

# Content

2. Performance.....	1
3. Character.....	1
4 . Packing list.....	2
5. Principle and structure.....	2
5.1 Basic principle.....	2
5.2 Instrument structure diagram.....	3
6. Installation guide.....	4
6.1 Storage.....	4
6.2 Unboxing and acceptance.....	4
6.3. Installation.....	5
6.3.1 Precautions.....	5
6.3.2 Installation Environment.....	5
6.3.3 Instrument installation.....	5
7. Electrical connections.....	6
7.1 Main unit and related accessories.....	6
7.2 Connect with computer.....	6
8. Hardware installation steps.....	6
9. Related driver and software installation and menu operation instructions.....	12
9.1 Related driver and software installation.....	12
9.1.1 Related installation driver.....	12
9.1.2 Software installation.....	16
9.2 Menu operation instruction.....	16
9.2.1 Instrument interface settings.....	17
9.2.2 Structure of menu.....	17
9.3 Software basic operation.....	20
9.4 Test sample classification reference.....	24
10 Daily Maintenance.....	28
10.1 Daily use and maintenance of the instrument.....	29
10.2 Troubleshooting.....	30

10.3 How to use Silver calibration film and calibration.....	33
11. How to create workspace.....	37
11.1 Preparation before creating a workspace.....	37
11.2 How to create workspace.....	38
11.2.1 complete reconstruction of work zone.....	38
11.2.2 Rebuild using the original work zone.....	50
11.3 How to modify Workzone.....	52
11.4 delete workspace.....	55

# 1. Application

This instrument is mainly used for qualitative and quantitative analysis of elements in samples. It can quickly analyze non-destructive solid samples, powders and liquids. It is widely used in quality inspection, electronic and electrical RoHS directives, medicine, food, metallurgy, chemical industry, building materials, geology, minerals, archaeology and other fields.

# 2. Performance

Elements analysis rang: Na~U

Minimum detection limit:  $\leq 2\text{PPM}$  (mg/kg)

Element content analysis range: 0.0002%~99.99% (It depends on the specific elements)

The elements can be analyzed at the same time: more than 20kinds

Repeatability:  $\leq 2\%$

Stability:  $\leq 2\%$

Sample testing time: 30—900sm, adjustable

Detector resolution: 142~253eV

# 3. Character

- 1) Perfect radiation safety protection.
- 2) Automatic instrument calibration function.
- 3) Powerful software operating system and friend operation.
- 4) Customize various analysis reports according to customer

requirements.

- 5) Fast analyze multi-element.
- 6) 8 million pixel CCD camera.
- 7) Automatically select and automatically convert the six-channel filter system.
- 8) Using high-resolution foreign detectors
- 9) No liquid nitrogen and water circulation cooling required
- 10) Rapid analysis of RoHS/WEEE instructions

## 4 . Packing list

1) Energy dispersive X-ray fluorescence spectrometer (host)	
1set	
2) Data dealing system	1set
3) Power cord of machine	1pcs
4) Sample container	1pcs
5) Silver calibration film & EC680m	1pcs of each
6) Sample cup	1pcs
7) Manual	1pcs
8) Product certificate	1pcs
9) Safety radiation permit	1pcs
10) Packing list	1pcs

## 5. Principle and structure

### 5.1 Basic principle

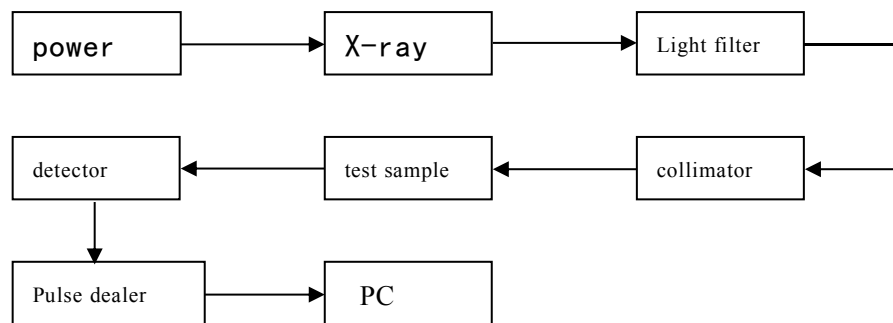


Figure 1 Spectrometer schematic

The spectrometer provides high voltage to the X-ray tube according to the high-voltage power supply, and the X-ray tube emits X-rays through the filter, and then irradiates the sample to excite the X characteristic ray of the element, and the detector detects the characteristic of X ray of the element to be tested by the pulse processor operation. After processing, it is transferred to the computer test software to obtain the content of the measured elements.

## 5.2 Instrument structure diagram

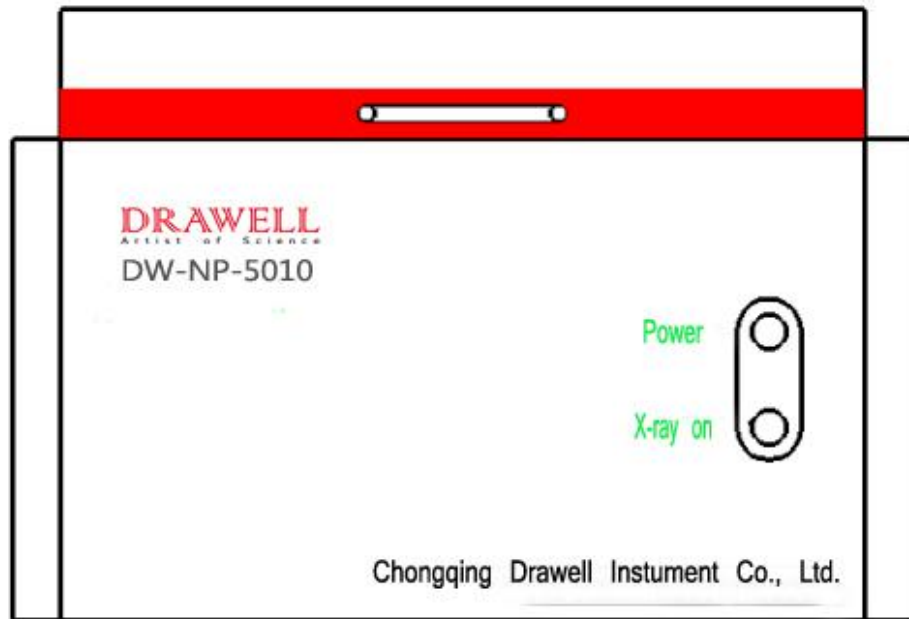


Figure 2 Instrument structure diagram

## 6. Installation guide

### 6.1 Storage

The measuring instrument should be stored indoors, the temperature should be within  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , humidity  $\leq 70\%$ .

### 6.2 Unboxing and acceptance

The instrument is taken out of the box. Please check the certificate and product packing list, and check the spare parts, accessories and random files of the instrument.

At the same time, check the appearance of the instrument to see if it is damaged during transportation. If there is any abnormality, please contact the supplier or manufacturer immediately.

## **6.3. Installation**

### **6.3.1 Precautions**

Some particularly important items before install instrument are as follows:

- 1) This instrument is an optical precision instrument, there is a password in important operation items and must be operated by a special person.
- 2) The power supply must be grounded; the instrument case and the ground bus should be connected reliably.
- 3) The input and output plugs of the instrument are marked, checked one by one, and do not plugin and out when it is working!

### **6.3.2 Installation Environment**

The instrument should be installed indoors, without strong electromagnetic fields, and vibration sources but ventilation, and good heat dissipation, avoid direct sunlight and strong air convection.

Power supply:  $220V \pm 22V$ ,  $50Hz \pm 0.5Hz$ , 200W

Temperature range:  $25^{\circ}C \pm 5^{\circ}C$

Relative humidity:  $\leq 70\%$

### **6.3.3 Instrument installation**

The instrument is mounted on a stable, instrument shape size is 560 mm × 500 mm × 400 mm (length × width × height) and a weight of 35 kg.

## 7. Electrical connections

### 7.1 Main unit and related accessories

The system besides computer includes: power cord, and 3 pics of USB cable.

### 7.2 Connect with computer

Using the USB cable connect the host machine from back to the computer.

**Warning:**the instrument housing is grounded reliably!

220V AC power is dangerous to the person. In order to prevent electric shock, there is a special grounding bolt on the housing of the instrument. When installing, be sure to connect the instrument housing to the grounding busbar by a copper wire with a section larger than  $2\text{mm}^2$ . The grounding resistance should not exceed  $10\Omega$ .

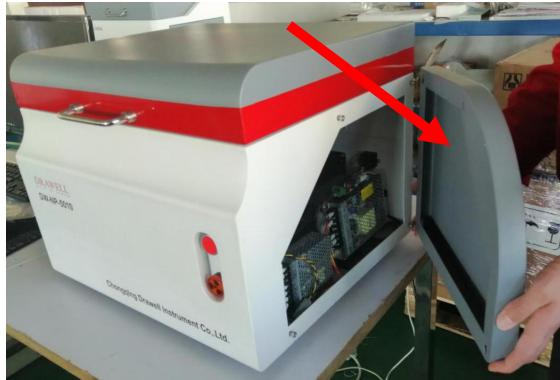
## 8. Hardware installation steps

Step 1: open the package.

Step 2: find the packing list and check whether all accessories are missing.

Step 3: place the instrument on a suitable table.





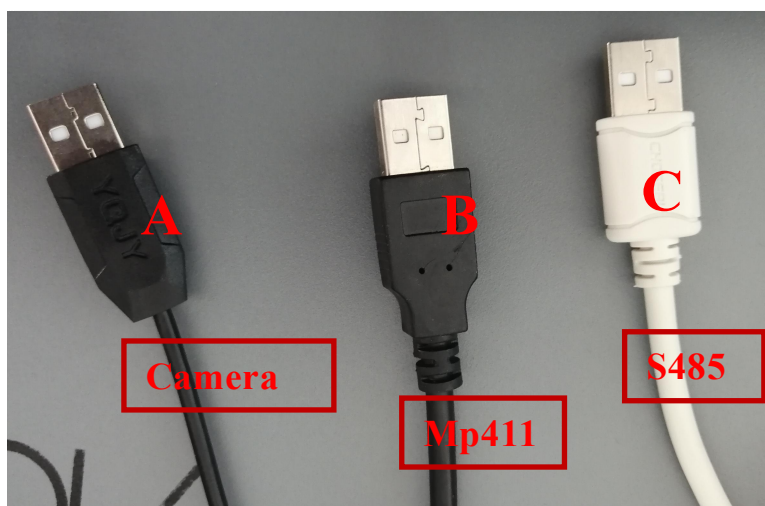
Step 4: open the right cover of the instrument (method: hold the bottom of the right cover and push it upward, and then parallel to the person's side along the table top to take down the right cover.



Step 5: check whether the internal parts and wiring of the instrument are loose or not. If there is no problem, install the right cover again. (push the right cover into the four screw holes and press it down. )

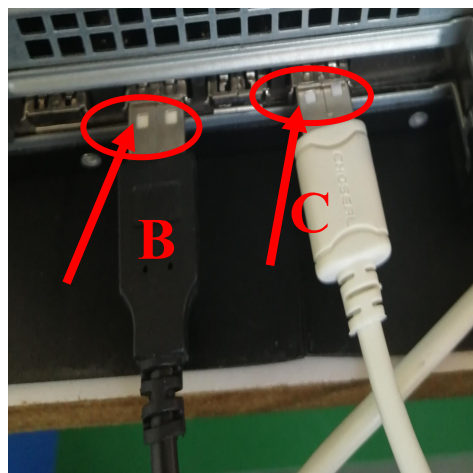
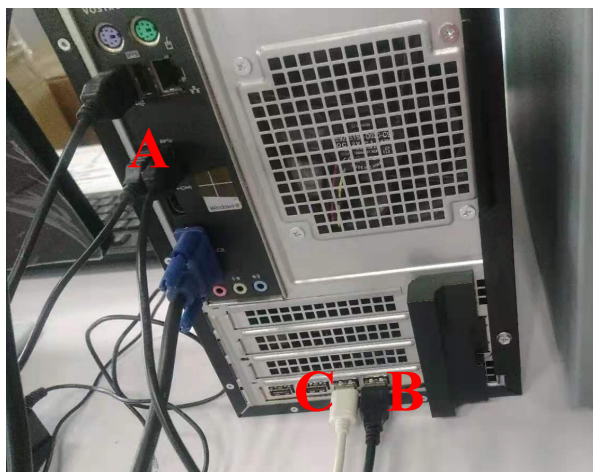
Step 6: put the instrument and computer on the desk.

