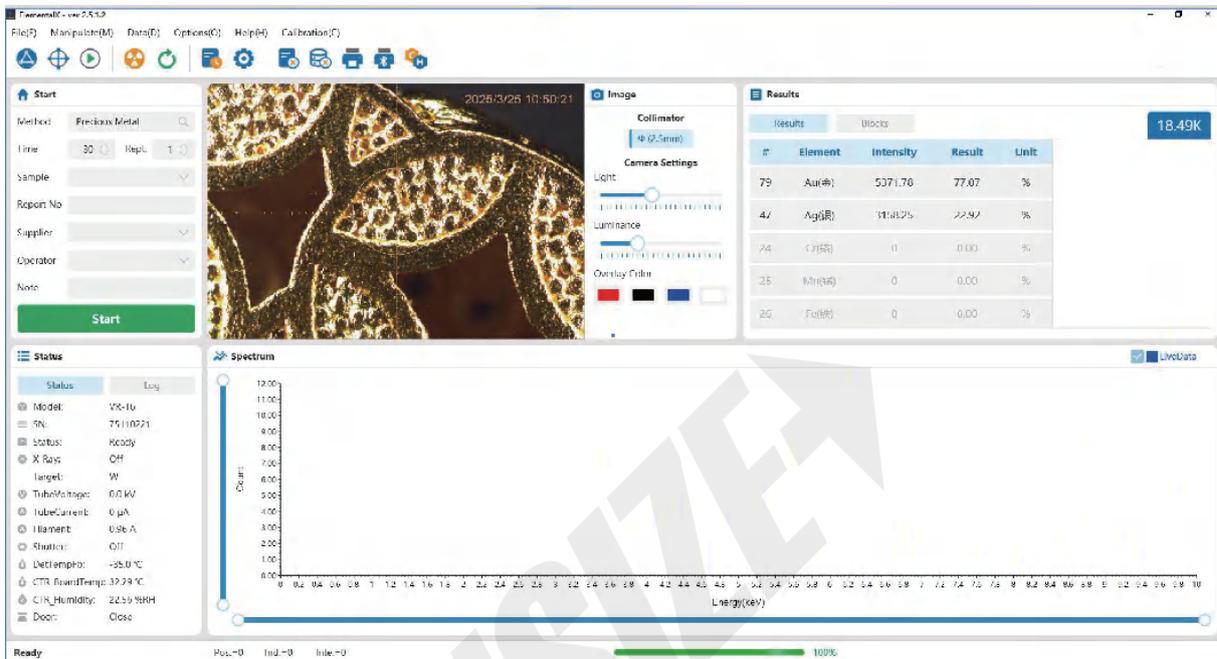
2.9. Switch Theme Color

The software supports multiple theme color modes. Simply click the [Settings] shortcut button and select [Switch Theme Color] to toggle between themes with one click, adapting to different lighting environments and user preferences to enhance visual comfort and operational focus.



