PORTABLE SPARK DIRECT READING SPECTROMETER

CODE OES-P200

MANUAL

MN-OES-P200-E V0

User notice

Thank you very much for choosing to use the INSIZE OES-P200 ortable spark direct reading spectrometer. Please read this user manual carefully before using the OES-P200. This manual covers all important information and data used in the product. Users must strictly abide by the regulations to ensure the normal operation of the instrument. At the same time, attention and warning information can help users use the instrument correctly, so that users can get accurate and reliable analysis results.

Overview

The products described in this manual have been rigorously tested before leaving the factory to ensure product quality. In order to ensure safe and reliable operation and obtain correct analysis results, users must strictly follow the usage methods described in this manual for maintenance and operation. In addition, proper transportation, storage and installation, and proper operation and maintenance contribute to the safe and normal operation of the system.

This manual describes the daily use of the OES-P200 optical emission spectrometer. It provides a detailed description of the composition, installation, operation and maintenance of the OES-P200 optical emission spectrometer, as well as an introduction to the structures and performance characteristics of the OES-P200 optical emission spectrometer. It provides a reference for use by technicians with specialized training or knowledge related to the operation of the instrument. The safety information and warnings mentioned in this manual must be correctly understood by the operator and applied in practice.

Attention and warning information

This manual describes the specific applications of the OES-P200 optical emission spectrometer, as well as start-up, operation and maintenance. In particular, the maintenance and warnings in this manual are essential (Emphasized in the manual with appropriate icons). According to the warning information, improper operation can be effectively avoided.

The development, manufacture, and testing of the products described in this manual put the appropriate safety standards first. Therefore, if the user performs assembly, use and maintenance in accordance with the instructions in this manual, it can avoid property damage and personal injury caused by improper operation.

The maintenance and warnings in this manual are often displayed with a specific icon with the appropriate explanatory text. The maintenance and warnings used in this manual are

as follows:

Icon	Description
	Maintenance mark and information - Indicates important information to be aware of during the use of the product, or sections of this manual that requires special attention.
	Warning Marks and Messages - Indicates that failure to comply with appropriate safety precautions during use of the product may result in the instrument not being properly measured. In severe cases, serious personal injury or property damage may result.

Contents

Chapter 1 Spectrometer Overview

1.1 Instrument Introduction

OES-P200 portable spark direct reading spectrometer is a kind of direct reading spectrometer that can analyze the elements of metals and their alloys. The overall stability of the instrument is excellent, and it is easy to debug; through the software adjustment, it is easy for the user to change and increase the channels, and it is even very simple to increase an analyzing matrix. The appearance of the instrument is shown in Figure 1-1:

Figure 1-1 OES-P200 portable spark direct reading spectrometer appearance

OES-P200 portable spark direct reading spectrometer adopts modern optical technology and automation technology, for example: the application of automatic spectral line calibration technology, greatly improving the degree of automation of the instrument, so make it easy to operate.

OES-P200 portable spark direct reading spectrometer adopts double optical chamber structure, the elements of the ultraviolet wavelength using optical chamber argon technology to minimize the absorption of O2 on the wavelength <200nm spectral line. Make the instrument analyze C, P, S and other elements of stability and detection limit has been improved.

OES-P200 portable spark direct reading spectrometer double optical chamber with constant temperature system (constant temperature 34℃). The instrument does not require much ambient temperature and has good long-term stability.

OES-P200 portable spark direct reading spectrometer adopts highly integrated, maintenance-free digital spark source, which is a composite spark, arc, arc-like and other combinations of parameters, and can analyze constant, high content, trace elements and even trace elements and ultra-high content elements.

The software of OES-P200 portable spark direct reading spectrometer adopts Windows interface with full Chinese display, perfect function and easy operation.

Each instrument is specially manufactured according to the user's requirements, carefully loaded and adjusted, fully calibrated and aged. OES-P200 portable spark direct reading spectrometer is the preferred and ideal analytical instrument for the detection of indestructible metal raw materials.

1.2 Instrument Parameters

Name	Content
Optical system	
Optical Structure	Paschen-Runge rowland circle full-spectrum vacuum optical system
Visible optical chamber temperature	34℃±0.5℃
Ultraviolet optical chamber temperature	34℃±0.5℃
Wavelength Range	165-200mm，200-580nm
Focal Length	298mm，300mm
Grating	3600m1/mm
Detector	Multiple high performance linear CMOS arrays
Average Resolution	≤10pm/pixel
Spark stand	
Gas	Argon(≥99.9995%)
Argon Flow	When sparked: 3L/min Standby: 0.3L/min
Electrode	Tungsten spray electrode
Cleaning	Automatic cleaning function
Composition	Thermal deformation self-compensation design
Analysis Gap	Sample stand analysis gap:2.88mm
Spark source	
Types	HEPS high energy pre-combustion technology
Discharge Frequency	100-1000HZ
Discharge Current	1-400A

Advanced technology	Optimization design of discharge parameters
Pre-ignition	High energy pre-combustion technology
Processor	High-end ARM, high-speed data synchronization acquisition and processing
Data collection system	
Ports	Ethernet Data Transmission Based on DM9000A
Working power supply	Lithium battery 24V10AH
Other	
Can be analyzed elements	C, P, S, Fe, Cu, Al, Ni, Co, Mg, Ti, Zn, Pb, Sn etc.
Electricity consumption	Max: 750W Standby: 20 W
Operating temperature	10-35°C (temperature≥5°C)
Operating humidity	20-85%
Size of the host not counted with trigger gun	310mm(L)* 180mm(W)* 525 mm(H)
Mobile cart dimensions	510mm (L)* 480mm (W)* 965mm (H)
Weight	Host: 19 Kg, mobile cart: 22.5Kg

1.3 Instrument features

Fast and reliable on-site metal detection;

The lightest and most compact design integrates all functions in one;

Straightforward user interface, easy for quick navigation of instrument settings and workflows;

Flexible multi-substrate system

It can analyze the elemental composition of metal materials in a variety of matrices with high precision, even some optical alloy elements which cannot be detected or partially detected via many traditional handheld devices.

It can accurately analyze carbon (C), phosphorus (P), sulfur (S), boron (B) and other elements in steel.

Precision comparable to the of laboratory desktop spectrometers

Compact and lightweight portable spark direct reading spectrometer, as optical and fast as a handheld device. It provides the most flexible, accurate and economical analysis method for determining the composition of metals and their alloys composition. The test results are as accurate and reliable as the data of laboratory desktop spectrometers. It can do test quickly and accurately even in some specific environments on-site.

Anytime, anywhere, on-site inspection

Compact and lightweight system design. Especially outstanding for rapid detection or complex on-site environments. Integrated high-performance lithium battery and intelligent battery system, measures continuously. Truly your reliable partner.

Intelligent, multi-modal mobile design

Adhering to the innovative design concept, we design a friendly operation interface based on the actual situation of on-site use. Multiple modes such as hand-carrying, back, small cart, boxing are designed, allowing users to easily move the device and complete the entire analysis process safely. Provides reliable solutions for difficult-to-reach temporary analysis and material reliability identification.

1.4 Maintenance

Environmental requirements

The working environment temperature of the instrument is between 10°C and 30°C.

For there is a constant temperature system inside the instrument. Air conditioner is recommended, in order to prevent the continuous operation of the internal constant temperature from affecting the service life of the instrument. The relative humidity at the working site of the instrument should be less than 70%. Otherwise, unpredicstand failures may occur in optical systems, high-voltage systems or other electronic systems due to low temperature or high humidity.

Argon requirements

The OES-P200 uses spectrometer-specific argon gas. The purity is above 99.9995%.

Impurities index (volume fraction):

O2<100 ppb	H2<50 ppb	H2O<400 ppb	CO<50 ppb	CO2<50 ppb
CH4<50 ppb	NO<20 ppb	NO2<20 ppb	SO2<20 ppb	H2S< 20 ppb
NH3< 20 ppb	NMTHC (as CH4) <50 ppb			

Qualified argon gas needs to be prepared by users themselves when installing the instrument. If the argon gas cannot reach sub-purity, please use an argon gas purification device. The argon gas cylinder should be equipped with an argon meter (or oxygen

meter) and a copper tube connected to the meter. The argon pressure provided to the instrument is 0.5MPa. High-purity argon (argon purity ≥ 99.9995 %) is used as the analysis gas source, please pay attention to gas safety, a large amount of argon leakage may cause suffocation.

Sample processing

When analyzing samples with a spectrometer, sample preparation is extremely important. The preparation method depends on the material being analyzed. Steel and other hard materials are usually prepared by a pallet grinder or a belt grinder. It is recommended to use 40-60 grit iron oxide sandpaper or sanding disc (cutting disc). Cast iron specimens must be ground with a rotary grinder and an appropriate grinding wheel selected. For example: when preparing iron samples, use aluminum oxide (brown steel jade) grinding wheels instead of silicon carbide grinding wheels. Non-ferrous materials, such as copper and aluminum, should be prepared with high-speed lathes or grinders.

Our spectral grinding machine OES-MY100 can be selected

For a large piece that cannot be cut, a polishing machine can be used to remove the rust and coating on the surface of the test sample before the material can be tested. Please pay attention to safety when operating. Improper use of sample grinders, grinders and lathes may cause harm to the human body.