Step 7: computer connection: find the three lines in the figure below



Step 8: insert three kinds of lines according to the figure below. Be sure to pay attention to the direction of B and C. The white square shown in

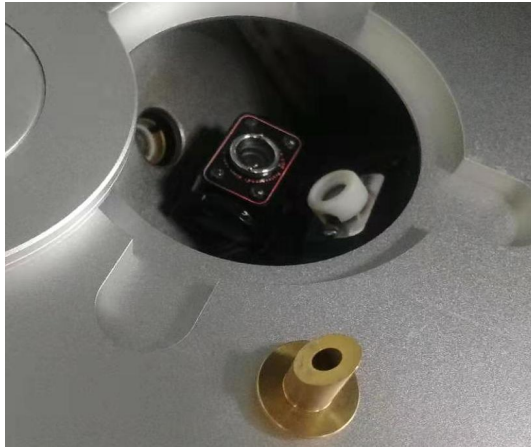
the figure must face upward.



Step 9: find the sample box and open it



Step 10: take out the  $\Phi$  5mm collimator



Step 11: remove the sample tray, clean the adhesive tape inside and put it into the collimator.



Step 12: the cross section of the collimator must be horizontal as shown.

Step 13: cover the sample tray.



Step 14: take out a Mylar film and lay it on the sample tray.

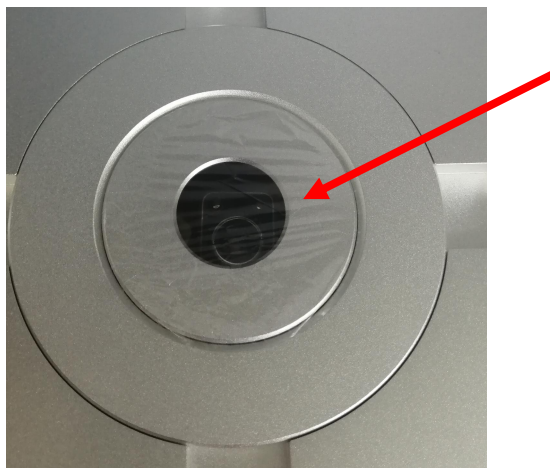




Step 15: cover the upper plate of the sample supporting plate



Step 16: lay the Mylar film as flat as possible, as shown in the figure:



Step 17: find the silver calibration film and put it into the sample chamber.



Step 18: close the spectrometer cover



Step 19: turn on the computer

Step 20: turn on the power supply of spectrometer host

Step 21: after turning on the instrument, confirm that there is no abnormal power on, then operate according to the operation manual of the instrument and conduct the silver calibration film test. ( Refer to 9.3 software basic operation 1 and 2)

## 9. Related driver and software installation and menu operation instructions

### 9.1 Related driver and software installation

Note: the driver and software have been installed before the instrument leaves the factory, so please skip 9.1 and enter 9.2 directly. Only in case of computer or system failure, perform the operation of 9.1

The relevant driver and software are placed in the spectrometer PC, and the PC with the installation software.

#### 9.1.1 Related installation driver

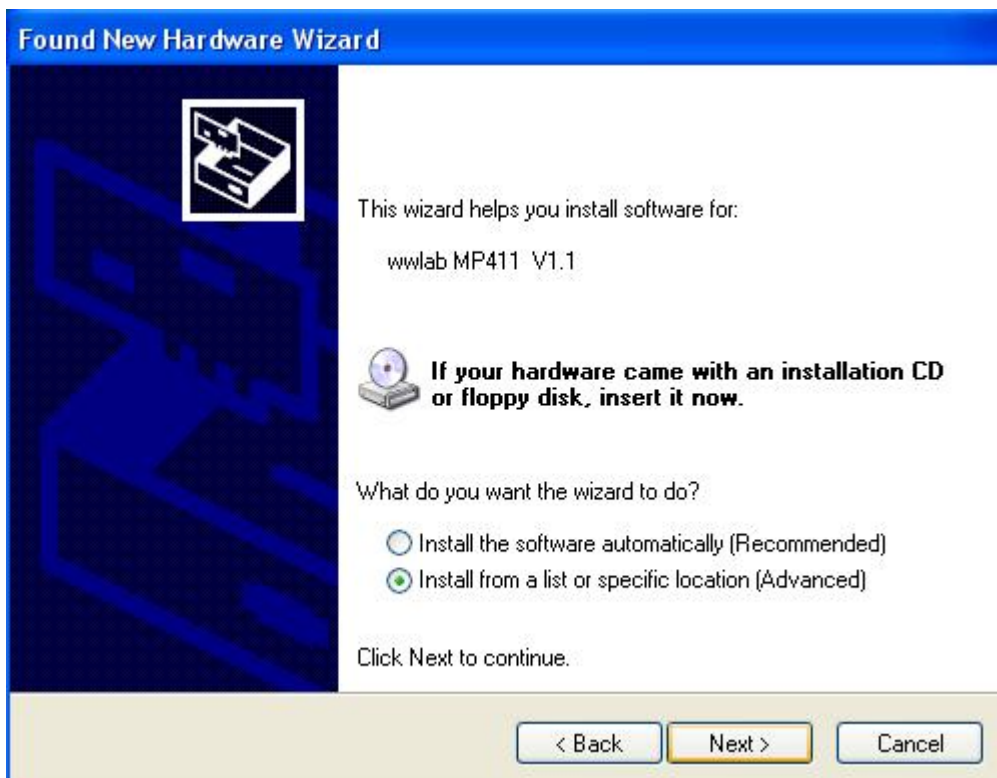
1. The camera (CCD) is driver-free installed in the windows xp operating system.

##### 2、MP411driver

When the device is connected and the computer is started, the Windows system will automatically prompt to find new hardware.



Then select "Install from a list or specific location(Advanced)" and click "Next".

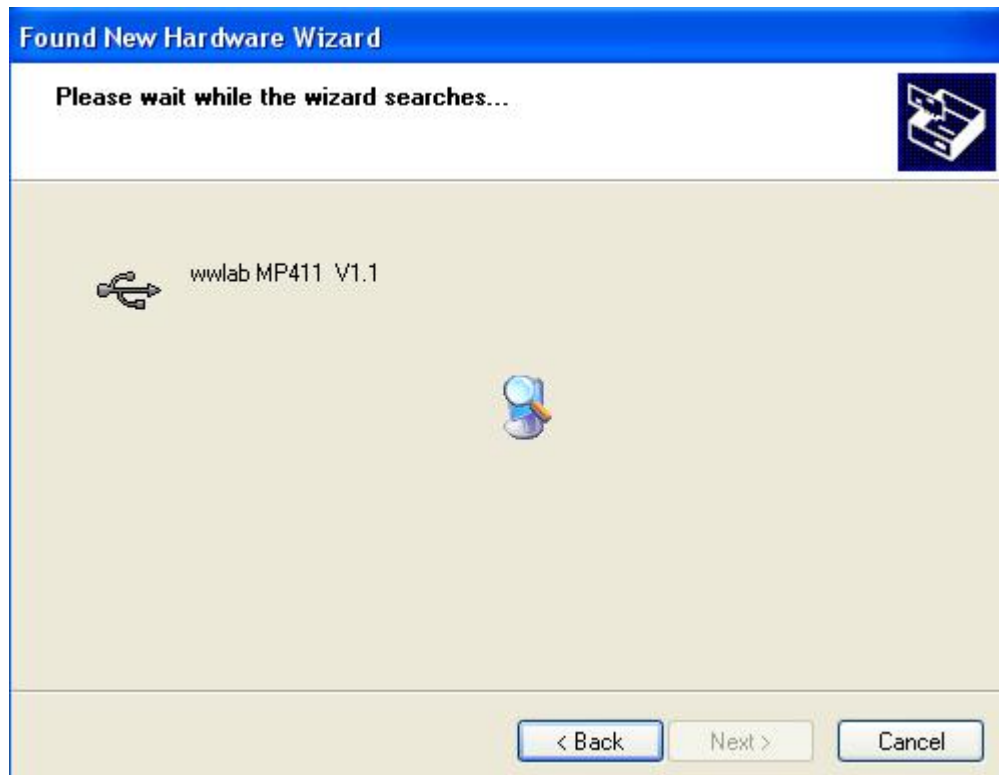


Then click "Next".

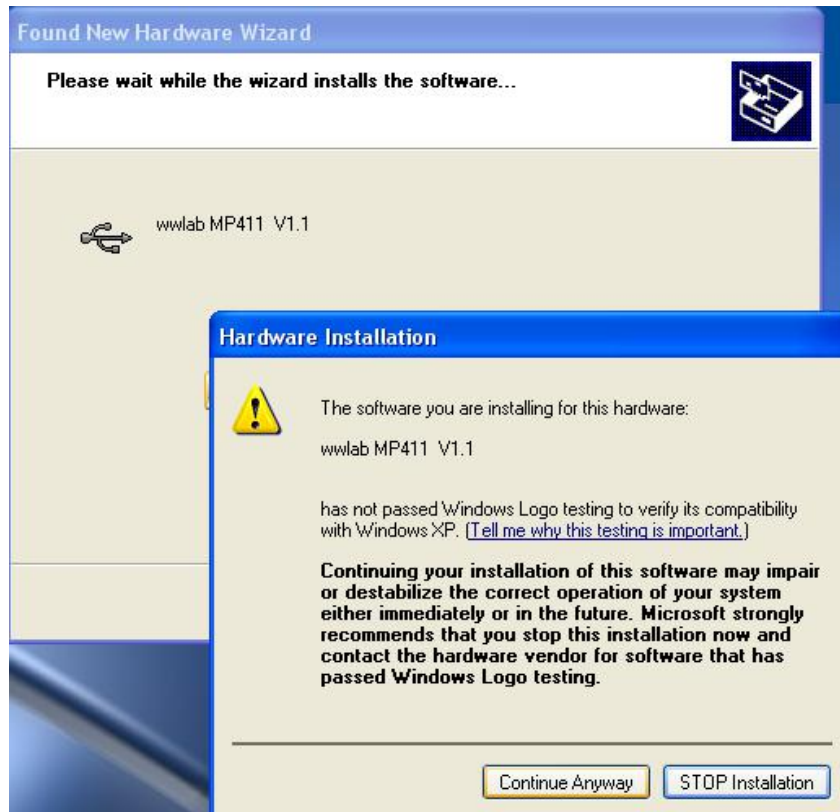




Then click "Next"







Then click "Next" until the above window appears, click "Continue Anyway", click "Finish" after installation.

After the installation is completed, in the lower right corner of the display screen will show the new hardware is installed and ready for use.

### 3、DPP driver

Turn on the spectrometer power switch, Windows system will automatically prompt to find new hardware (this is USB to 485 driver), find the "CP210xVCPInstaller\_x64.exe" file on the computer and double-click to install.

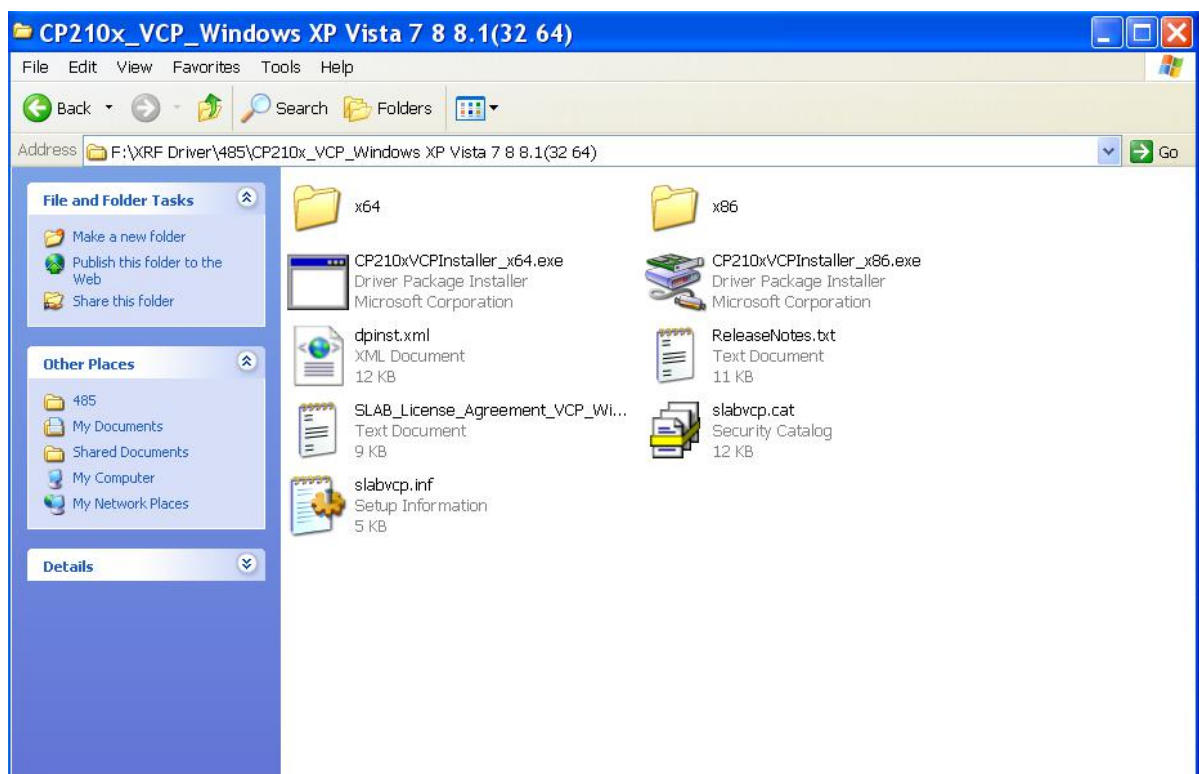
At this point, all required drivers are installed.