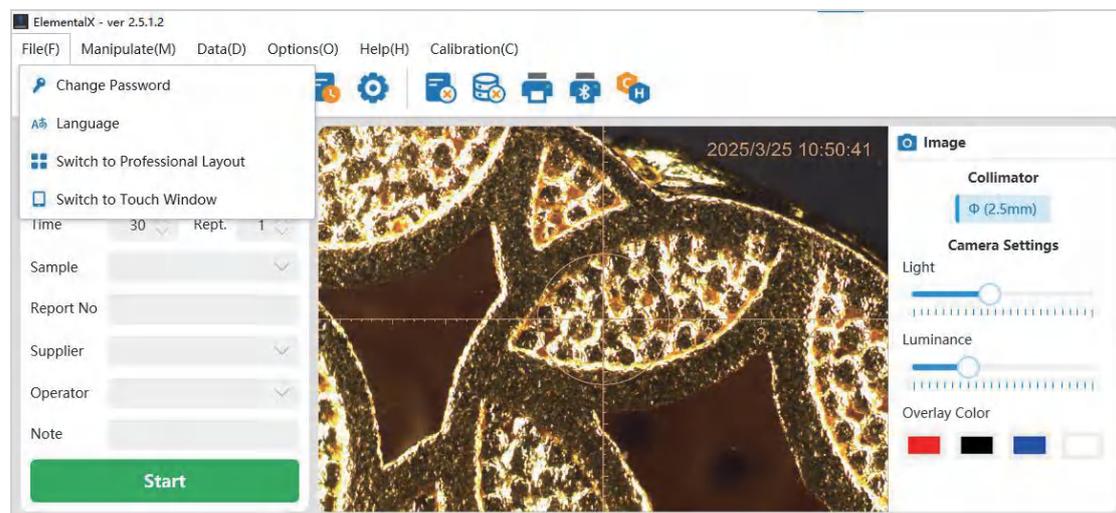
2.10. Switch to Main Window

The [Switch to Main Window] function in the [Settings] menu enables one-click switching to the desktop software interface, with real-time synchronization of test data and spectrum graphs, allowing access to enhanced professional analysis capabilities.



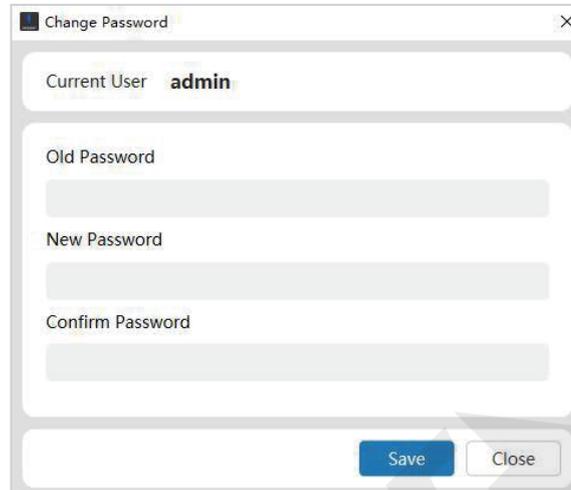
2.10.1. Navigation Bar - File Settings

The [File] menu integrates account security, language selection, and display mode settings.



(1) Change Password

Click [File] → [Change Password] to access the password modification page. Enter the current password, new password, and confirmation password sequentially, then save the settings. This changes the login password for the currently active account.

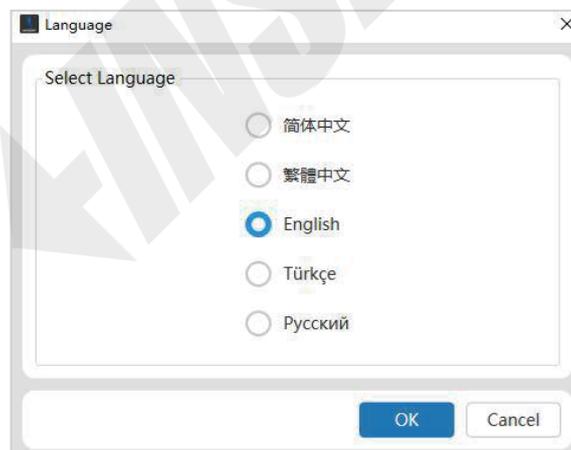


The screenshot shows a dialog box titled "Change Password" with a close button (X) in the top right corner. The dialog contains the following fields and buttons:

- Current User:** A text field displaying "admin".
- Old Password:** A password input field.
- New Password:** A password input field.
- Confirm Password:** A password input field.
- Buttons:** "Save" (blue) and "Close" (grey) buttons at the bottom right.

(2) Language Settings

Click [File] → [Language] to select language as needed.