Software requirements

This instrument is a professional spectrum analysis instrument. Non-professional analysts are not allowed to operate it without authorization, otherwise it may cause instrument failure or personal injury. The computer used is a specific device, and application software unrelated to the spectrometer is not allowed to be installed on the computer; files in the OES-P200 analysis software are not allowed to be moved, modified, or deleted at will.

spark optical source

During the spark operation of the instrument, high-frequency EDM will be generated at the spark stand. Therefore, during the spark analysis process, must not move or take away the analysis sample by hand, and no liquid is allowed to spill on the spark stand, otherwise the instrument may be damaged or human body may be harmed. The optical chamber and spark stand are precision optical components and are not allowed to be opened or disassembled without authorization. If you have any questions, please consult a trained professional or contact INSIZE service department in a timely manner.

1.5 Application areas

OES-P200 portable spark direct reading spectrometer can be widely used in the rapid analysis of metal components in the laboratory, inspection of incoming and outgoing materials, and metal material analysis in industries such as automobiles, aerospace, petrochemicals, electric power, machinery manufacturing, and casting.

Chapter 2 Basic Composition of Instruments

2.1 Appearance of the instrument

Figure 2-1 Overall view of the instrument

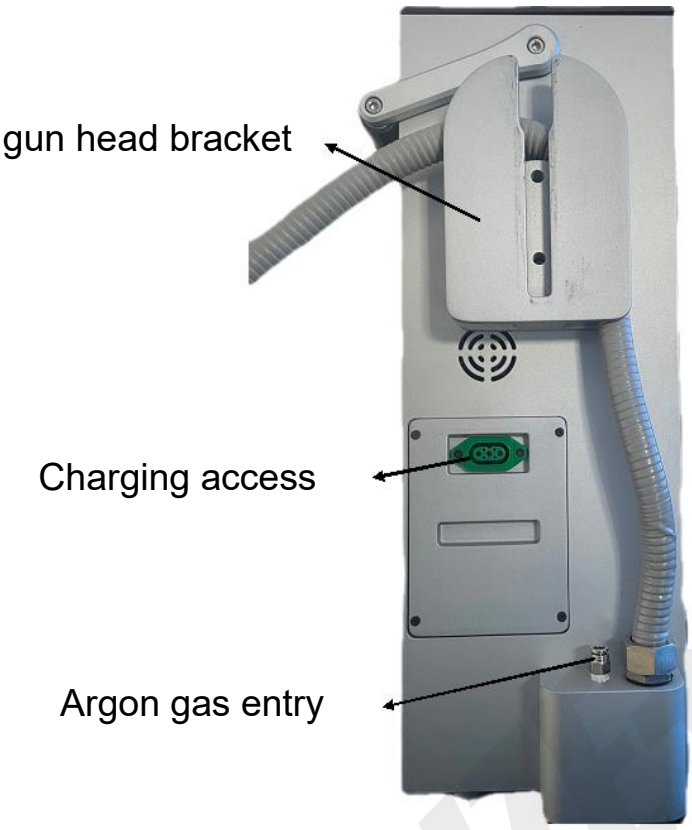
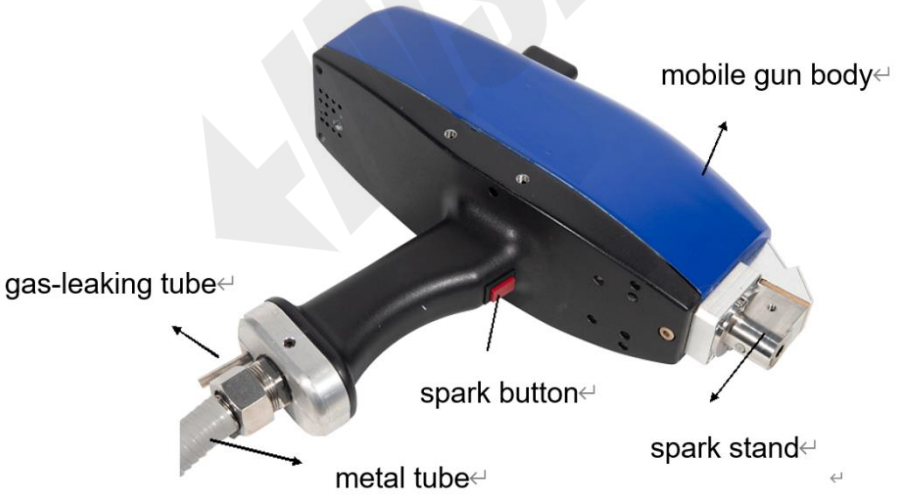


Figure 2-3 left side view of the instrument



Chapter 3 Spectrometer installation

3.1 Assembly

3.1.1 Gas connection

Step 1: Take out the pressure reducing valve and install it on the outlet of the argon cylinder valve, as shown in Figure 3-1:

Figure 3-1 The connection between the pressure reducing valve and the argon cylinder should be tightened with a wrench

Step 2: Connect the special fluorine tube of Φ6mm to the terminal ferrule joint of the pressure reducing valve, as shown in Figure 3-2 and 3-3:

Figure 3-2 Fluorine pipe with ferrule installed

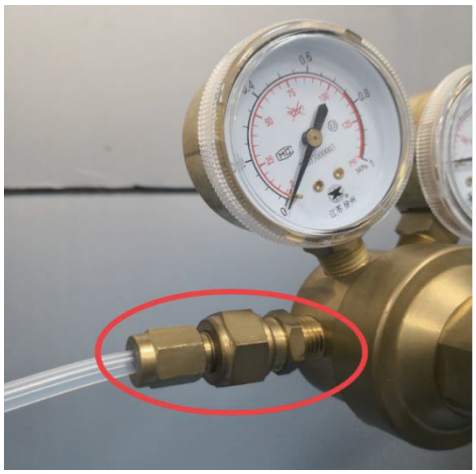


Figure 3-3 Outlet end of pressure reducing valve

Step 3: Connect the other end of the fluorine tube to the argon inlet of the instrument, as shown in Figure 3-4:

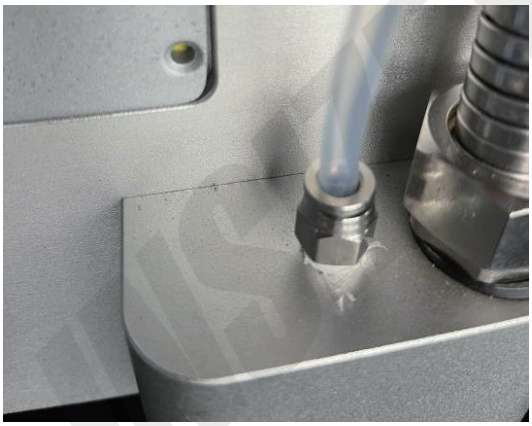


Figure 3-4 Argon inlet at the rear of the machine

Step 4: Clockwise adjust the outlet pressure of the pressure reducing valve to 0.4 MPa. The stand on the right shows the total amount of argon in the argon cylinder, as shown in Figure 3-5:

Figure 3-5 Adjusting the flow size

Notice

- When the total volume of the argon gas cylinder reaches 1Mpa, the argon gas should be replaced in time;
- When connecting or removing the argon-fluorine tube connector on the instrument, please use two wrenches, one wrench to fix the connector on the instrument, and the other wrench to operate the argon-fluorine tube connector.

3.2 Instrument trial operation and sample preparation

3.2.1 Instrument trial operation

Before the instrument trial operation of OES-P200 portable spark direct reading spectrometer, please confirm:

Confirm that the instrument has not been accidentally damaged due to transportation or other reasons;

Confirm that the relative humidity of the environment is between (20~80)%;

Confirm that the ambient temperature is between (10~30) ℃;

Confirm that the purity of the argon gas used is above 99.9995 % ;

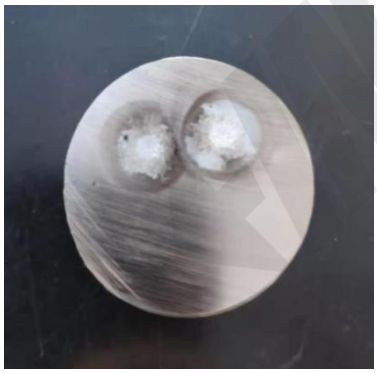
Note: If the instrument needs to analyze samples every day, it is recommended that the main power be turned on at all times to ensure constant temperature and high vacuum inside the instrument, and that the CMOS detector is in a sstand state, so that the instrument can enter the standby analysis state at any time. **If the instrument is shut down for more than two days, it can Turn off all instruments, but turn on main power 1 hour before using the instrument.**

3.2.2 Sample preparation

When preparing samples, determine the sample processing equipment (purchased according to the analysis materials) : pallet grinder (sandpaper) , sample grinder as shown in Figure 3-6, rotary grinder (grinding wheel or brown corundum) , lathe (non-ferrous metals) , sampling equipment (ingot mould).