### 9.1.2 Software installation

Please confirm the system time before installing the software. When the installation is complete, you cannot modify the time.

In the computer you can find the XRFSetup file, it's save in the E or F disk. Install the equipped software on the computer, and the system will automatically pop up the window of the install content.

Double click to start the installation.



Click "Next" and follow the prompts to complete the software installation.

### 9.2 Menu operation instruction

This software is developed with VC++6.0. According to the functions, it

can be divided into five main functions: instrument interface monitoring, instrument performance testing, working curve (called work area in this program) preparation, sample testing and result retrieval. The individual functions are described in detail below.

### 9.2.1 Instrument interface settings

Start Workstation and see the software interface as shown below (Figure 3). The status of the spectrometer is displayed. The interface is divided into four areas according to the function, namely the toolbar, the operation button area, the spectrometer status display area and the spectrum display area. The interface and operation method are described in detail below.

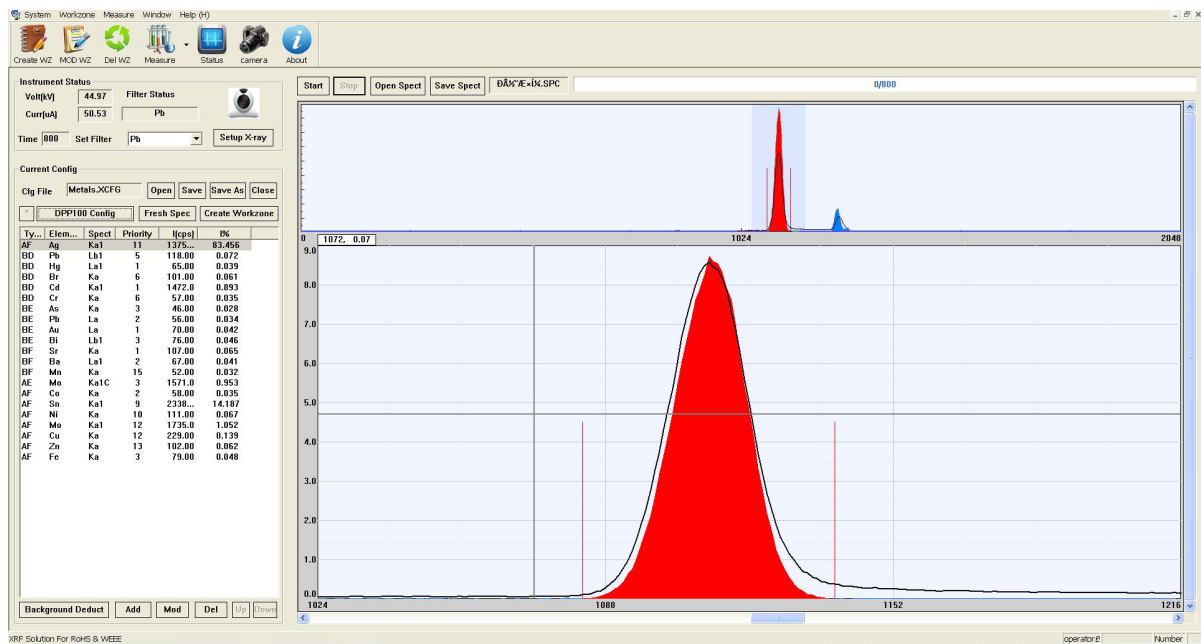


Figure 3 software interface

### 9.2.2 Structure of menu

1) Menu bar: System menu, workspace menu, measurement menu, query menu,

window menu, and help menu.

①System menu:



Among them, "Operator Management" is used to maintain, correct and add status settings to the instrument administrator. Only authorized operators can use password to operate.

②Workspace menu:



Among them, the "edit workspace" is the administrator to operate the work curve through this function.

③Testing menu:

The



testing menu is used for the switching between testing interface and



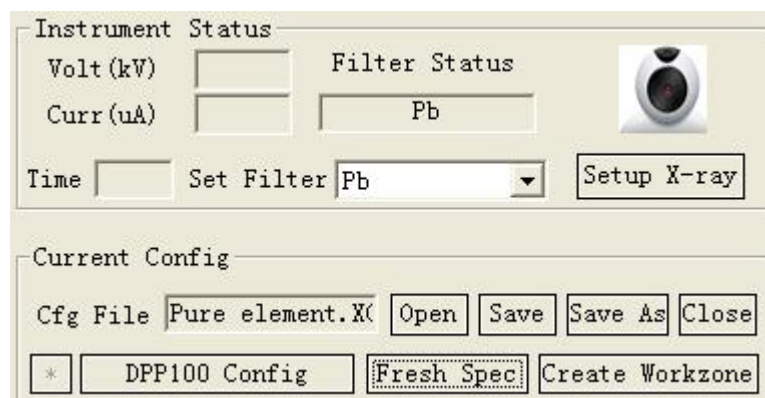
workspace. It also can switch by

- ④The query menu is a function of viewing historical data.
- ⑤The window menu is a function of switching open windows.
- ⑥The help menu display the version number of the software.

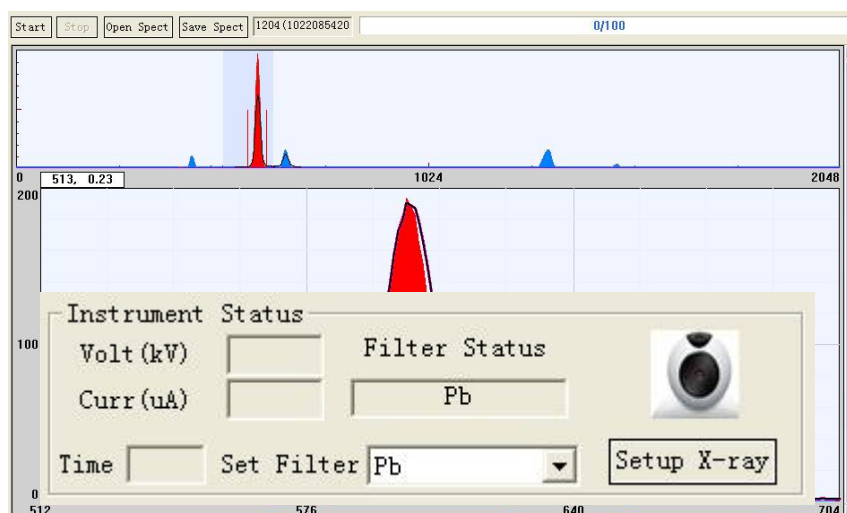
## 2) Toolbar

From left to right are: create workzone, modified workspace, delete workzone, measure sample, instrument status, sample camera and about our factors.

## 3) Instrument specifications display



#### 4) Spectral display area

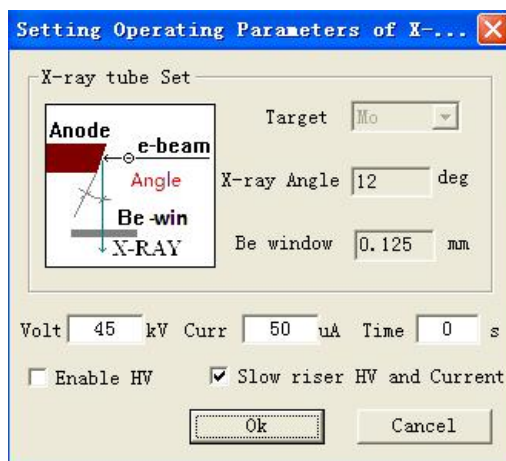


### 9.3 Software basic operation

After the operator is familiar with the above software interface, you can operate it refer to the following methods.

1. Operator login: Press the power switch and the indicator lights. Open the program by double-clicking the software shortcut icon on the desktop. The program prompts to log in, select the corresponding operator name and password to log in.
2. Warm-up: The host should be warmed up when the power is turned off for more than 2 hours. In the software interface, Click "Setup X-ray" ,

pop-up “Set X-ray Tube Working Parameters” window, select “Enable HV” and “Slow riser HV and Current”, and click “OK”



The software will run according to the setup program, which takes about 10 minutes to complete.

Warm-up before starting: The host should be warmed up when the power is turned off for more than 2 hours. In the software interface,

If the system does not turn off exceed 1 hour, the "Slowly rise tube voltage & current" option is not selected when selecting parameters. The tube default voltage and current is 45kV 50  $\mu$  A, the tube voltage upper limit is 50kV, and the tube current upper limit is 1000  $\mu$  A.

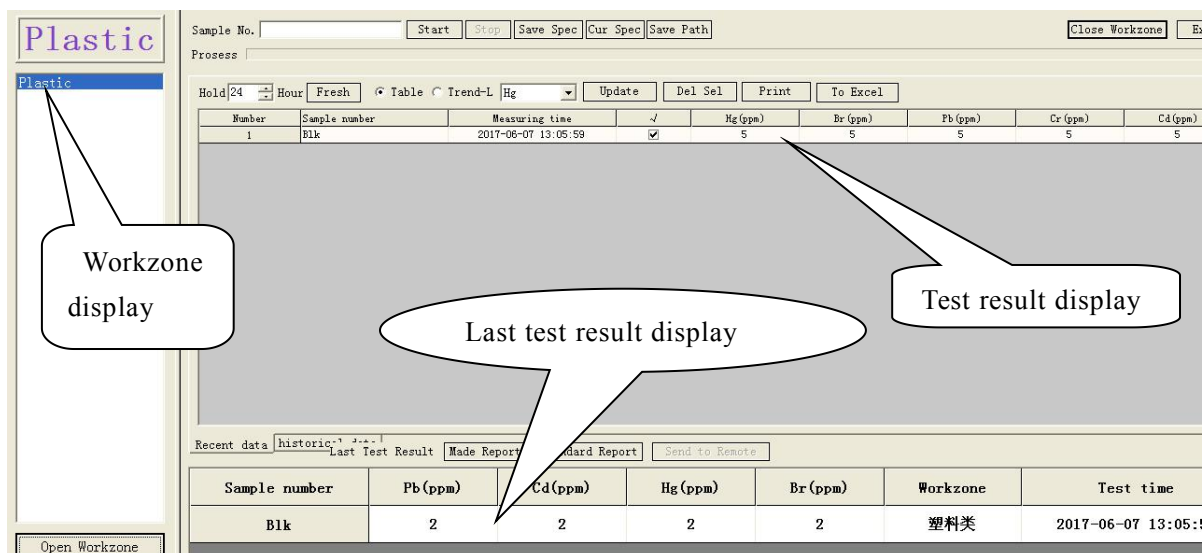
3. Warm-up before starting: After the instrument parameters achieve the set value (tube voltage: 45kV, tube current 50  $\mu$  A), click the “Start” button in the spectrum display area to let the instrument automatically detect the preheating, don’ t operate the instrument, wait for 20 minutes,



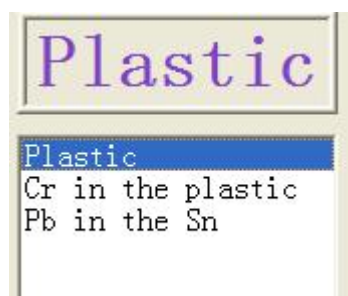
then you can use the instrument.