The screenshot shows a dialog box titled "Language" with a close button (X) in the top right corner. The dialog contains the following elements:

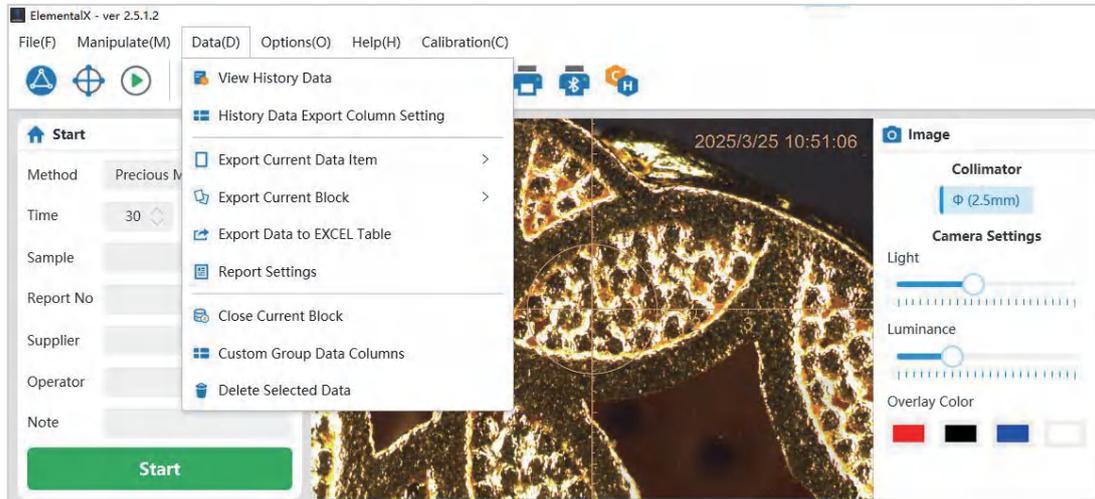
- Select Language:** A section with five radio button options:
 - 简体中文
 - 繁體中文
 - English
 - Türkçe
 - Русский
- Buttons:** "OK" (blue) and "Cancel" (grey) buttons at the bottom right.

(3) Switch to Touch Window

The system supports seamless two-way switching between the instrument's touchscreen interface and the desktop software interface, with one-click return to the native touchscreen operation.

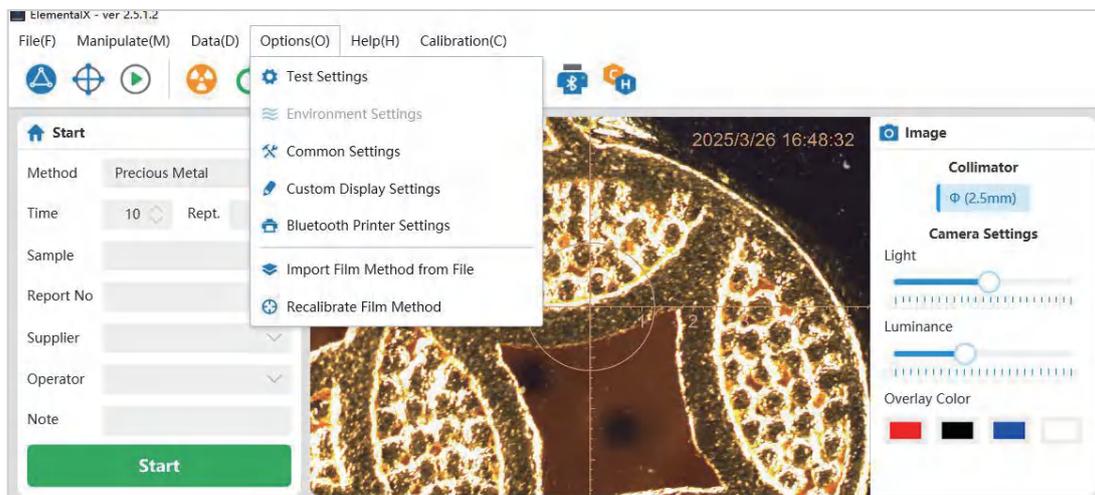
2.10.2. Navigation Bar-Data Settings

Under the [Data] menu, users can conveniently access historical records, export current datasets, and flexibly configure customized reports — enabling comprehensive data management and optimized utilization.