Figure 3-6 OES-MY100 SPECTRAL SAMPLE GRINDER

Examples of spark Points for Routine Samples



Low alloy steel

Cast iron

Aluminum

Copper

3.3 Charging

The instrument needs to be charged by a 220V 50Hz power supply. Exceeding this range may cause damage to the battery or shorten the service life of the battery. It is best to leave 15% - 20% remaining power, and the charging time is about 3 hours. As shown in Figure 3-7:

Figure 3-7 Charging

Note: The instrument cannot be used when it is charging, as this will cause inaccurate when analyzing C, P, and S elements.

Chapter 4 The operation of spectrometer

4.1 Analysis software

4.1.1 Software interface introduction

Click the application's app, enter the software through the operator password 111111 or the administrator password admin or 666666. The following interface will appear, as shown in Figure 4-1:

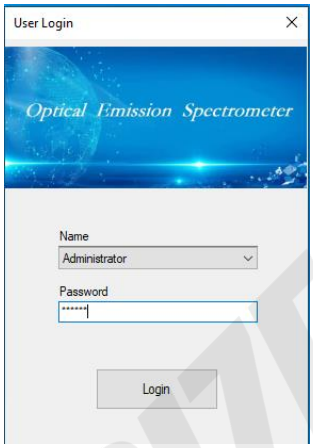


Figure 4-1 Login interface

The main interface is divided into model interface, analysis result display, menu bar, operation bar, information display bar and status bar, as shown in Figure 4-2:

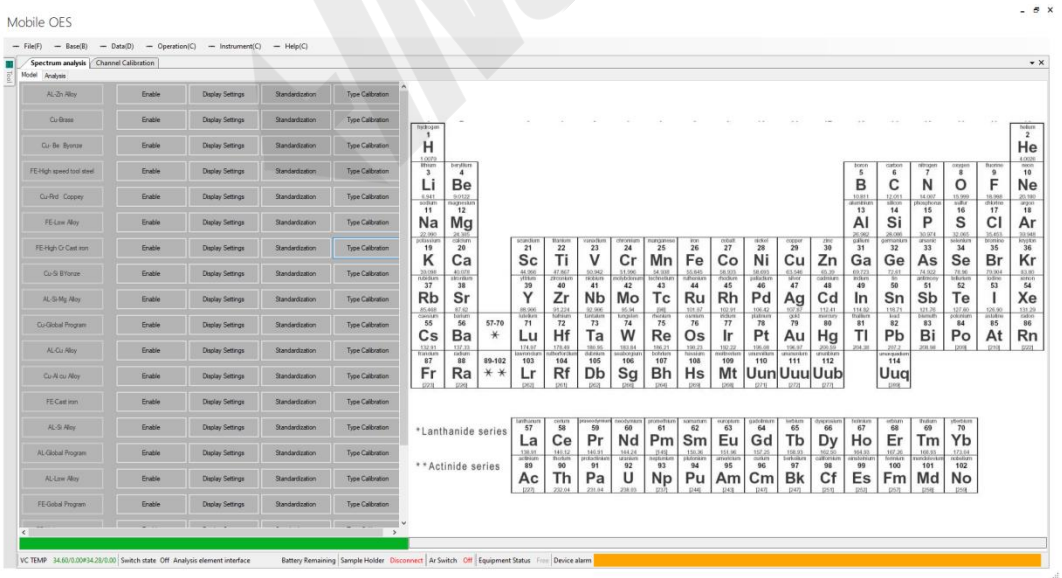


Figure 4-2 Model interface

Analysis results display: used to display the content of the analysis elements, each line shows 10 elements, the extra elements are displayed in the second column, up to three columns of elements, each time the display shows 11 columns, the number of columns

exceeds the drop The scroll bar shows that the SD and RSD values are automatically displayed when the number of analyses exceeds 2 times. as shown in Figure 4-3:

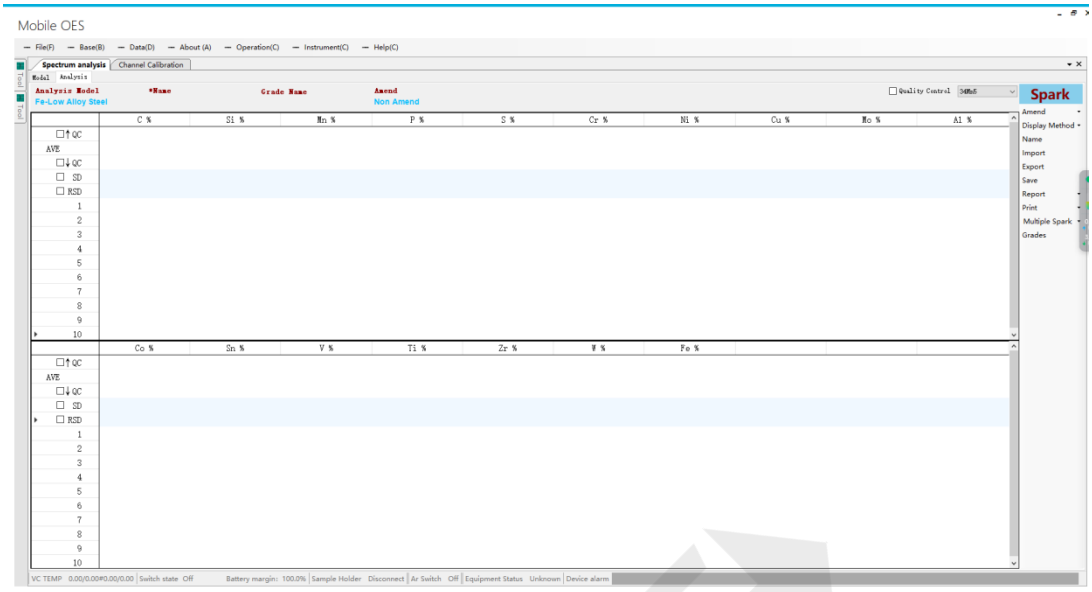


Figure 4-3 Analysis interface

Menu bar: Displays files, base, data, operation, instrument, and help respectively. The functions of each sub-menu bar are introduced below:

4.1.1.1 File

“Account Management”: You can modify the login password of the administrator and operator;

“Authorization": Provides users the authority of developer.

“Exit": Click to close the software.

4.1.1.2 Base

“Sample Management": You can query the content standards of relevant samples;

4.1.1.3 Data

“Query analysis data": Query the saved data. The saved data must be edited with the sample name for this data, otherwise it cannot be confirmed what data it is. The query data can be queried by date and sample name, and the queried data can be printed in batches;

“Report information setting": Set the report format of the printed data, and you can set the printed items, such as: the name of the unit that sends the sample, etc.

4.1.1.4 Operation

“Analysis window": the interface displays the analysis element;

“Spectrum calibration": When the analysis accuracy of the instrument deviates with the change of temperature and vacuum, it is necessary to calibrate the optical path of the equipment. At this time, a sample from the factory must be sparked. After 3-5 sparks, click on the calibration button to calibrate all optical paths, and then click Save to take effect for this calibration;

“Instrument reset": After the optical source restarts, you need to click this button to make the spark optical source work normally;

4.1.1.5 Instrument

“Argon flushing of excitation table": "Flush" is to use argon gas to flush the hand-held spark gun head, and "Off" is to turn off argon gas flushing.

“Ultraviolet chamber filled with argon": "Flush" uses argon gas to flush the ultraviolet optical chamber in the hand-held spark gun without time limit,and "off" closes the argon gas to flush the ultraviolet optical chamber.

“Excitation and heat dissipation": "Turn on" or "Close" the fan in the spark gun;

“Visible light chamber heat dissipation": "Turn on" or "Close" the fan in the host optical room;

“Status Monitor": Observe the status change of temperature and vacuum degree in real time;

“Setting Parameters": Change the parameters as needed;

“Shutter test": Observe whether the spark gun head opens and closes normally;

""Argon filling ": Make argon gas long-time flush the UV chamber in the spark gun to exhaust the air;

Model interface: Contains various curves, element display settings and formula adjustments.

“Display settings”: The order of elements displayed in the analysis interface and the number of decimal places displayed.

“Standardization": When the parameters of the instrument deviate, the instrument needs to be calibrated. At this time, the instrument needs to be calibrated through high and low standards. It can be divided into "New" and "View". “New” is to spark standardized samples. Each sample needs to be sparked 2-3 times. Select data with good repeatability to save. Generally, the relative standard deviation RSD is less than 3.

“Type calibration": To select the standard sample used when calibrating and analyzing the sample this time. It is divided into "New" and "View". “New” is to create a new control sample. When correcting the control sample, the control sample needs to be sparked 2-3 times to obtain data with good repeatability and save it. Generally, the relative standard deviation (RSD) is required only to be less than 3. "View" refers to viewing the calibration factor of all type standard samples.

Operation bar: Mainly used to set the data processing mode before and after analysis:

“Spark”: sparks the sample for this analysis;

“Amend”: “Non Amend": Cancel “Type Calibration"; “Type Calibration": When analyzing a sample, choosing the type calibration. This type calibration needs to be sparked and effective. When the type calibration is clicked to calibrate, the required type standard sample is selected to calibrate the sample that needs to be sparked. Generally, a type standard sample of the same material is required for calibration. When a suitable type standard sample is selected, the name of the selected type standard sample will be displayed; "type standardization": If the customer’s high and low standards are used up, the original high and low standards can be replaced by the standardized and reconfigured high and low standards for the type standard sample.