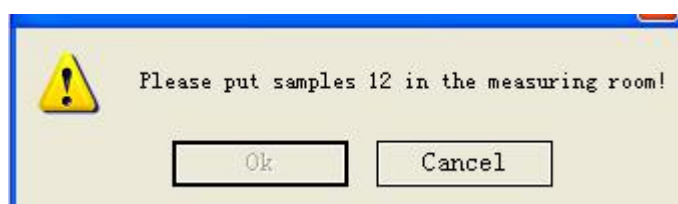
4. Testing operation: click the  in the toolbar, to achieve the testing window.



Select the corresponding working curve according to the type of sample (see Table 1 of sample reference classification). If it is not displayed here, you can choose the desired curve type by "Open Workzone".



Enter sample number at the "Sample No." and click "Start" → prompt "Place the \*\*\* sample in the testing chamber!" → "OK",





Directly click “OK” (tube voltage, tube current has been confirmed in the working curve, time can be selected between 120s and 300s), the program began to analyze this sample.

When the program finishes testing, the test results will display directly in the display area, the last test result is enlarged in the display area. At this time, the test results can be "print" and "and “output to Excel”; the list of display areas can be selected by the mouse to "delete the selected data", and the mouse can click on the corresponding file name to "organize the data". (optional deletion); you can make a “print report” on the current test results (the report of the individual test results, see the attached table 2 print report settings). You can recall the saved sample spectrum and reprint the report. To do this, click on “Saved Spectrum”, find the sample name of the report you want to print from the save path, double-click to open, and then click “Print Report”. you can double-click on all the data display in this window and print the required sample report.

The printed report is under and determined by the “Help” and “User Name” information in the menu bar. The reported data, spectra, and images of the tested sample are automatically added by the system.

During the testing process, you can switch testing state and spectra

display state by  and . A simple qualitative analysis of the

sample being tested can be performed at the spectral display state.

5. During the test, you can switch the operator at any time by clicking “System” → “Change Operator” in the menu bar, and pop up the switch dialog box to select “Operator Name” and “Password” .



## 9.4 Test sample classification reference

Mainly set up for the EU RoHS related regulations, this chapter mainly introduces the related products, parts, electronic components, solder and accessory materials testing methods.

- ① The tested sample must be a single, homogeneous material which means that the sample being tested must not be doped with metal and plastic. Before the test, the staff must disassemble an integral part and break it down into a single material.
- ② For regular samples, test them directly in the test window. Strip samples should be placed horizontally; for small volumes sample, should be add up several placement to test; for paper films, they should be stacked to test.
- ③ When testing the wire, it is necessary to test the wire, copper wire and tin head.
- ④ If there is coating on the metal parts, the coating and the substrate

will be tested. Generally, the radiation penetrates the coating layer by about 30um, and the specific penetration thickness is related to the composition and process of the coating.

⑤ When testing solder joints on PCB boards, the most effective way to avoid the measurement of the substrate is to cut the solder joints or directly test the solder joint materials. When testing the substrate of the PCB board (plastics type), stack multiple boards together and test the cut surface.

float copper  
it is tested  
and spectrum:



When testing PCB  
(metals type),  
by combining CCD  
the position of

floating copper is seen from the CCD, and the spectrum of Cu element is seen on the spectrum.

⑥ If the pins of all electronic components are immersed in tin, the pins of the electronic components are treated as a solder.

⑦ According to the principle and characteristics of energy dispersion, iron, stainless steel, copper, copper and zinc alloys are combined into one type—metals. When testing copper alloy samples, first test in metal. If the test result Pb is greater than 5000 mg/kg (ppm), it should be converted to copper alloy exemption test by: converting from metal list to copper alloy exemption list in test window and click on “Current Spectrum” in the alloy exemption list, the software will display the “Enter sample number” prompt box below.

- ⑧ Enter the sample label here and click OK to see the result in the list.  
(This is only suitable for samples of copper alloys. For copper alloys, low content (5000 mg/kg (ppm) is as a standard) are more accurate in metals type testing and higher content are more accurate in copper alloy exemptions testing.
- ⑨ In the classification of test samples, metals and plastics can be distinguished from appearance and material; individual samples can only be distinguished from the spectrum.

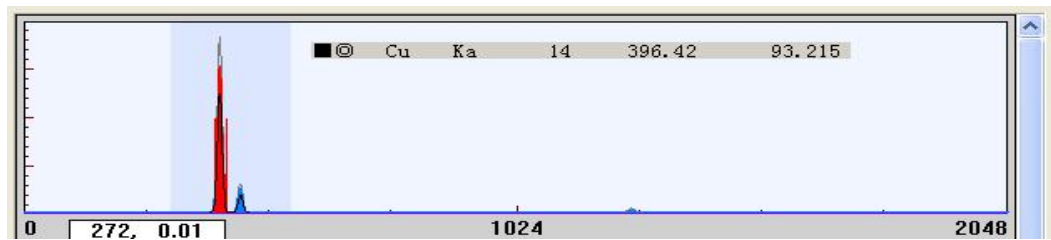
**Typical metal typ spectrum:**



stainless sample

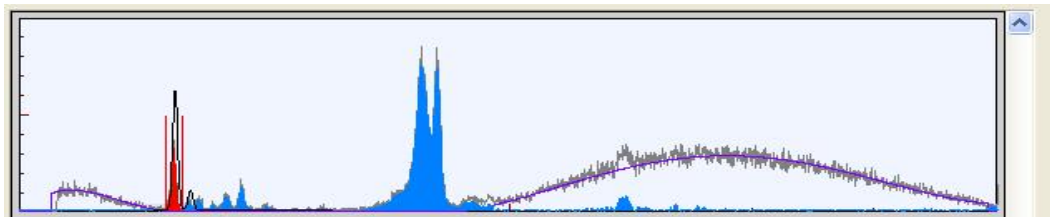


Iron galvanized sheet

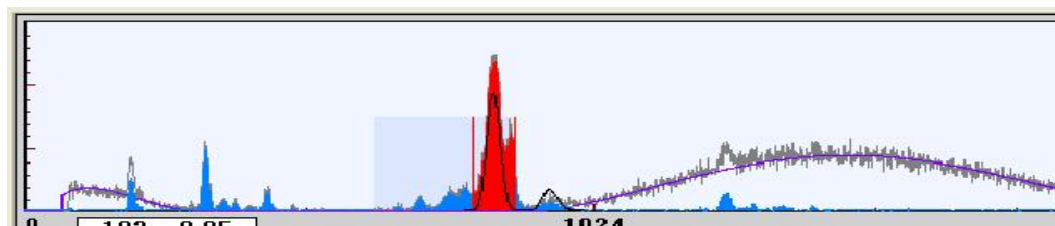


Pure copper sample (non-copper alloy sample)

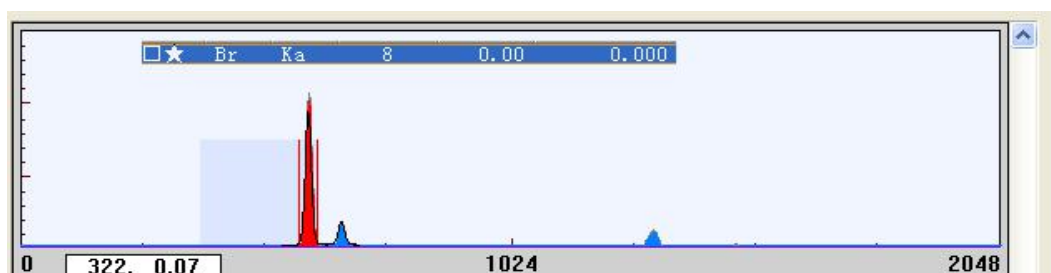
**Aluminium-magnesium material sample spectrum:**



**Typical plastic sample:**



Some plastics type sample and Al-Mg type sample is not easy to be distinguished from spectrum, but they can be distinguished from material.



Plastic sample with high bromine

Copper alloy sample:



## 10 Daily Maintenance

### 10.1 Daily use and maintenance of the instrument

1. Refer to the instruction manual of the instrument to operate the instrument correctly. When the instrument has not been used for more than 2 hours, the instrument tube voltage and tube current should be slowly raised when used again to avoid the X-ray tube being subjected to excessive load transiently, resulting in short anode wire burning and damage to the light tube. .
2. After opening the software to raise the tube voltage and current , observe whether the state of the instrument tested by the software is correct, whether the tube voltage and current is 45kV, 50  $\mu$  A; whether the filter position is at the Pb position. Check that everything is ok and continue to operate the instrument.
3. Since the X-ray tube needs high voltage to work, it will generate a large amount of heat, and it takes a proper time for the instrument components to dissipate heat. It is recommended to turn down the tube voltage of the instrument to 0 when not in use for a long time, so that the X-ray tube is in a dormant state. Use electric cooling to dissipate heat.
4. When the instrument is used frequently, the instrument should be rested properly. If the instrument is used continuously 3 to 4 hours, let the instrument tube voltage and current turn down to 0, completely turn off the instrument and let the instrument naturally dissipate heat.
5. As the temperature of the X-ray tube inside the instrument increases,

when the temperature of the X-ray tube exceeds 60 °C, the protection circuit of the X-ray tube will automatically cut off the power supply of the high-voltage power supply. At this time, do not turn off the power supply of the instrument, so that the instrument works normally, but can not turn on the high-voltage power supply. After the temperature of X-ray tube drops to normal temperature, the instrument can work normally. The normal working temperature of the instrument room should be kept at  $25 \pm 3$  °C. It is recommended to use cautiously when the temperature is higher than this. The instrument needs rest.

6. When the sample volume is small, like powder type sample, it needs to be placed in the sample cup to prevent falling into the instrument and causing malfunction.
7. Regularly process redundant measurement data files in the software, and delete data files that are not used in the spectrum path in each work area, so that the software can work normally.
8. Plug in the U disk on the operating computer, pay attention to anti-virus, and prevent the virus from destroying the software.

## 10.2 Troubleshooting

In order to facilitate the user to better use the spectrometer and carry out scientific maintenance, the faults that may occur during the operation of the spectrometer are as follows:

1. The power indicator light is not on when the "power switch" is turned



on.

Remedy: ① Check if the power connection of the instrument is normal.

② If it is caused by lightning or short circuit, please check if the fuse on the back of the spectrometer is blown.

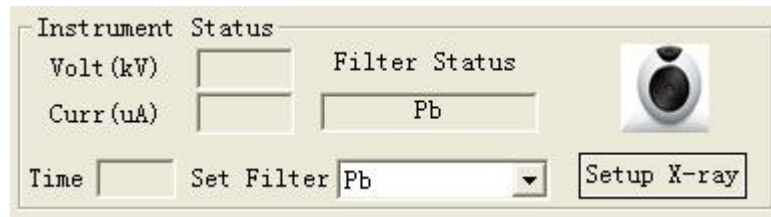
2. When click "Tube voltage and current Setting", the tube voltage and current value is normal, but the high voltage work indication is not normal.

Remedy: Check if the high-voltage indicator light has been twisted, resulting in poor contact.

3. After the tube voltage and current is set, there is no change, and it cannot be raised. At the same time, the intermittent message "MP411 occurs error, please check whether the device is correctly connected to the system".

Remedy: ①The USB cable connected to the host is not properly connected or disconnected; ②It may be that the computer is not operated properly, and the MP411 device in the Device Manager is disabled. If it is not disabled, restart the computer MP411 to connect. ③If you can't connect to the computer after restart, turn off the computer, re-plug the USB cable of the MP411, and then turn on the computer, then you can connect it. ④If the above steps can't be connected, the voltage of the USB port on the motherboard of the computer may be too low. Resulting you to buy four-port PCI card of USB to install, and connect the MP411 USB cable to it, you can connect. ⑤ If all above methods do not work, it may be MP411 fault, you need to contact our after-sales service department.

4. During the test, you can hear abnormal sounds.



Remedy: First click the tube voltage and current “Setup X-ray” to cancel the “Enable HV” check box, and click “OK” to turn off the high voltage. See if you can hear abnormal sounds. If it still exists, it may be the sound of the cooling fan. If it doesn't exist, raise the voltage slowly, see if you can hear abnormal sounds. If there is any, please contact us to solve the problem.