2.10.3. Navigation Bar-Options

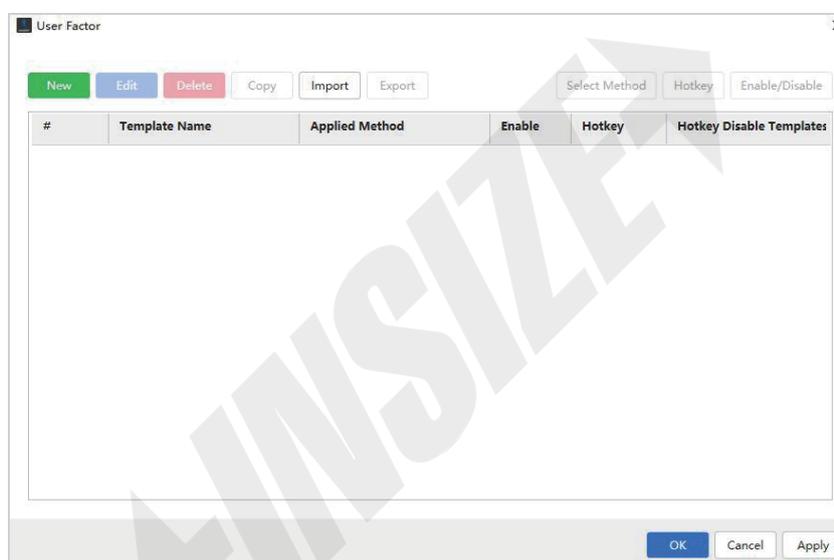
[Options] menu enables users to effortlessly configure various personalized settings, including but not limited to detailed test parameter adjustments, printer configurations, user factor modifications, and customization of general basic settings. These comprehensive options ensure the software fully adapts to individual workflows and preferences, thereby enhancing work efficiency and user satisfaction.



(1) User Factor

The software's User Factor feature enables instrument recalibration when needed. While the built-in background correction (BG) method automatically corrects for matrix effects from most coexisting elements, exceptions may occur—particularly when elemental oxides interfere with measurements of other elements. Although such deviations are typically minimal, the User Factor function allows targeted recalibration for specific samples when higher precision is required.

Click [Options] → [User Factor] to access the user factor editing page. After determining the correction factors for the target elements, you can calibrate the elemental content by configuring three parameters: A0, A1, and A2. The instrument's calculated value C will then be processed through the correction curve $A_2^2 \times C + A_1 \times C + A_0$ to derive the final concentration result.



Notice:

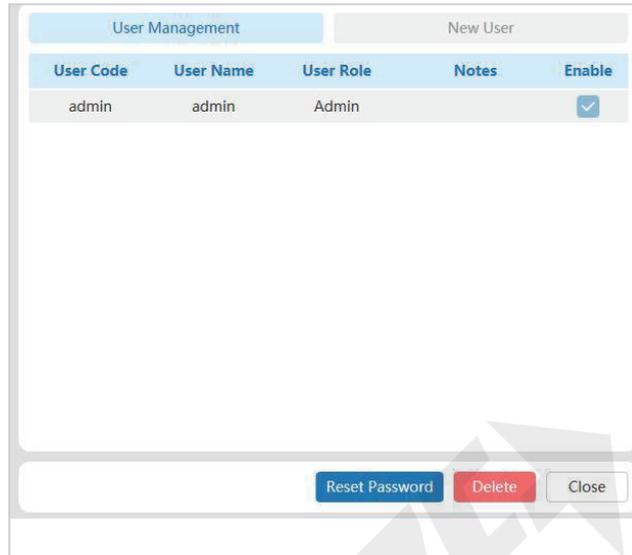
A minimum of three test samples with known standard concentrations must be measured using the software for no less than 300 seconds. The measured results are then curve-fitted against the standard reference values to determine the correction factor parameters.

(2) User Management

The user management interface provides functions such as Create New Account, Enable, and Disable. Click [Options] → [User Management] to access the user management page.