“Display method": Concentration, relative intensity and raw intensity.

“Name": The name of the sample being sparked this time;

“Import”: The extracted spectrum spark data is re-imported into the analysis interface for display;

“Export”: The results of this analysis can be exported in different formats to facilitate the import of this analysis data into the analysis interface in the future;

“Save”: Save the data sparked this time in the database. When saving, you need to enter the name of the sample for later viewing and printing;

“Report”: Refers to the way to export the WPS spreadsheet, which is divided into exporting average values and all analysis data;

“Print”: Prints out this data in the form of average value;

“Multiple spark”: 3 and 6 continuous sparks are available. During continuous spark, do not change the position of the sample to prevent the risk of electric shock.

“Grades”: You can select samples that have been entered in the grade library and set upper and lower limits. When exceeded, the sample content will change.

Display information bar: In this bar, “Analysis Curve” displays the analysis curve selected for this spark sample; “Amend” displays whether type calibration is enabled for this spark; “Name” displays the current spark sample name;

Status bar : “VC TEMP” displays the optical chamber temperature of the instrument, which generally changes within the range of 34±0.5°C; “Switch state on” indicates that the argon gas has been turned on, the input pressure detected by the pressure switch on the gas path module is 0.4MPa. If it shows “Switch state on”, it means that the argon gas is not opened or the output pressure of argon gas is less than 0.4MPa; “Alarm status” shows the online status of the instrument and the communication status of the spark source, green means normal, if red, it means that the spark source switch is not turned on or the instrument and the computer are not connected, you can double-click here, there will be an error message.

4.1.2 Input standard sample

Step 1 Click “Sample Management” in “Base” in the menu bar of the analysis software, as shown in Figure 4-4:

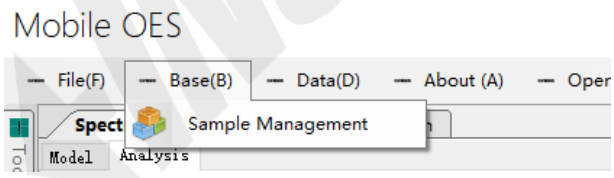


Figure 4-4 Sample management

Step 2 Find the corresponding category, such as “Fe Alloy Steel”, right-click and select “Add Sample”, as shown in Figure 4-5:

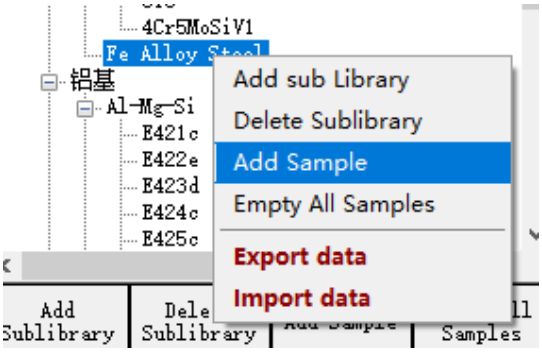


Figure 4-5 Add sample

Step 3 Enter the corresponding sample name and content then click “OK” button, as shown in Figure 4-6:

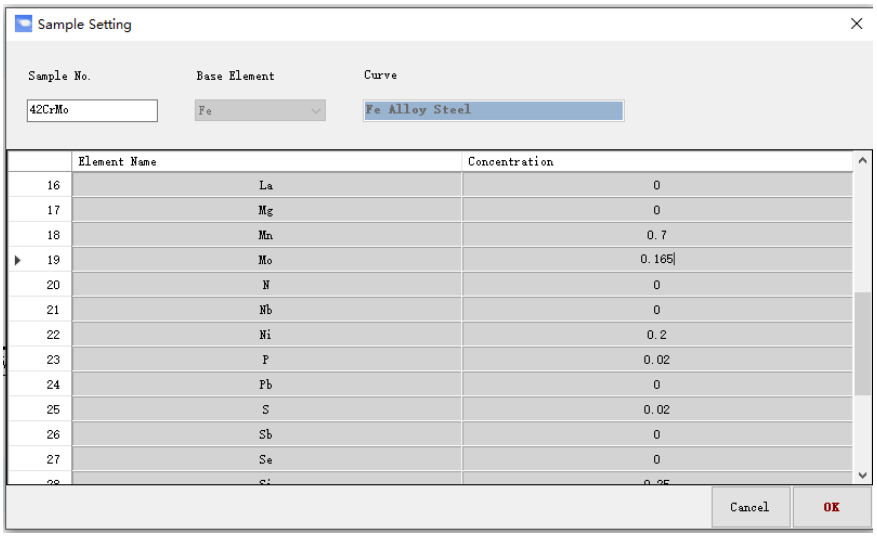


Figure 4-6 Input concentration

Step 4 Confirm the content again by comparing the content list, and click “Write to Database” and “Read the Database”, as shown in Figure 4-7:

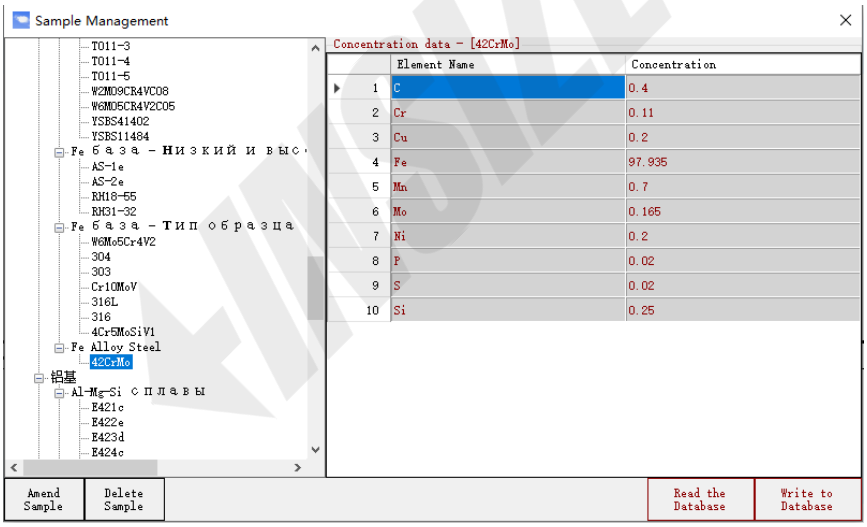


Figure 4-7 Confirm the content again

4.2 Preparation works

4.2.1 Status of the instrument

Step 1 Check visible optical chamber temperature (33.5℃-34.5℃) and ultraviolet optical chamber temperature (30℃- 40℃) in the instrument status bar . The battery remaining capacity is: greater than 15%, and the instrument status is normal, as shown in the figure 4-8:

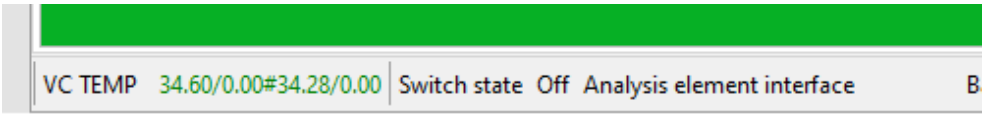


Figure 4-8 The parameters in the status bar are normal

Step 2 Click “Argon Filling” of “Instrument” in the software menu bar, open the argon gas valve, and wait for 800 seconds for argon filling, as shown in Figure 4-9:

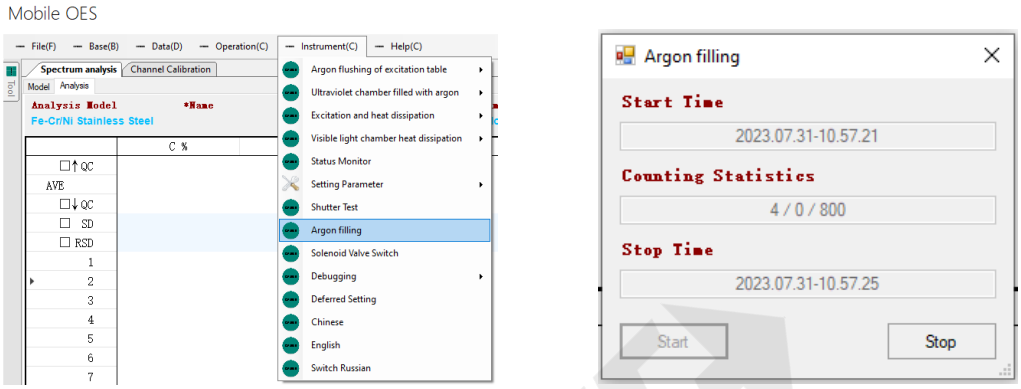


Figure 4-9 Argon filling

Step 3 Select the required curve and click “Enable”, as shown in Figure 4-10:

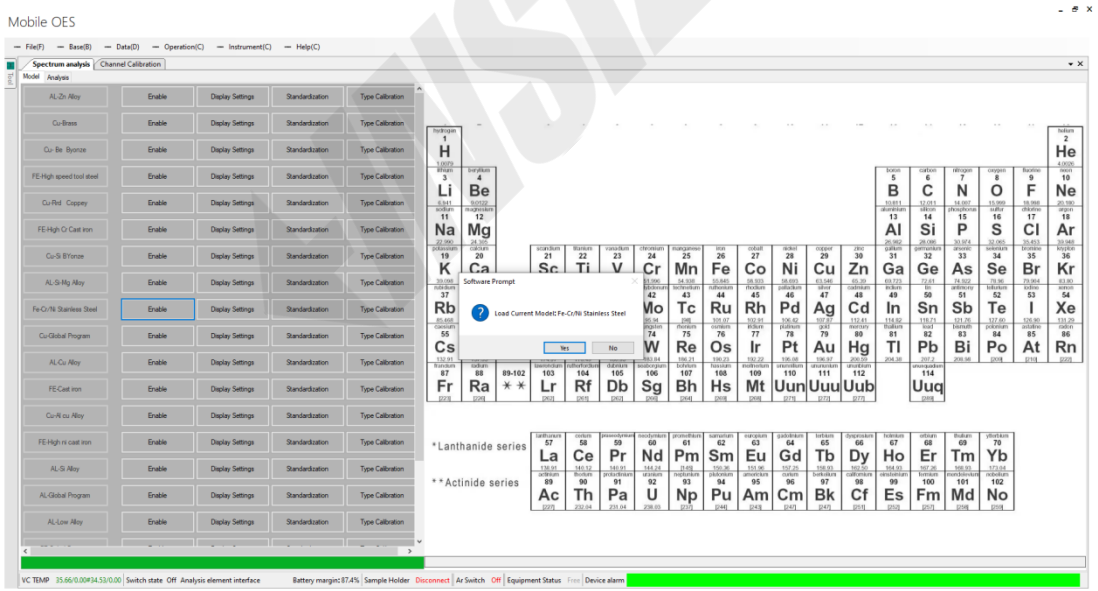


Figure 4-10 Working curve

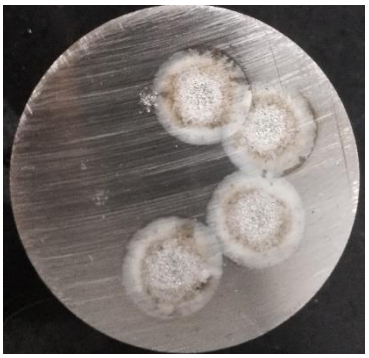
Step 4 Open the argon main valve and adjust the flow to 0.4MPa, as shown in Figure 4-11:

Figure 4-11 Argon pressure gauge

4.2.2 spark of waste samples

Observe the spark point. The steel sample has a pit in the center and a black circle around it. The cast iron sample has a pit in the center and a white circle around it. The higher the silicon content, the larger the white circle. The lower the carbon content, the darker the area around the point. The spark points is as shown in the figure (more than 5 times).

Iron sample



Steel sample

4.3 Spectrum calibration

During the use of the instrument, the spectral position will change slightly with the passage of time and the thermal expansion and contraction of the material. Users need to perform spectral line matching and calibrations regularly according to their own conditions. When the indoor temperature changes significantly or the shutdown time is long, generally when the temperature fluctuation exceeds ± 5°C, if the data drifts greatly during control sample analysis, calibration processing must be performed first. If the indoor temperature is constant, calibration can be done once every three months (or longer). In addition, if the intensity of the spectral line calibration is less than 1000, the lens needs to be wiped (**see 6.2 Lens Cleaning for details**), and then the spectral line calibration processing is performed again. The spectral line calibration of OES-P200 is completed automatically, and the user only needs to spark the spectral line calibration sample. Spectral line calibration needs to be performed with administrator authority. The specific steps are as follows:

Step 1 Click " Spectrum Calibration " in " Operation " in the menu bar of the analysis software, as shown in Figure 4-12:

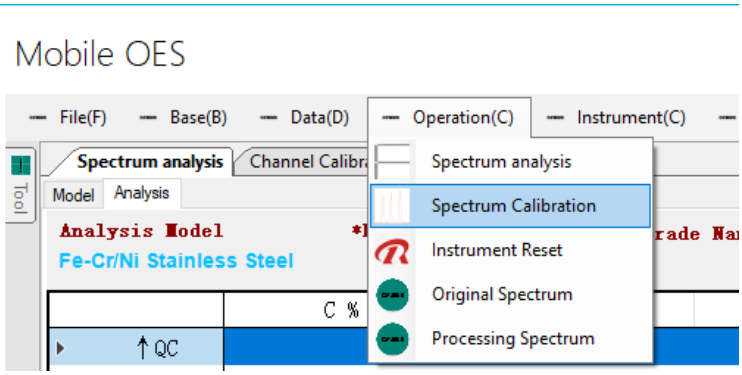


Figure 4-12 Spectrum calibration

Step 2: Enter the spectrum calibration interface, follow the prompts to find the corresponding sample, and spark the sample three times, as shown in Figure 4-13:

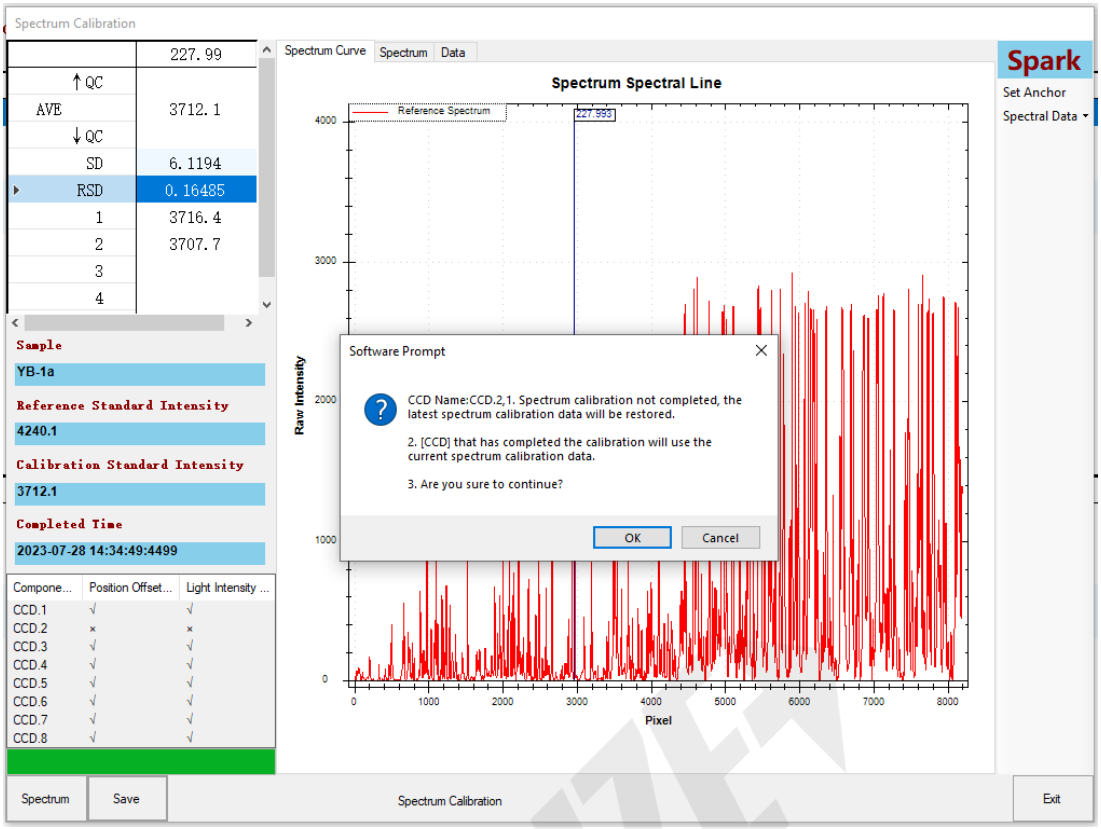


Figure 4-1 sparks of the corresponding samples

Step 3 Observe the RSD column in the analysis results, if it is less than 3, click " Spectrum Calibration" and "Save"; if the RSD is greater than 3, you need to re-spark the sample, right-click to delete a data with a large difference, and then observe the RSD, ensure that the RSD is less than 3 and then click " Spectral Calibration" and "Save", as shown in Figure 4-14:

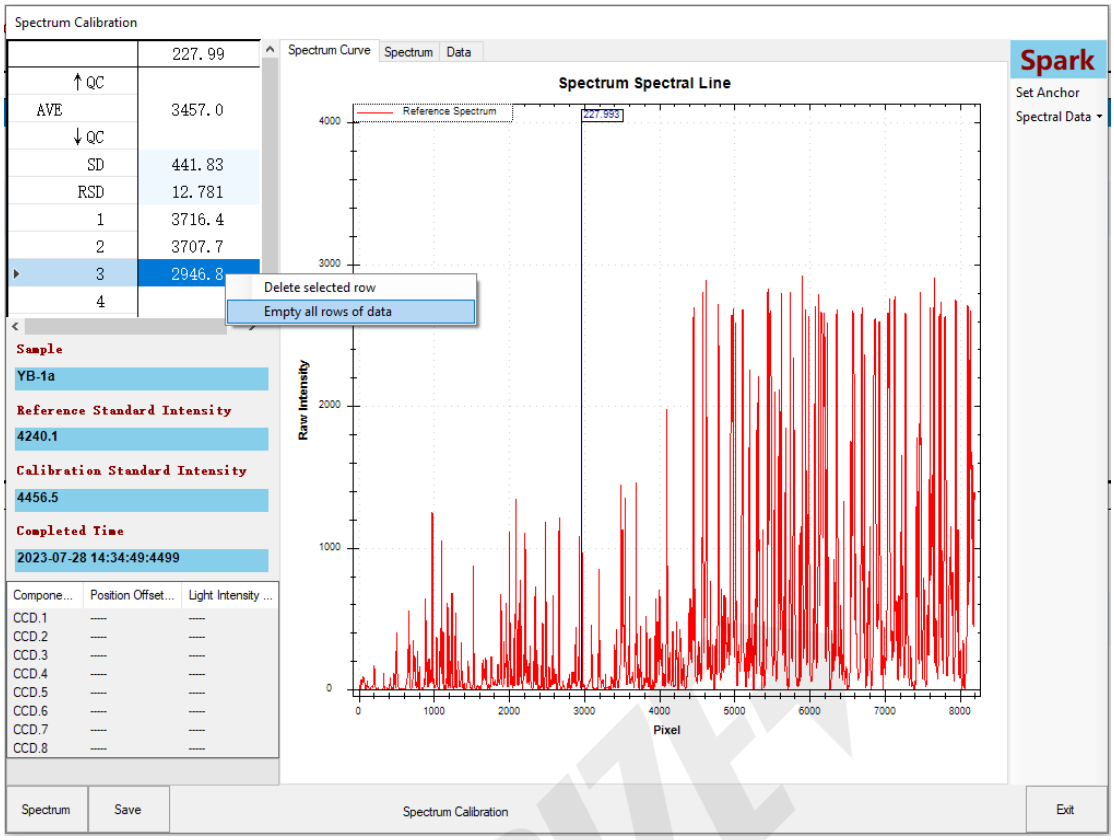


Figure 4-14 ensure that the RSD of the three data is less than 3

4.4 Standardization

Since the working condition of the instrument is a relatively stable state composed of many factors, the change of the working environment of the instrument (changes in temperature and humidity), the purity of the replacement argon gas, the pressure of the argon gas (flow rate),the sample grinding surface ,the operator's operating habits, and a series of external factors will cause the drift of the instrument's working curve, which is manifested by the different detection results of the same sample in different periods. So the instrument should be standardized at any time according to the usage situation; Some factors that change slowly over time, such as lens pollution, electronic system aging, and optical system energy attenuation, will cause the working curve to drift slowly.

At this time, standardization operation is needed. It corrects the spectral intensity of all analysis models of one category through high and low standards, which can effectively improve the accuracy of measurement. In short, we can correct the drift of these working curves through standardized means, so that it can remain relatively sstand for a period of time, which is enough to meet the work needs. Users conduct it regularly according to their actual situation, and it is generally recommended to conduct it once a week.

4.4.1 Standardization operation

Step 1 Click the “Standardization” of the corresponding curve in the “Model” menu bar of the software, as shown in Figure 4-15:

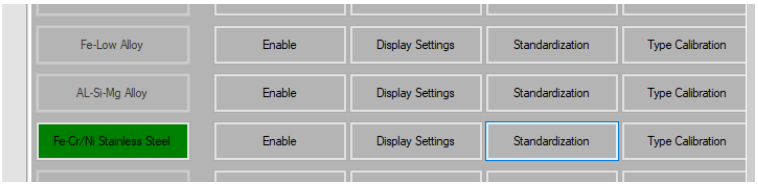


Figure 4-15 standardization

Step 2 Spark the corresponding high and low standards in turn, and observe the RSD after twice sparks. If the RSD of channels above 500 are all less than 3, click the next sample to repeat the above operation. If the RSD of channels above 500 are all greater than 3, you need to spark the Sample again, delete a data with a large difference, and finally ensure that the RSD of more than 500 channels is less than 3, as shown in Figure 4-16 below:

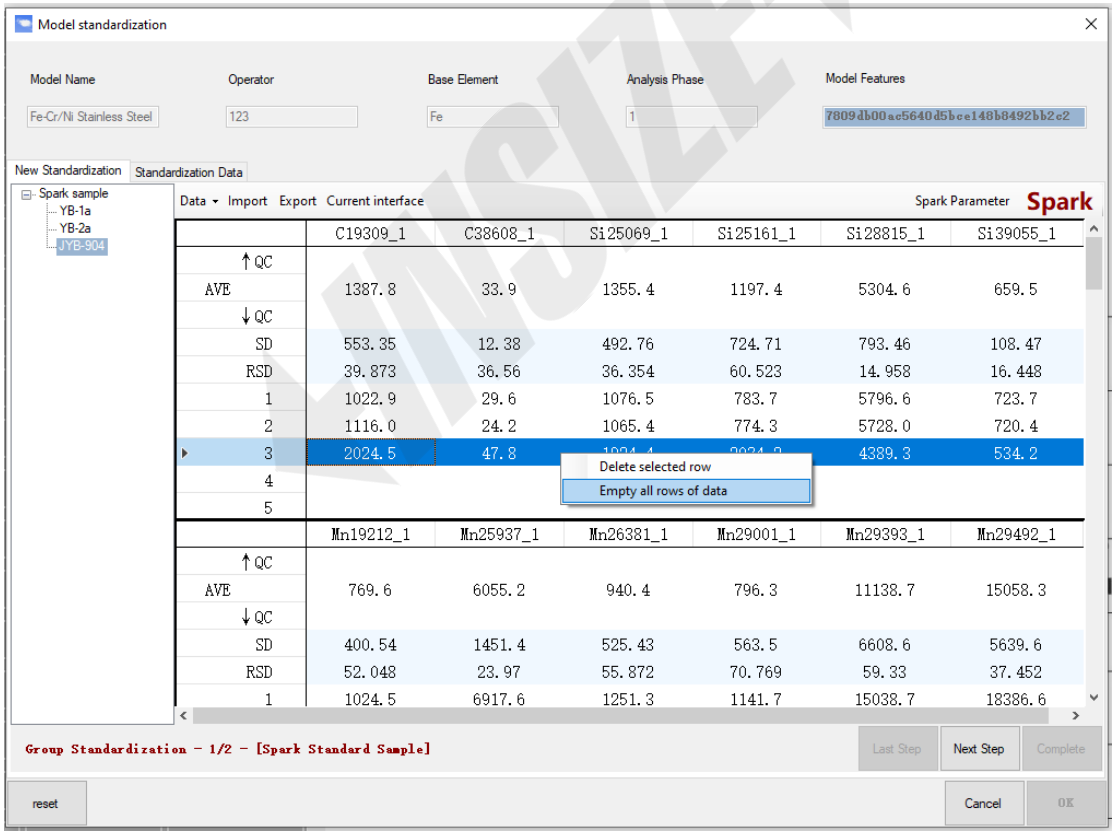


Figure 4-16 Spark High & Low standard sample

Step 3 When the left side display shows that both the high & low standard samples have been sparked and meet the conditions, click “Next” and “Save”, as shown in Figure 4-17:

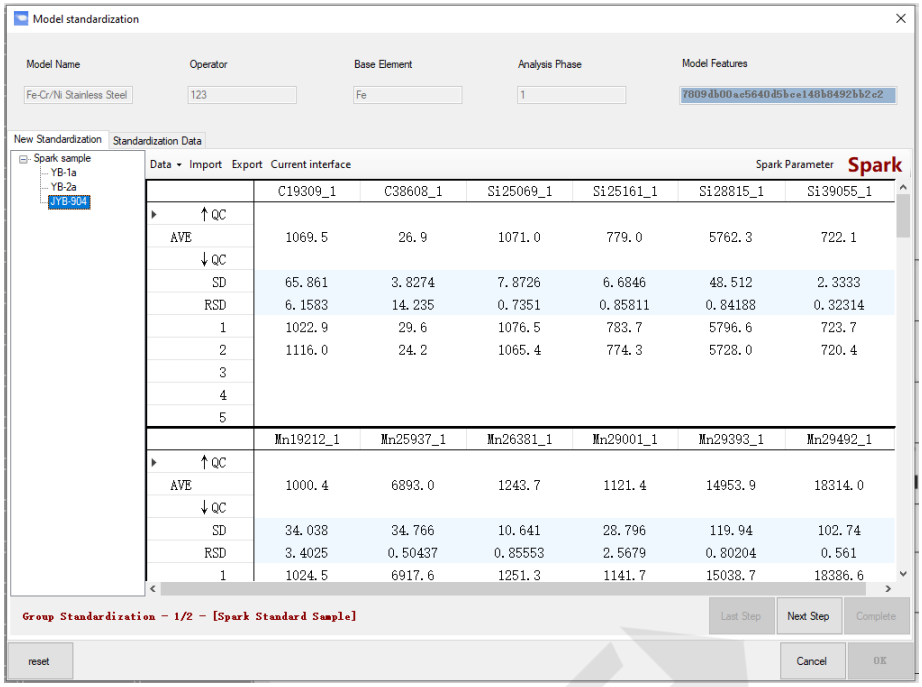


Figure 4-17 optical intensity standardization

Step 4 Save the standardized data, click “Complete”, “OK”, wait for 10 seconds, then click “Confirm”, wait for another 10 seconds, the software will automatically jump, as shown in Figure 4-18:

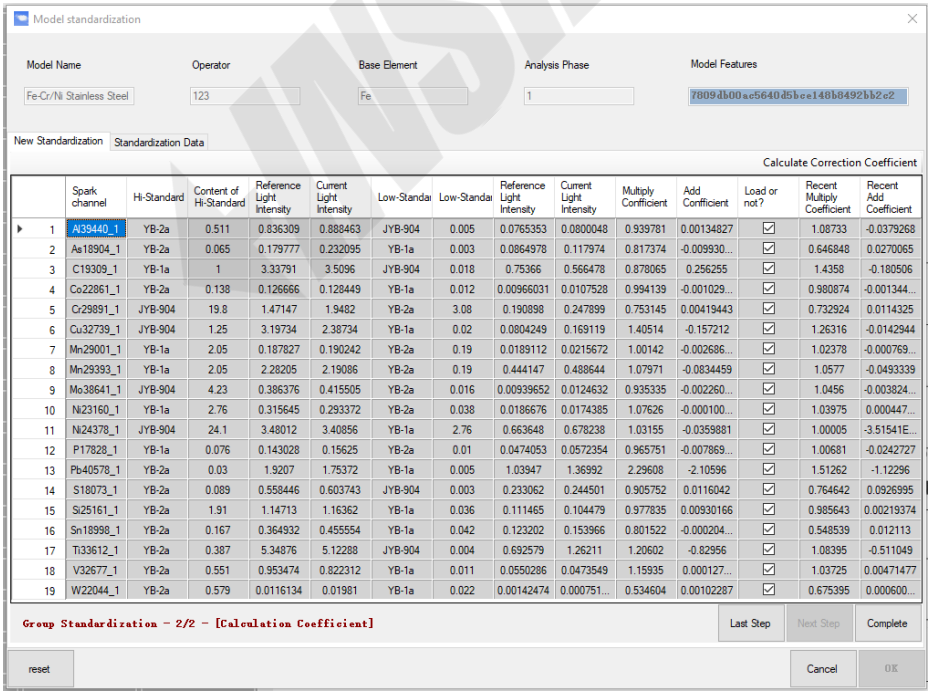


Figure 4-18 Save data

4.4.2 Manual standardization coefficient calibration

After completing the above steps, randomly sparked a high and low standard sample. If you are not satisfied with the test results and do not want to correct them through control samples, you can also change the data results by modifying the coefficients.

Step 1 When the measured value of a high-standard element (generally with a content greater than 0.1) is too high, and you want the result to be lower, modify the reference optical intensity value to be smaller. Then the concentration value will become lower as the calibration amount becomes smaller. When the value is low, change the reference optical intensity value to a larger value, and the concentration will become higher accordingly, as shown in Figure 4-19:

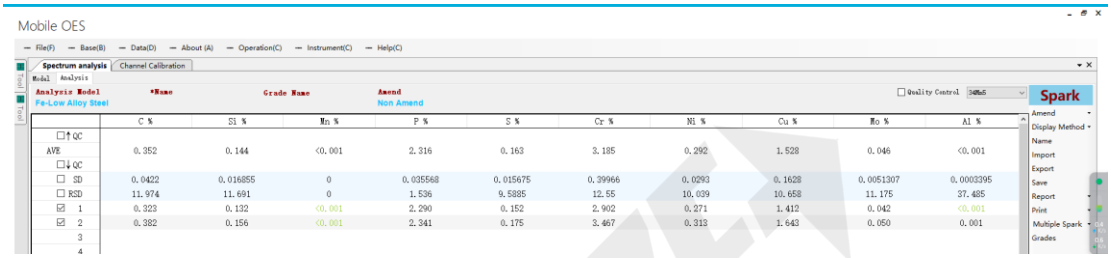


Figure 4-19 where the content of C is too high

Step 2 Click the “Standardized Data " under "Standardization" in " Model " on the menu bar , select the corresponding element, and then click "Set Parameters", as shown in Figure 4-20 :

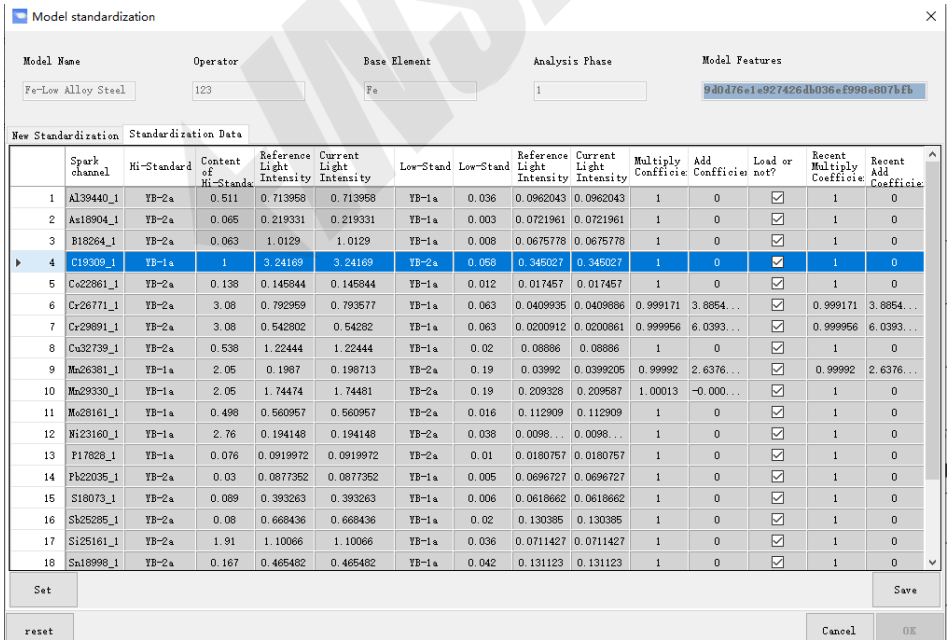


Figure 4-20 View of normalized optical intensity

Step 3 It can be observed from the figure that the absolute optical intensity of the high-standard reference channel of the C element is 6897, which is 1 step. You can adjust "+"

or "-" to increase or decrease the value, so as to achieve the adjustment value of 20725 (Modify about 5% each time) and click "Save", as shown in Figure 4-21:

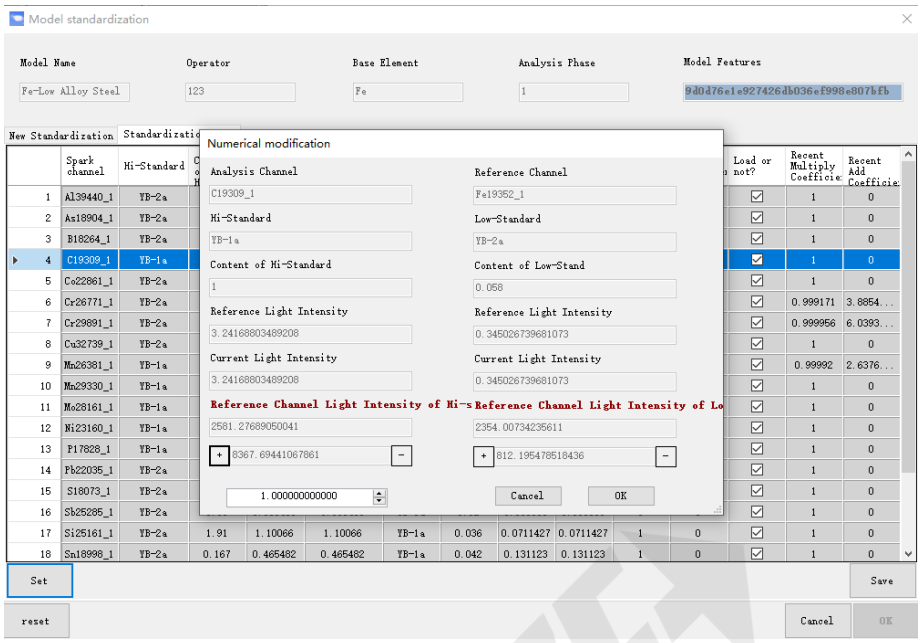


Figure 4-21 Modify the reference optical intensity

Step 4 Modify the corresponding reference optical intensity, and the content will change, as shown in Figure 4-22:

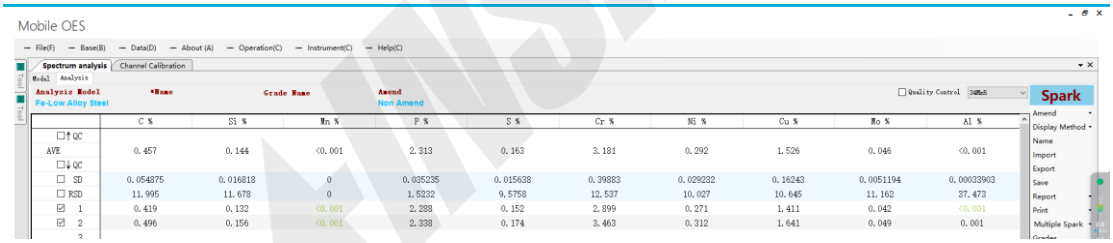


Figure 4-22 Observation of C element content

In the same way, when the measured value of the low-standard element (content less than 0.1) is low, and the result is expected to increase, the reference optical intensity value should be modified a little larger, then the concentration value will increase correspondingly with the increase of the calibration amount. And vice versa, when the value is high, modify the reference optical intensity value to be smaller, and the concentration will become lower.