5. When switching the filter, it always prompts “Switching” .

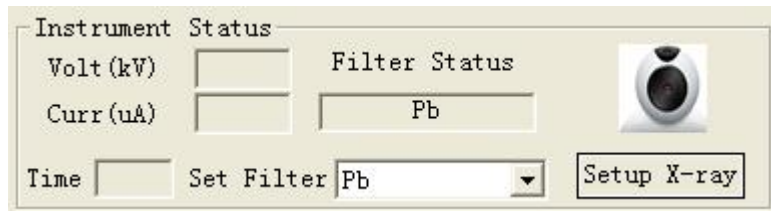
Remedy: ① If it always prompts “Switching” for more than 1 minute, you should turn off the power of the spectrometer host, wait five minutes, then turn on the power of the spectrometer host, and then see if the filter in the test software is automatically switch to Pb, if the "switching" has been prompted for more than 1 minute, check whether there is value of 0 or other values for the tube voltage and tube current. If there is value, it means no problem with the MP411, the filter disc may be stuck by the shrapnel. You can open the sample cover of the instrument and take off the sample cover. Unplug the collimator and pull the filter disc by hand. When the filter disc is activated, it will automatically go to the Pb position. If you see that the tube voltage

and tube current display no value, the MP411 maybe with problem. You need check if the USB cable is correct and the MP411 device is normal. ② If none of the above actions is useful, the filter carousel may be with problem. Please contact our after-sales service department.

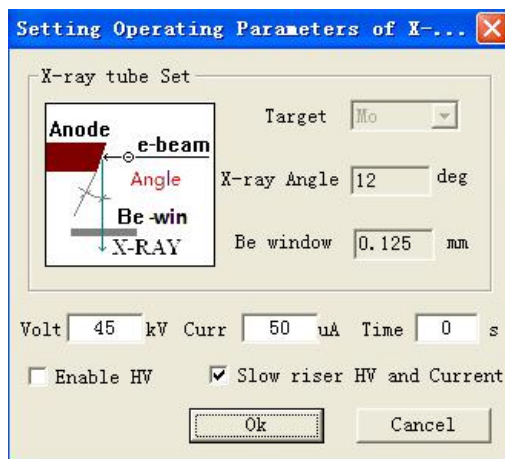
**Remedy:** Please contact our after-sales service department for this situation.

## 10.3 How to use Silver calibration film and calibration

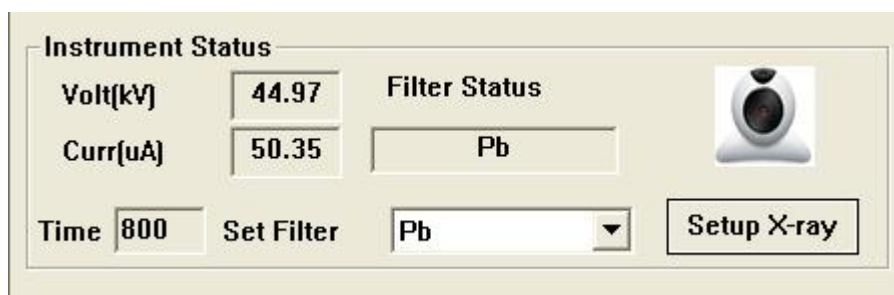
Before turning on the test sample every day, click "Setup X-ray" as follows



Open the X-ray tube high voltage power supply setting interface as follows:



select "Enable HV" 、 "Slow riser HV and Current" , click "ok" . Wait for the Volt(kV) and Curr(uA) raised to set value, see as below:



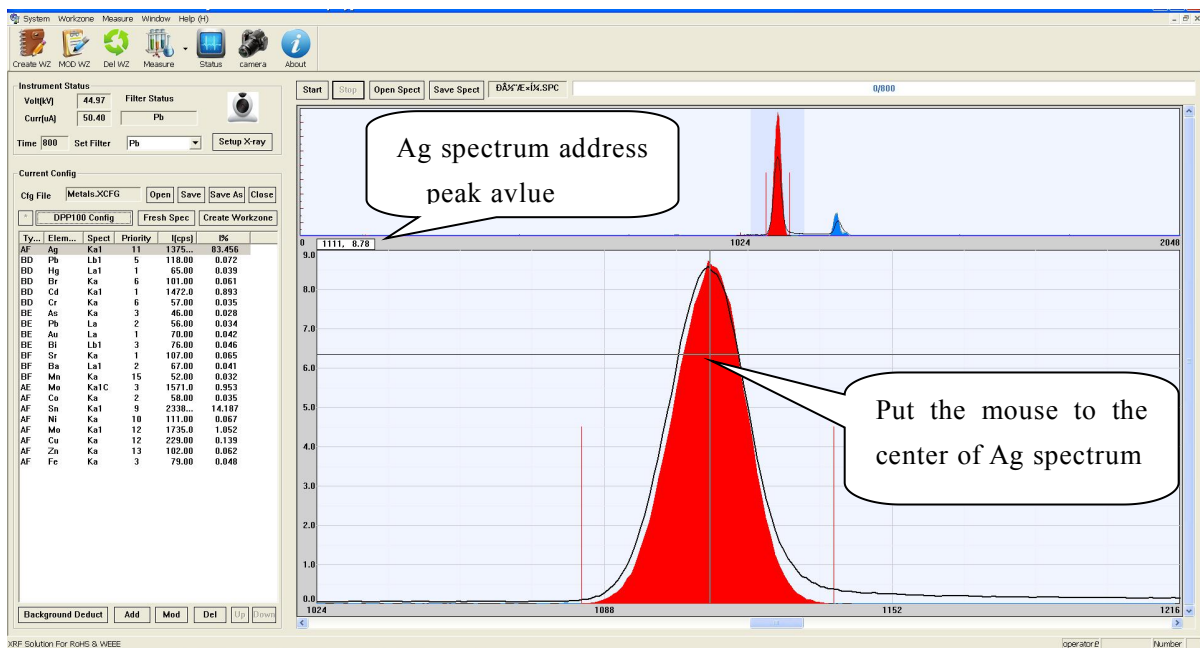
Then put the Ag calibration film into instruments sample cavity, click the "Open" , select the "Pure element" files.



select the “Ag” element .

DPP100 Config						Fresh Spec	Create Workzone
Ty...	Elem...	Spect	Priority	I(cps)	I%		
AF	Ag	Ka1	11	1375...	83.456		
BD	Pb	Lb1	5	118.00	0.072		
BD	Hg	La1	1	65.00	0.039		
BD	Br	Ka	6	101.00	0.061		
BD	Cd	Ka1	1	1472.0	0.893		

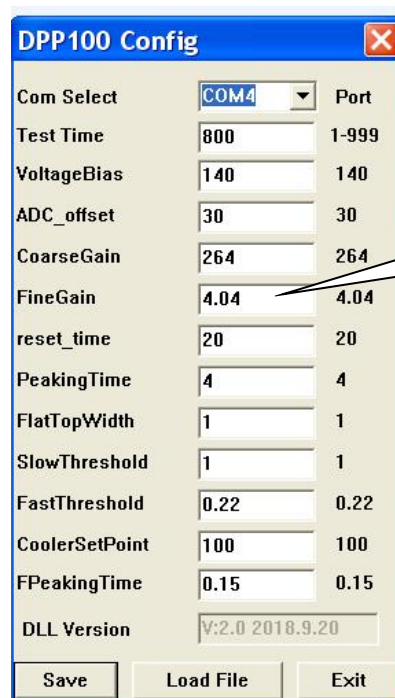
click the “Start” ,wait for the test over (Note: Before starting the test every day, click "Start" and after the test is finished, it will take 5 minutes to click "Start" again before calibration can be done as follows).  
move the mouse to the center of Ag spectrum to see if the address peak value is at 1110 or 1111, if it at the Address then to normal test. see as below:



If the Ag spectrum address peak value not in the 1110 and 1111, if it is peak value too large or too small, click “DPP100 Config”

Then open the fellow window, adjust the “FineGain” value, then click “Save” .

Adjustment method: if the peak value is 1113, it is large 1111 to 2, adjust the “FineGain” 4.04 to 4.03. if the peak value is 1109, it is small 1111 to 2, adjust the “FineGain” 4.04 to 4.05. other values are set according to this method.



The image shows a software configuration window titled "DPP100 Config". It contains a list of parameters with input fields and corresponding values. A callout bubble points to the "FineGain" field, which is currently set to 4.04, with the text "adjust the 'FineGain' value".

Parameter	Value	Range/Default
Com Select	COM4	Port
Test Time	800	1-999
VoltageBias	140	140
ADC_offset	30	30
CoarseGain	264	264
FineGain	4.04	4.04
reset_time	20	20
PeakingTime	4	4
FlatTopWidth	1	1
SlowThreshold	1	1
FastThreshold	0.22	0.22
CoolerSetPoint	100	100
FPeakingTime	0.15	0.15
DLL Version	V:2.0 2018.9.20	

Buttons: Save, Load File, Exit

## 11. How to create workspace

### 11.1 Preparation before creating a workspace

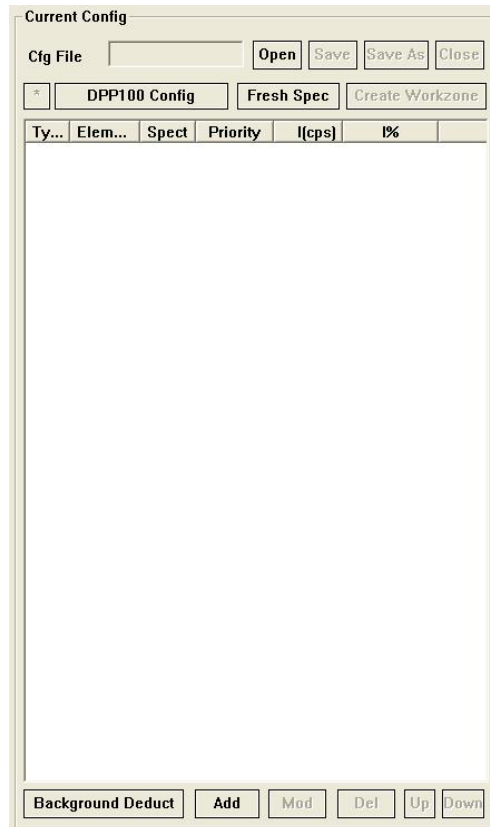
The instrument is a rapid analysis instrument for measuring elements, which can be semi quantitative analysis and quantitative analysis. Semi quantitative analysis does not need to calibrate the working area. It only calls the elements to be measured in the main interface of the instrument, and puts the sample "click" button in the instrument interface to test. After testing, the proportion of CPS on the left side is estimated. The content of the element. Quantitative analysis is a method to obtain more accurate results by strictly calibrating the standard series samples, and then calling the calibrated work area to measure the samples. The following is how to carry out quantitative analysis of the work area operation method.

Prepare a series of standard samples. Samples for instrument calibration can buy ready-made reference samples of the same kind. If possible, they can be made by chemical analysis according to the concentration range of the samples. The calibration of the sample concentration and gradient in a working area is the key to the accuracy of the sample measured by the instrument. Generally, the calibration sample of a working area should be at least 10 gradient samples. The sample content gradient should be determined according to the accuracy of the sample to be measured, and the concentration range of the sample should be covered. In principle, the better the gradient of the standard sample, the wider the coverage, the better.