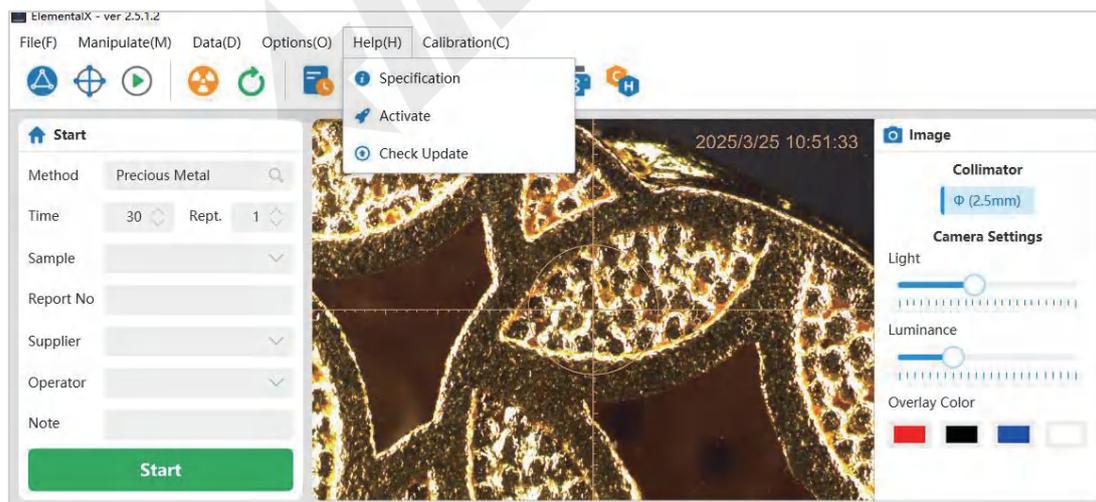
- **Create New User:** Click the [New User] button. Enter the following fields sequentially: User ID, User Name, Password, Role, Remarks. Click [Save] to complete the account creation.

- **Enable/Disable:** The "Enable" column features a two-state checkbox.
Checked → User account is active;
Unchecked → User account is disabled.
- **Reset Password:** Select the user, then click [Reset Password] to initial password 1234.



2.10.4. Navigation Bar-Help

Within the [Help] menu, users can conveniently access critical resources including product specifications, software update status checks, and device activation management.



Specification

Click [Help] → [Specifications] to view detailed specifications.

The Specifications section contains the instrument's basic parameters, device information, and operational records.

Chapter3 Cleaning & Maintenance

3.1. Leaning and Repairs

To ensure instrument reliability, keep your instrument clean!

1. When cleaning the surface of the instrument, use a soft cotton cloth.
2. When cleaning the test window, use a sanitary tampon or a cotton cloth for cleaning lenses.
3. The sample chamber should be cleaned regularly and the sample platform should be wiped with cotton cloth.

3.2. Key Notes for Cleaning/Maintenance

Prohibited: Do not use detergents or solvents to clean the instrument.

WARNING:

All non-routine maintenance (including cleaning, servicing, or repairs) must be authorized by INSIZE.

3.3. Emergency Handling Procedures

3.3.1. Minor Damage/Malfunction

If the appearance of the instrument is basically intact and there is no major damage, but there is a small problem, such as a power switch failure, a power indicator light failure, or an abnormality in the radiation lamp, please follow the steps below:

1. Turn off the instrument and stop using the instrument, at which point the instrument will no longer produce radiation and can safely proceed to the next step.
2. Place the instrument in the safety place.
3. The person in charge or management of the instrument shall notify the after-sales service center of INSIZE as soon as possible.

3.3.2. Serious Damage

In case of severe instrument damage, immediately follow these emergency procedures:

1. Execute the minor damage protocol by powering off the instrument to terminate all operations and ensure complete cessation of X-ray radiation.
2. Subsequently, carefully collect all dislodged components, securely package them along with the main unit in the designated safety containment case, and urgently contact the INSIZE for professional intervention.

INSIZE

Chapter4 Safety Information

This chapter covers radiation safety matters and general safety standards when using the XRF-FM480 analyzer. Before you start to use the XRF-FM480 analyzer, be sure to familiarize with this chapter.