## 11.2 How to create workspace

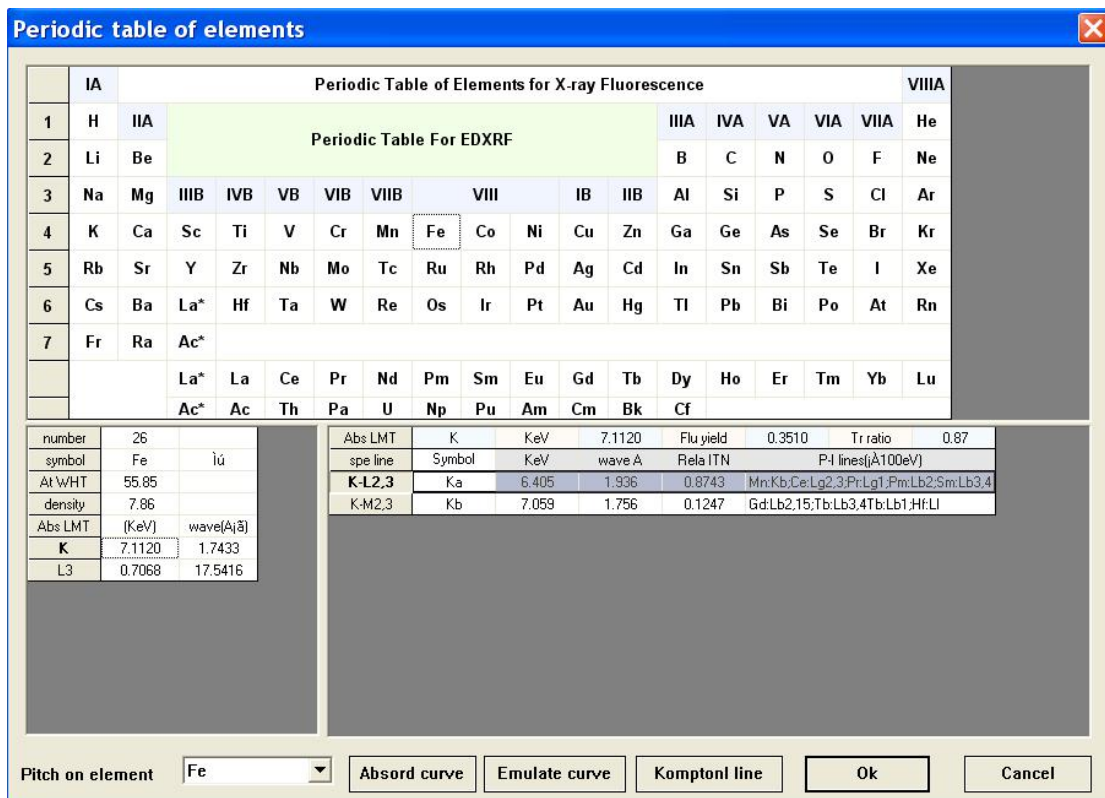
### 11.2.1 complete reconstruction of work zone

In the application software interface, as shown in the following figure:

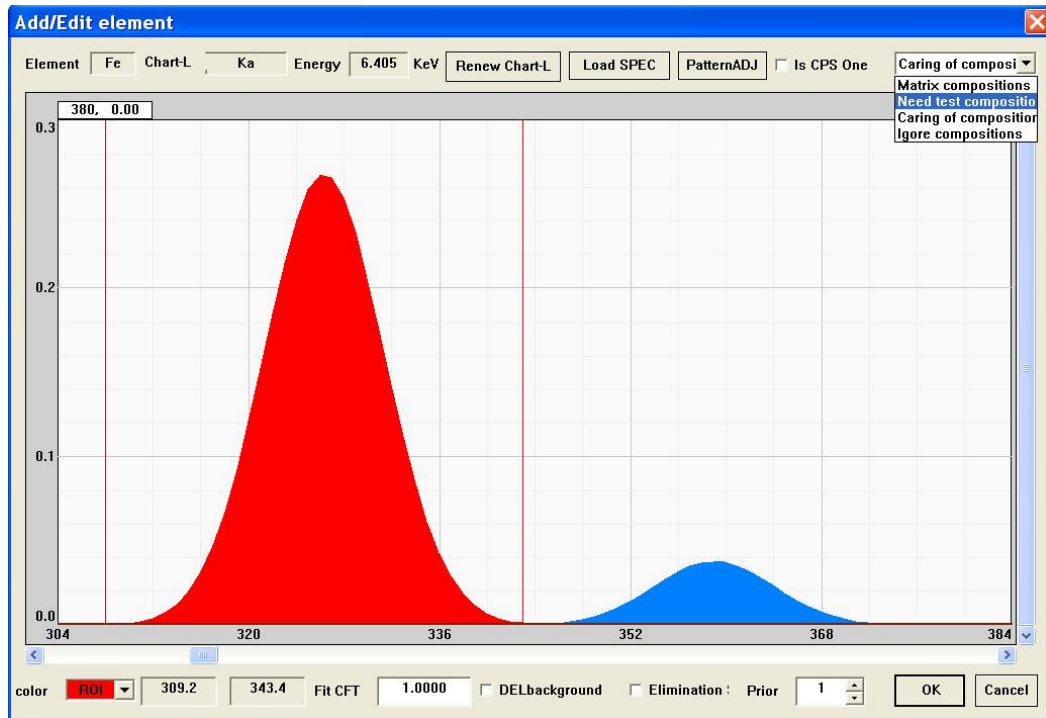




Direct method: Click "Add" to open the periodic table of elements, select the elements to be detected and some related elements, as shown in the following figure:



After selecting the elements to be tested, enter the dialog box shown in the following figure, for example, after selecting "Fe":



Click the drop-down button, select the "need test composition", select the "DELbackground" and "Elimination after Spectrum Resolution". After priority selection of more than 10, click "OK" to complete the selection of an element to be tested. After selecting the elements to be tested in turn, we can choose "Matrix composition" and other "Caring of composition" and "Ignore compositions", which can be selected as "DELbackground" and "Elimination after Spectrum Resolution" or not, and the priority can be selected or not. These can be adjusted according to the accuracy of the measured elements after the creation of the workspace, which needs to be adjusted according to experience after the actual test sample.

After selecting the elements according to the above method, it is necessary to select the element with the highest content or select Mo

element to select "Is CPS One" to enter the interface of creating workspace. When the element selection is complete, the following figure is shown (this is an example):

Current Config

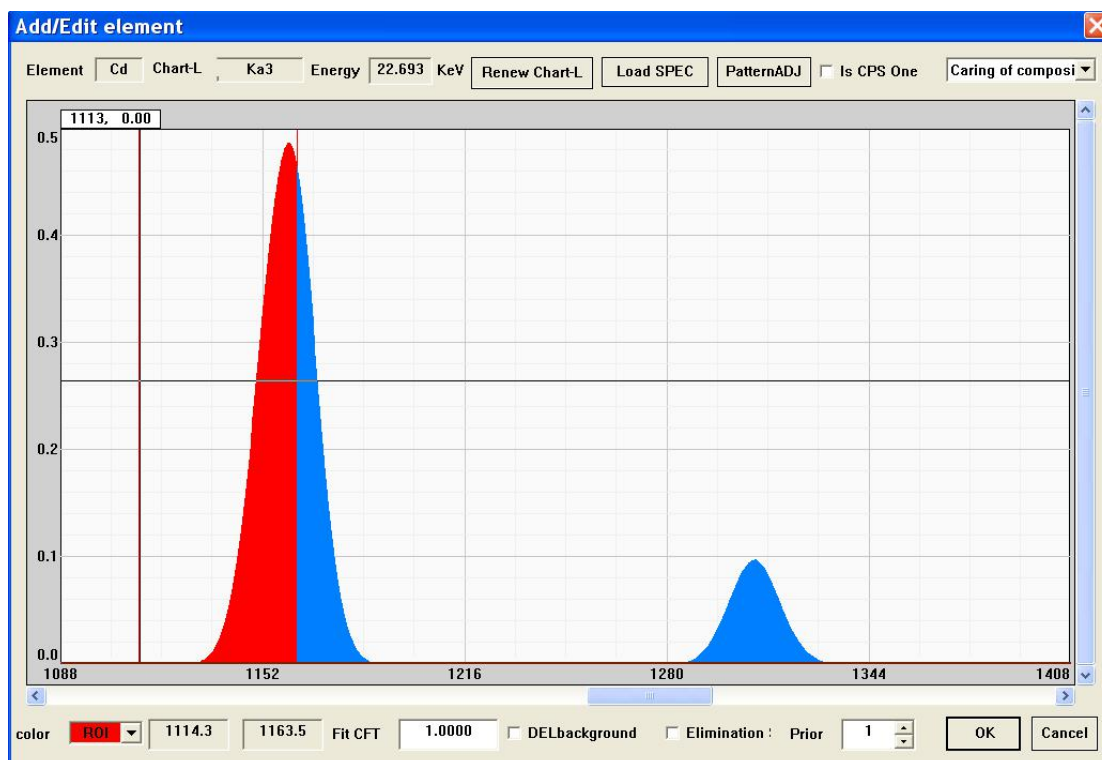
Cfg File

Ty...	Elem...	Spect	Priority	I(cps)	I%
BD	Fe	Ka	12	0.00	0.000
BD	Pd	Ka	15	0.00	0.000
AE	Cd	Ka3	1	0.00	0.000

At this time, you can click "Save Files" and name the file names you need. After closing the file, you can open the file. Then the "Create Workzone" button can be operated. After clicking it, you can enter the Create Workspace interface. In this process, if appeared the selected element "Undetermined \*\*\*\* line' s pure element spectral peak position, please check the configuration file!" dialog box, please click OK.



After clicking OK, it enters another dialog box as follows:



It will also appear in the previous dialog box, click "OK", and then move the mouse on the top of the peak to the left and right sides of

The screenshot shows the 'Add/Edit element' window with the following details:

- Title Bar:** Add/Edit element
- Element:** Cd
- Chart-L:** Ka3
- Energy:** 22.693 KeV
- Buttons:** Renew Chart-L, Load SPEC, PatternADJ, Is CPS One (unchecked), Caring of composi (dropdown)
- Plot Area:**
  - X-axis:** Energy in KeV, with major ticks at 1088, 1152, 1216, 1280, 1344, and 1408.
  - Y-axis:** Intensity, with major ticks at 0.0, 0.1, 0.2, 0.3, 0.4, and 0.5.
  - Peaks:**
    - A large red peak centered at 1152 keV, reaching an intensity of approximately 0.48.
    - A smaller blue peak centered at 1313 keV, reaching an intensity of approximately 0.08.
  - Annotations:** A label '1313, 0.08' is present in the top left corner of the plot area.
- Bottom Panel:**
  - color:** ROI (dropdown)
  - ROI Values:** 1130.0, 1189.0
  - Fit CFT:** 1.0000
  - Checkboxes:** DELbackground (unchecked), Elimination: Prior (unchecked)
  - Value:** 1 (dropdown)
  - Buttons:** OK, Cancel

The screenshot displays the 'WZ File' software interface. The top menu bar includes 'File', 'Edit', 'View', 'Tools', 'Help', and 'Help (H)'. Below the menu is a toolbar with icons for 'Create WZ', 'MOD WZ', 'Del WZ', 'Measure', 'Status', 'camera', and 'About'.

The main window is titled 'WorkZo [NoMetal]' and contains several tabs: 'Definition', 'Calibration of geometric factors', 'System deviation measurement', and 'Applicability test'. The 'Definition' tab is active, showing a table with columns: Channel number, Elemental Symbols, Spectral line, Selection, Reporting sequence, Compound, Unit, Decimal digit, High limit alarm, Alarm value, Report N.D. value, Report B.C. value, and Note.

Channel number	Elemental Symbols	Spectral line	Selection	Reporting sequence	Compound	Unit	Decimal digit	High limit alarm	Alarm value	Report N.D. value	Report B.C. value	Note
0	Pb	Lbl	<input checked="" type="checkbox"/>	01	Pb	ppm	2	<input checked="" type="checkbox"/>	10000.00	1.00	100000.00	measure
1	Hg	Lat	<input checked="" type="checkbox"/>	02	Hg	ppm	2	<input checked="" type="checkbox"/>	10000.00	1.00	100000.00	measure
2	Cd	Kat	<input checked="" type="checkbox"/>	03	Cd	ppm	2	<input checked="" type="checkbox"/>	10000.00	1.00	100000.00	measure
3	Br	Ka	<input checked="" type="checkbox"/>	04	Br	ppm	2	<input checked="" type="checkbox"/>	10000.00	1.00	100000.00	measure
4	Cr	Ka	<input checked="" type="checkbox"/>	05	Cr	ppm	2	<input checked="" type="checkbox"/>	10000.00	1.00	100000.00	measure
5	As	Ka	<input type="checkbox"/>	-	-	-	-	<input type="checkbox"/>	-	-	-	ignore
6	Sb	Ka	<input type="checkbox"/>	-	-	-	-	<input type="checkbox"/>	-	-	-	ignore
7	Sr	Ka	<input type="checkbox"/>	-	-	-	-	<input type="checkbox"/>	-	-	-	ignore
8	Zr	Ka	<input type="checkbox"/>	-	-	-	-	<input type="checkbox"/>	-	-	-	ignore
9	Ca	Ka	<input type="checkbox"/>	-	-	-	-	<input type="checkbox"/>	-	-	-	ignore

On the right side of the 'Definition' tab, there are buttons: 'Element', 'Oxid', 'Add WebZus', 'Del WebZus', 'WebZus', 'Error Check', and 'Print WebZ'.

The bottom section of the window contains a 'Parameter' area with the following settings:

- Target Mat: [Rs] [In] [Angle] [12] [°]
- High Pass: [45] [Hz] [Current] [300] [uA]
- Be Window: [0.125] [mm] [Max wave] [3] [A]
- Angle In: [45] [°] [Angle Out] [45] [°]
- Filter Filter: [20000] [Sec Filter] [1]
- Filter Box: [10000] [0] [1] [Calculate]
- Filter Box: [10000] [0] [1] [Alpha

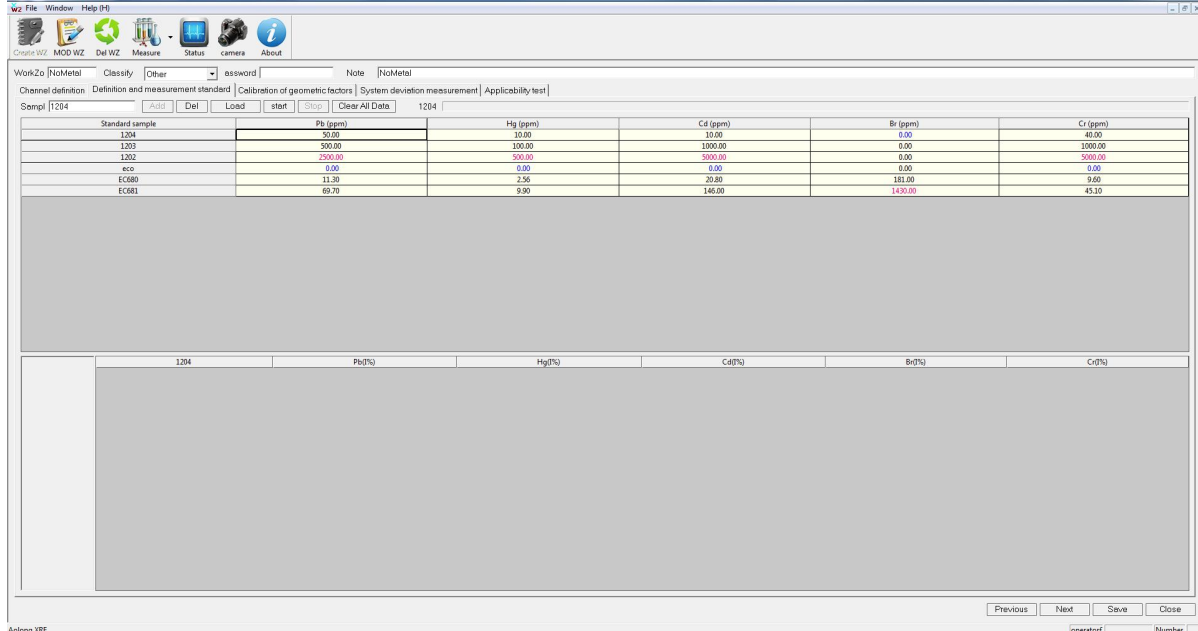
At the bottom right, there are buttons: 'Previous', 'Next', 'Save', and 'Close'.

First, open to the "channel definition" column, channel number, in which "selected" refers to the selected check box hit "√" and then select the element, do not test the element, do not hit "√". "Unit" in the middle of this line refers to the measuring element, which has five kinds of w%, ppm, μm, l%, ZD units respectively. If the percentage content is tested, w% is chosen. If RoHS is tested, ppm is chosen. If the thickness of coating is tested, μm is chosen. The latter two are seldom used. "Decimal number" refers to the number of decimal points to be retained behind the test unit. "High-limit alarm" refers to whether different font colors should be displayed in the test report. "alarm value" refers to adjust the result Pass or Fail for the test report. "Reporting ND value" means that no element has been detected, and "Reporting BC value" means that the content of the detected element is far greater than that of the detected element, Normal value set 100000.

The key is the setting of basic parameters. After calibrating the working area, the high pressure of X-ray tube voltage, current and primary filter are set here when measuring the sample. Opening the working area to measure the sample, the operator does not need to take care of these parameters, just input the name of the sample for testing. The three parameters mentioned above should be set in the basic parameters. See below figure:

Parameter				
Target Mat	Mo	X-ray Angle	12	°
High Volt	45	kV	Current	300 uA
Be Window	0.125	mm	Max wave	3 A
Angle In	45	°	Angle Out	45 °
Fir filter	ZrNiNi	Sec Filter		
Dilute Dose	<input type="checkbox"/> Li2B4O7	0	:1	Calculate Alpha Ratio
	<input type="checkbox"/> LiB03	0	:1	
	<input type="checkbox"/> LiF	0	:1	

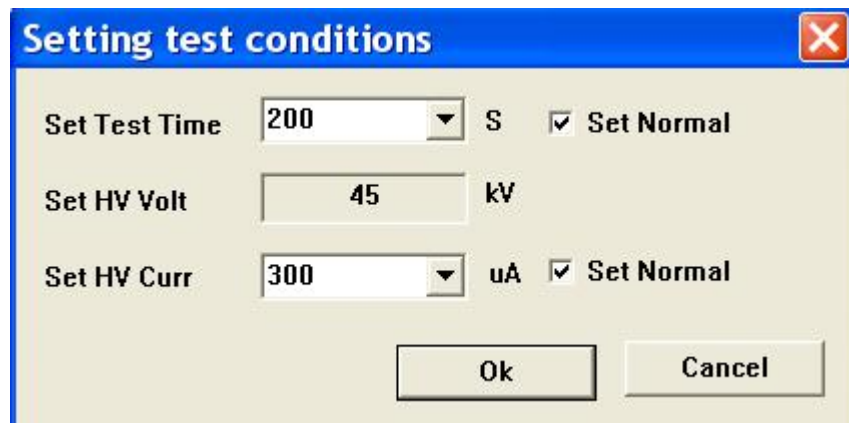
The other parameters should be set by default of the system. The maximum pressure of the X-ray tube voltage is 50 kV, the current is 1000 u A, and the normal high voltage of the X-ray tube is 45 kV. According to the measured samples, the current can be divided into metal and non-metal categories. The current of metal category is 300 u A, and that of non-metal category is 600 u A. However, the current configuration can also be changed according to the measured materials, but the maximum can not exceed 900 u A. Primary filters are generally selected "ZrNiNi", and other filters can be selected if special materials are tested. This can be adjusted according to the measured elements to see the test results. After setting these parameters, click "Calculate Alpha ratio" and then click "Complete Modification" to proceed to the next step "Definition and Measurement Standards", as shown in the following figure. In addition, the parameters of the column "Complete modification" are not needed.



The parameters of this line in the workspace shown above are used as references and need not be modified. Sample ID refers to the name of the sample we have prepared. The test order of the sample is from low to high, which is input into the software in turn. Sample name and standard value can be clicked on "Add" to input and build, then select the sample to be tested, and then click "Measure" to test the sample. If a label name is mistyped, you can click "Delete". After clicking "Measure", there will be a prompt to put in the standard sample. After clicking "OK", there will be a dialog box as follows. The dialog box below is the part of setting the test time in the workspace.

If you want to change the test time of the sample, select "Modify the workspace" in the toolbar to open this part to set the test time, and then click Save. The sample test interface needs to be closed. Modified workspace, then open the workspace after modification and then test.



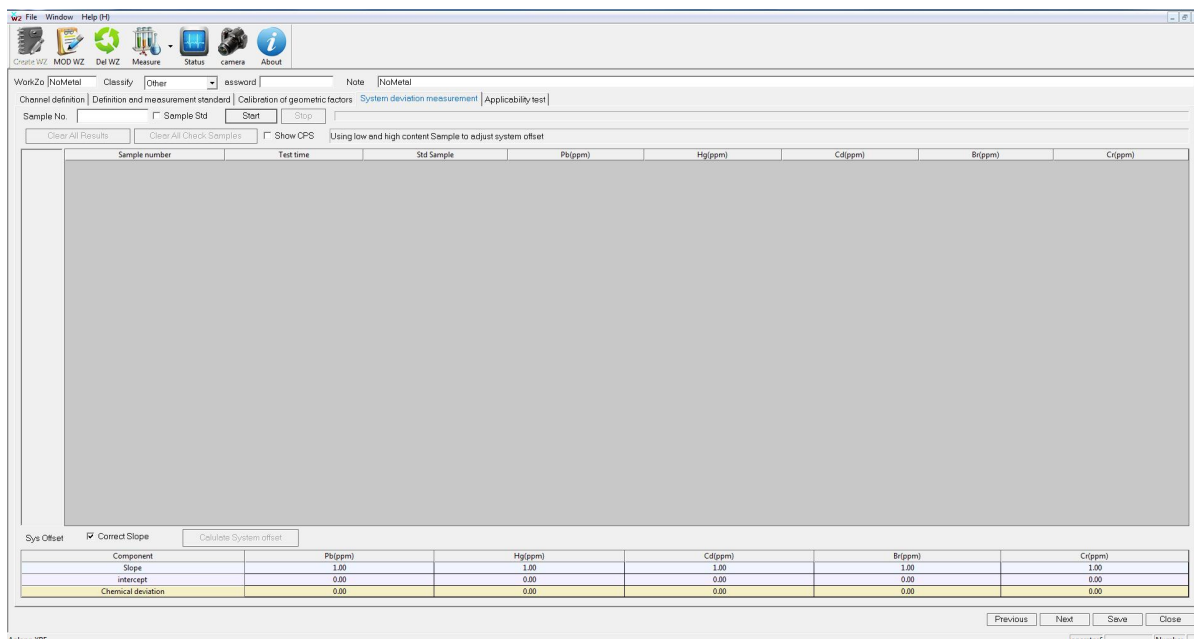


After choosing the time to complete the test, you need to check "Set Normal". Then click "OK" to do the standard sample measurement. At this time, you don't need to care about the others. After the sample test is completed, you can test the other standard samples. In addition, a single standard sample can be tested many times. Generally speaking, a single standard sample can be tested once. If there are many tests, it can be done, but the following figure operation is needed. Click on "switch state" to turn the measured value red. Then the measured value will not be calculated by formula. There are many test values can also be clicked on "delete", and all test values can only be selected as a suitable one.

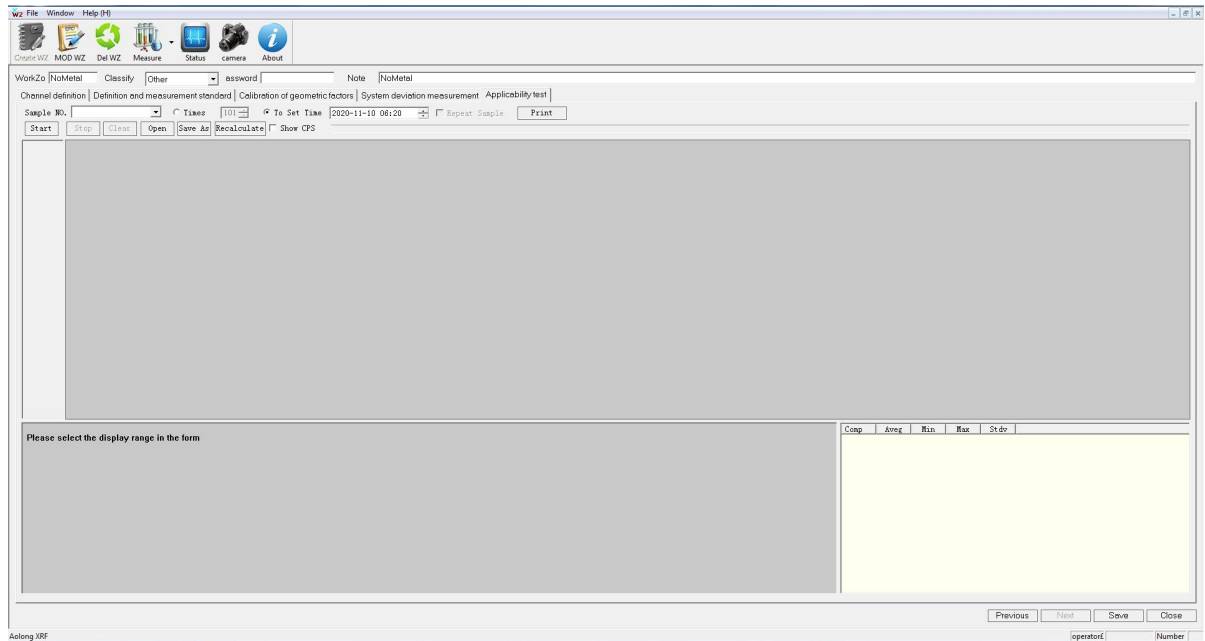
After all the samples are tested, click Next to open Calibration Geometric Factor. The following picture:



other fitting formulas can also be selected. After selecting the ingredients, select the fitting formula, click "Apply this to re-fit", and then click "Update the standard". After completing the calibration of geometric factors, click "Next" to open "System Deviation Measurement", as follows:



In the system deviation measurement, if the standard sample is sufficient, the system deviation measurement can be carried out to correct the standard sample, but generally speaking, the measured sample is more complex, so the system deviation measurement is not needed. If you want to measure it, you can input the sample number as shown in the figure above. After the system deviation measurement is completed, click "Next" to open "Applicability Test", as follows:



The applicability test can verify the performance of the instrument and the accuracy of the created workspace. There are two test schemes for the applicability test, one is to set the number of tests, the other is to set the test to a specified time. Both of these settings are tested automatically without human interference. After the test is completed, the average value, minimum value, maximum value and standard deviation can be calculated automatically. At this point, the entire calibration workspace is completed, at this time do not forget to save the workspace, and then click "Close".