4.1. Radiation Safety Guidelines

There are three basic principles of radiation protection, namely legitimacy, optimization and personal radiation dose limits. Radiation protection is divided into external radiation protection and internal radiation protection. The basic methods of external radiation protection include time protection, distance protection and shielding protection. Controlling these factors is key to keeping radiation doses.

(1) Time

The most direct way to reduce the amount of radiation is to reduce the time spent working with X-ray. If the time of exposure to radiation is reduced by half, the amount of radiation exposed will also decrease in the same proportion.

(2) Distance

Distance effectively reduces radiation exposure. When workers double their distance from the radiation source, the received radiation dose decreases by a factor of four. This demonstrates the inverse-square law, where radiation intensity from a point source diminishes in proportion to the square of the distance from the source.

(3) Shielding

Shielding materials refer to any substances capable of reducing radiation intensity. These materials achieve shielding effects either by absorbing radiation emissions from the source or by attenuating the radiation flux.

4.2. Safety Interlock System

4.2.1. Security Performance

The XRF-FM480 employs an X-ray tube to produce ionizing radiation, distinguishing itself from laboratory XRF instruments through its lower-power X-ray generation source, reduced operating tube potential, and radiation-shielded emission/detection components. This integrated design ensures no detectable radiation leakage occurs during normal instrument operation.

4.2.2. Radiation Safety Features of XRF-FM480

Label	Security features
1	Interlocking of the sample chamber When the instrument cover is opened and the high pressure is closed, the Z-axis is moved to the top and cannot moved anymore.
2	Radiation indicator indicating high voltage/X-ray on As long as the high-voltage power supply is switched on, and X-rays may be generated and the radiation indicators will be red.

High-Voltage Indicator Protocol:

Situation	High Voltage	Radiation Indicator
1	Turn on	Red
2	Turn off	White

Chapter5 Appendices

Element X-ray Energy Reference Table

Element	Atomic weight	Atomic weight	K α	K β	L α	L β	L γ	Le
Al	13	26.99	1.49					
Si	14	28.09	1.74	1.84				
P	15	30.97	2.02	2.14				
S	16	32.06	2.31	2.47				
Cl	17	35.45	2.62	2.82				
Ar	18	39.94	2.96	3.19				
K	19	39.1	3.31	3.59				
Ca	20	40.08	3.69	4.01	0.34	0.34		
Sc	21	44.96	4.09	4.46	0.40	0.40		
Ti	22	47.90	4.51	4.93	0.45	0.46		
V	23	60.94	4.95	5.43	0.51	0.52		
Cr	24	51.99	5.41	5.95	0.57	0.58		
Mn	25	54.94	5.90	6.49	0.64	0.65		
Fe	26	55.84	6.40	7.06	0.70	0.72		
Co	27	58.93	6.93	7.65	0.78	0.79		
Ni	28	58.7	7.47	8.27	0.85	0.87		
Cu	29	63.54	8.04	8.91	0.93	0.95		
Zn	30	65.38	8.63	9.57	1.01	1.03		
Ga	31	69.72	9.24	10.26	1.10	1.12		
Ge	32	72.5	9.88	10.98	1.19	1.22		
As	33	74.92	10.53	11.73	1.28	1.32		
Se	34	78.9	11.21	12.50	1.38	1.42		
Br	35	79.9	11.91	13.29	1.48	1.53		
Kr	36	83.8	12.63	14.12	1.59	1.64		
Rb	37	85.47	13.38	14.97	1.69	1.75		
Sr	38	87.82	14.14	15.85	1.81	1.87		
Y	39	88.91	14.93	16.75	1.92	2.00		
Zr	40	91.22	15.75	17.69	2.04	2.12	2.30	1.79
Nb	41	92.91	16.58	18.65	2.17	2.26	2.46	1.90
Mo	42	95.94	17.44	19.63	2.29	2.39	2.62	2.01
Tc	43	99	18.33	20.65	2.42	2.54	2.79	2.12
Ru	44	101.0	19.24	21.69	2.56	2.68	2.96	2.25
Rh	45	102.9	20.17	22.76	2.70	2.83	3.14	2.38
Pd	46	106.4	21.12	23.86	2.84	2.99	3.33	2.50
Ag	47	107.9	22.10	24.99	2.98	3.15	3.52	2.63
Cd	48	112.4	23.11	26.14	3.13	3.32	3.72	2.77
In	49	114.8	24.14	27.38	3.29	3.49	3.92	2.90

Sn	50	118.6	25.19	28.60	3.44	3.67	4.13	3.04
Sb	51	121.7	26.27	29.85	3.61	3.84	4.35	3.19
Te	52	127.6	27.38	31.13	3.77	4.03	4.57	3.34
I	53	126.9	28.51	32.44	3.94	4.22	4.80	3.48
Xe	54	131.3	29.67	33.78	4.11	4.42	5.04	3.64
Cs	55	137.3	30.85	35.15	4.29	4.62	5.28	3.79
Ba	56	137.3	32.07	36.55	4.47	4.83	5.53	3.95
La	57	138.9	33.30	37.99	4.65	5.04	5.79	4.12
Ce	58	140.1	34.57	39.45	4.84	5.26	6.05	4.29
Pr	59	140.9	35.86	40.95	5.03	5.49	6.32	4.45
Nd	60	144.2	37.19	42.48	5.23	5.72	6.60	4.63
Pm	61	147	38.54	44.05	5.43	5.96	6.89	4.82
Sm	62	150.4	39.91	45.65	5.64	6.21	7.18	4.99
Eu	63	152.0	41.32	47.28	5.85	6.46	7.48	5.18
Gd	64	157.2	42.76	48.95	6.06	6.71	7.78	5.36
Tb	65	158.9	44.23	50.65	6.28	6.98	8.10	5.55
Dy	66	162.5	45.73	52.38	6.50	7.25	8.42	5.74
Ho	67	164.9	47.26	54.16	6.72	7.53	8.75	5.94
Er	68	167.2	48.82	55.96	6.95	7.81	9.09	6.15
Tm	69	168.9	50.41	57.81	7.18	8.10	9.42	6.34
Yb	70	173.0	52.04	59.69	7.41	8.40	9.78	6.54
Lu	71	175.0	53.59	61.61	7.65	8.71	10.14	6.75
Hf	72	178.4	55.38	63.56	7.90	9.02	10.51	6.96
Ta	73	180.9	57.11	65.56	8.15	9.34	10.81	7.17
W	74	183.8	58.86	67.59	8.40	9.67	11.28	7.39
Re	75	186.2	60.66	69.66	8.65	10.01	11.68	7.60
Os	76	190.2	62.48	71.78	8.91	10.35	12.09	7.82
Ir	77	192.2	64.35	73.93	9.17	10.71	12.51	8.04
Pt	78	195.0	66.25	76.13	9.44	11.07	12.94	8.27
Au	79	197.0	68.19	78.37	9.71	11.44	13.38	8.49
Hg	80	200.5	70.16	80.66	9.99	11.82	13.82	8.72
Tl	81	204.3	72.18	82.99	10.27	12.21	14.28	8.95
Pb	82	207.2	74.23	85.36	10.55	12.61	14.76	9.18
Bi	83	208.9	76.32	87.77	10.84	13.02	15.24	9.42
Po	84	209	78.46	90.24	11.13	13.44	15.74	9.66
At	85	210	80.64	92.75	11.42	13.87	16.25	
Rn	86	222	82.86	95.32	11.72	14.32	16.77	
Fr	87	223	82.12	97.93	12.03	14.77		
Ra	88	226	87.44	100.6	12.34	15.23	17.80	10.62
Ac	89	227	89.79	103.3	12.65	15.71	18.41	
Th	90	232	92.19	106.1	12.97	16.2	18.98	11.12
Pa	91	231	94.64	108.9	13.29	16.7	19.55	11.36
U	92	238.0	97.14	111.8	13.61	17.22	20.16	11.62

←INSIZE→

www.insize.com