### 11.2.2 Rebuild using the original work zone

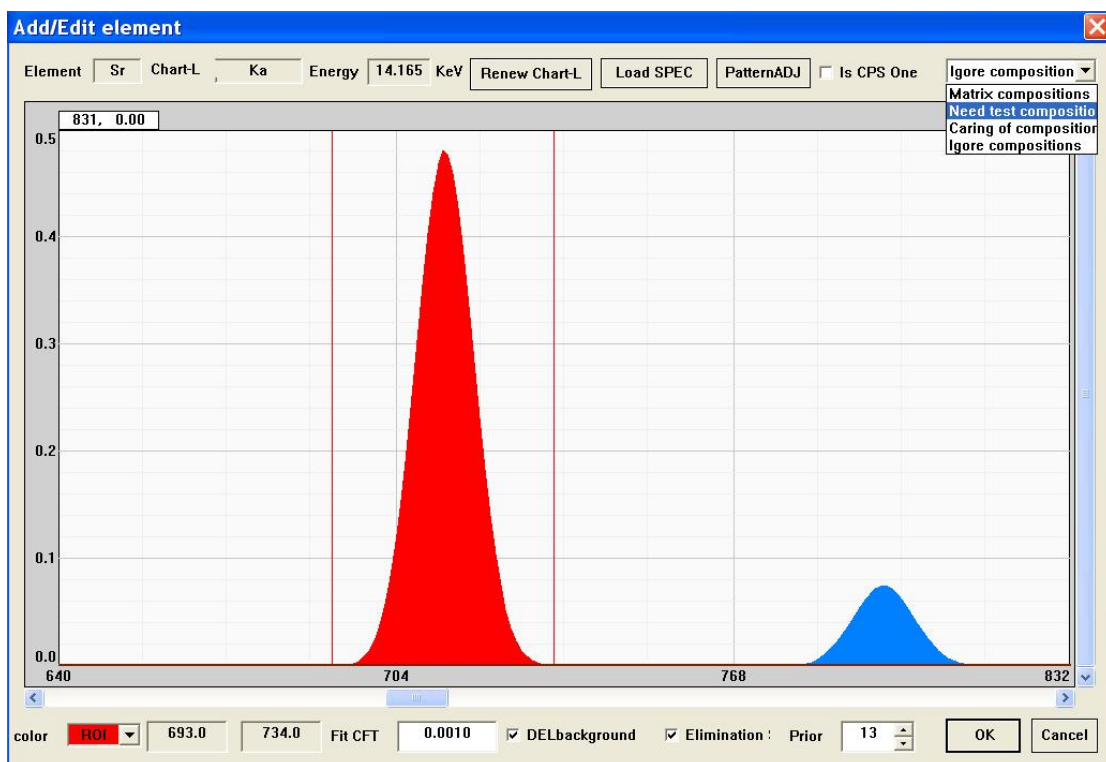
Another quick way to create a workspace is to modify the original workspace by clicking on "Open" open a exist File, as shown below.

**Current Config**

Cfg File:

Ty...	Elem...	Spect	Priority	I(cps)	I%
AF	Ag	Ka1	11	0.00	0.000
BD	Pb	Lb1	5	0.00	0.000
BD	Hg	La1	1	0.00	0.000
BD	Br	Ka	6	0.00	0.000
BD	Cd	Ka1	1	0.00	0.000
BD	Cr	Ka	6	0.00	0.000
BE	As	Ka	3	0.00	0.000
BE	Pb	La	2	0.00	0.000
BE	Au	La	1	0.00	0.000
BE	Bi	Lb1	3	0.00	0.000
BF	Sr	Ka	1	0.00	0.000
BF	Ba	La1	2	0.00	0.000
BF	Mn	Ka	15	0.00	0.000
AE	Mo	Ka1C	3	0.00	0.000
AF	Co	Ka	2	0.00	0.000
AF	Sn	Ka1	9	0.00	0.000
AF	Ni	Ka	10	0.00	0.000
AF	Mo	Ka1	12	0.00	0.000
AF	Cu	Ka	12	0.00	0.000
AF	Zn	Ka	13	0.00	0.000
AF	Fe	Ka	3	0.00	0.000

If there is an element to be tested in the original workspace, but it is not set as the element to be tested, then select the element, double-click it and enter the element settings dialog box, select the "element to be tested" in the drop-down button, and click "OK" (as shown below). It's the same if you don't measure an element. If the element to be tested is not in the original workspace, click the "Add" button to add the element to be tested. After the addition is completed, click "File Save" and then click Create Workspace. Other parameters are set and operated as 11.2.1 Create Workspace.

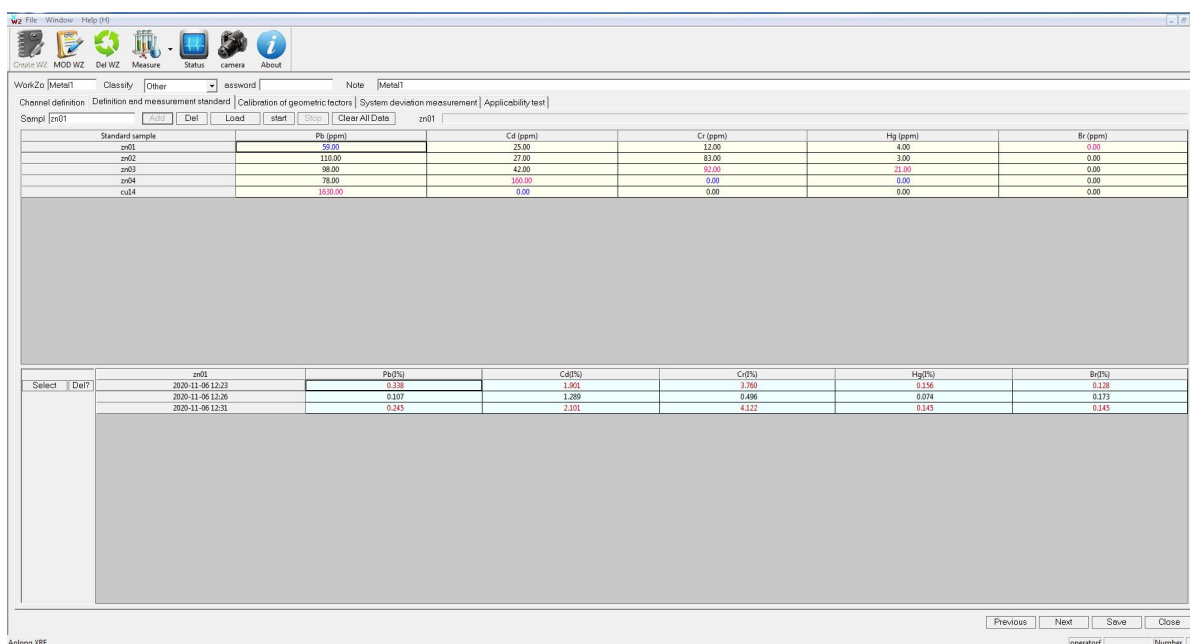


### 11.3 How to modify Workzone

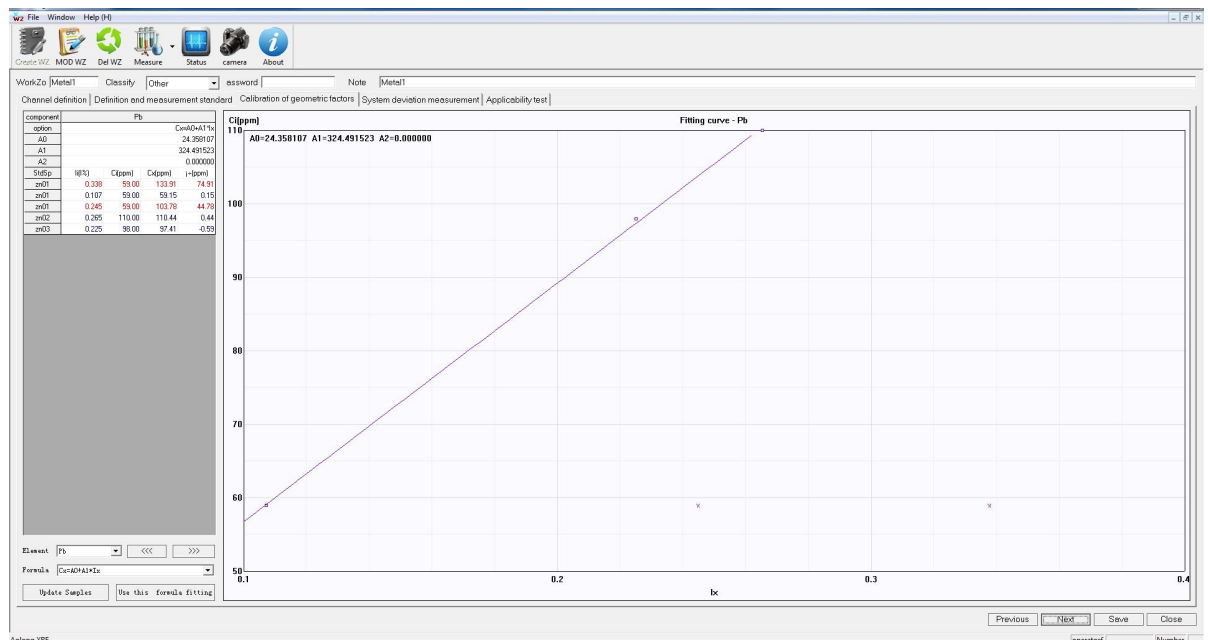
Modifying the workspace refers to modifying various parameters in the established workspace. If you want to add standard sample, change tube high

Voltage, Current, test time, or add test elements, you can modify the workspace. The specific modification is carried out according to the parameters mentioned in creating the workspace, and its purpose is to speed up the creation and modification of the workspace.

The important function of workspace modification is that the number of standard samples in the original workspace is insufficient, so it is necessary to add standard samples. In this case, it is not necessary to rebuild the workspace, just open the workspace that is already in use, and select "define and measure standard sample" as shown in the figure below:



Input the prepared standard sample into the table above according to the name and value of the standard sample. After putting the standard sample into the sample chamber, select the name of the corresponding standard sample, and then click "measure". The dialog box will appear and click OK to carry out the sample measurement. At this time, the instrument will automatically complete the measurement. After measuring the next standard sample in turn, proceed to the next step, as shown in the figure "calibration of geometric factors":



At this time, click "apply this option to re fit", then click "update standard sample", and then click "save" to complete the modification of the workspace.

Also note: after modifying the work area, you must remember to save it.

In the sample test interface, you need to close it and then open it again.

The modification can take effect!



## 11.4 delete workspace

To delete a workspace is to delete a work that is no longer needed. In general, it is rarely used because the workspace does not take up much memory space. If you want to delete it, go to the directory where you installed the application software and select the corresponding three files with the same name, such as "metal class" folder, "metal class. Xcfg" and "metal class. Xwz", and delete it. In this way, a workspace will be deleted.

**[Commitment]**

The warranty of this instrument is one year since the date of sale, and provides technical services and consultation for users. If there is human-initiated failure, such as violations of the instructions in this instrument manual, is not covered by the warranty.

In addition, the company reserves the right to improve and update on the instrument and its accessories without prior notice.