Notice

- When correcting the obtained value, it is opposite to the above result;
- The corrected coefficient is a permanent repair and must be based on comparing the content displayed by the spark standard sample with the standard content stand;
- The optical intensity must be standardized before calibration;
- The calibration method is most effective only for the interference of individual elements or when the spark parameters are not suitable for the analysis of this element. Therefore, the manual calibration of the persistence curve is a supplement to the standardization of the instrument;
- Persistent curve calibrations are sometimes repeated until the analysis results are accurate.

4.5 Type Calibration

If the channel analysis range of an analysis program is relatively large or there is interference (such as: superimposed interference, matrix effect, etc.), and there is still deviation in the control sample analysis after standardization, type standardization should be carried out. Type calibration can effectively calibrate the impact of various interference on the analysis results. It is especially suitable for multi-sample analysis of metals and their alloys with basically the same sample content or the same brand.

Step 1 Click “Type Calibration” of the corresponding curve in “Model” in the menu bar, as shown in Figure 4-23:

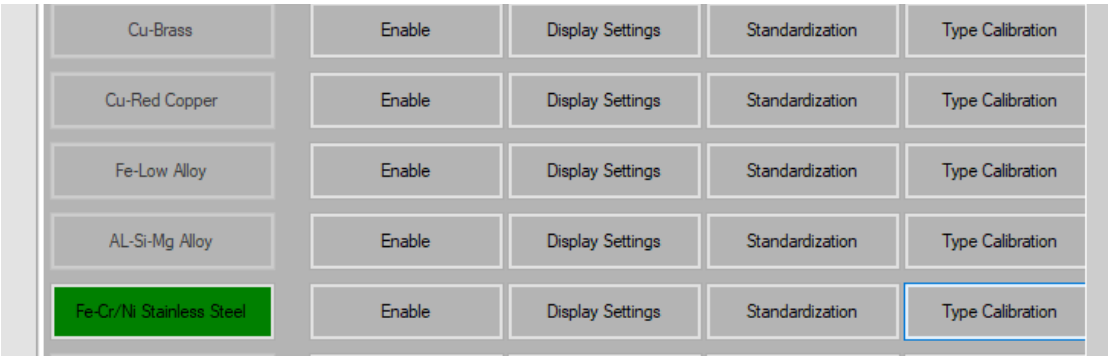


Figure 4-23 Type Calibration

Step 2 After clicking “New”, enter sample name, and then click “OK”, as shown in Figure 4-24:

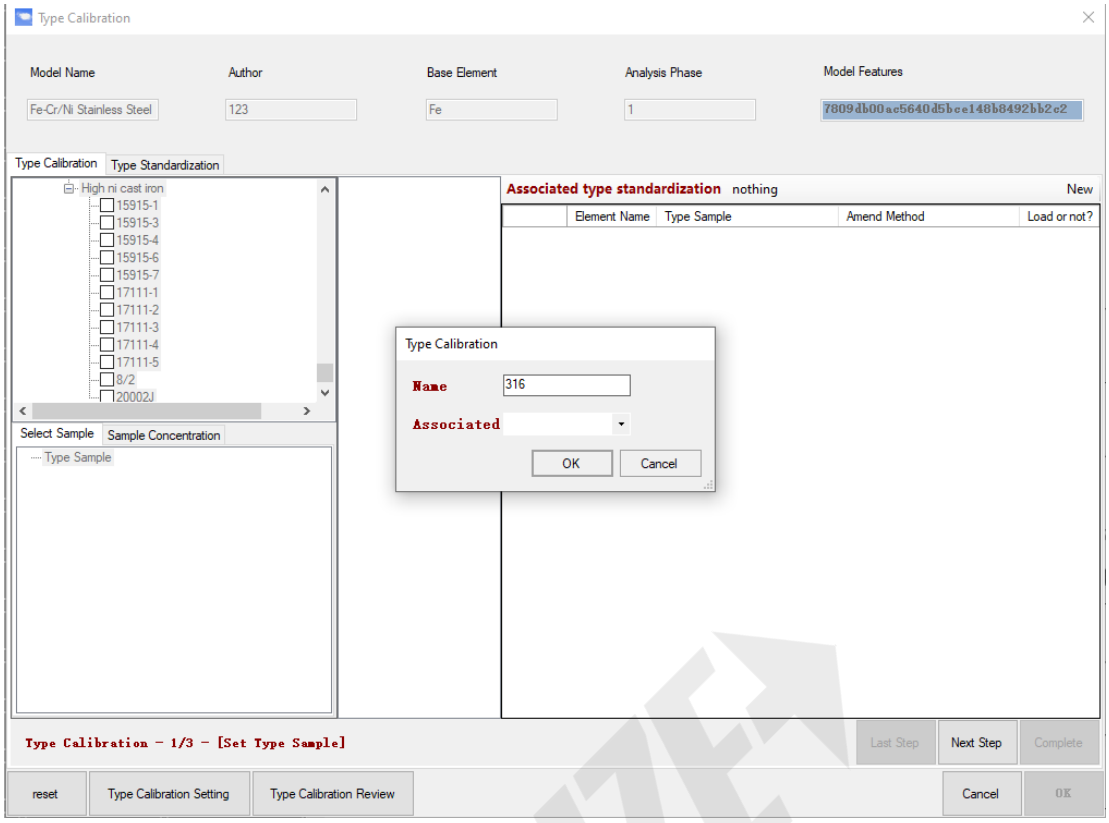


Figure 4-24 Enter sample name

Step 3: Check the required samples and click “Next”, as shown in Figure 4-25:

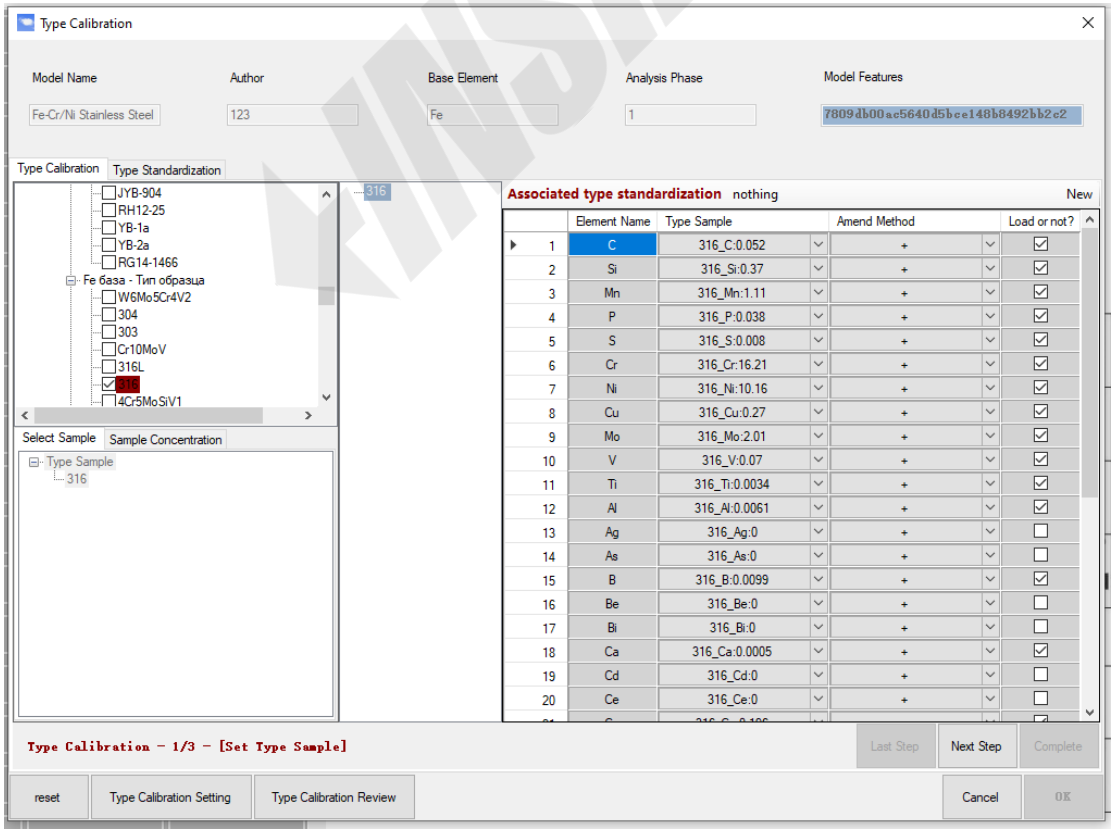


Figure 4-25 Add Type sample

Step 5 Enter the spark page. According to the sample information listed on the left, place the selected sample on the spark stand, click " spark " to analyze the sample, as shown in Figure 4-26:

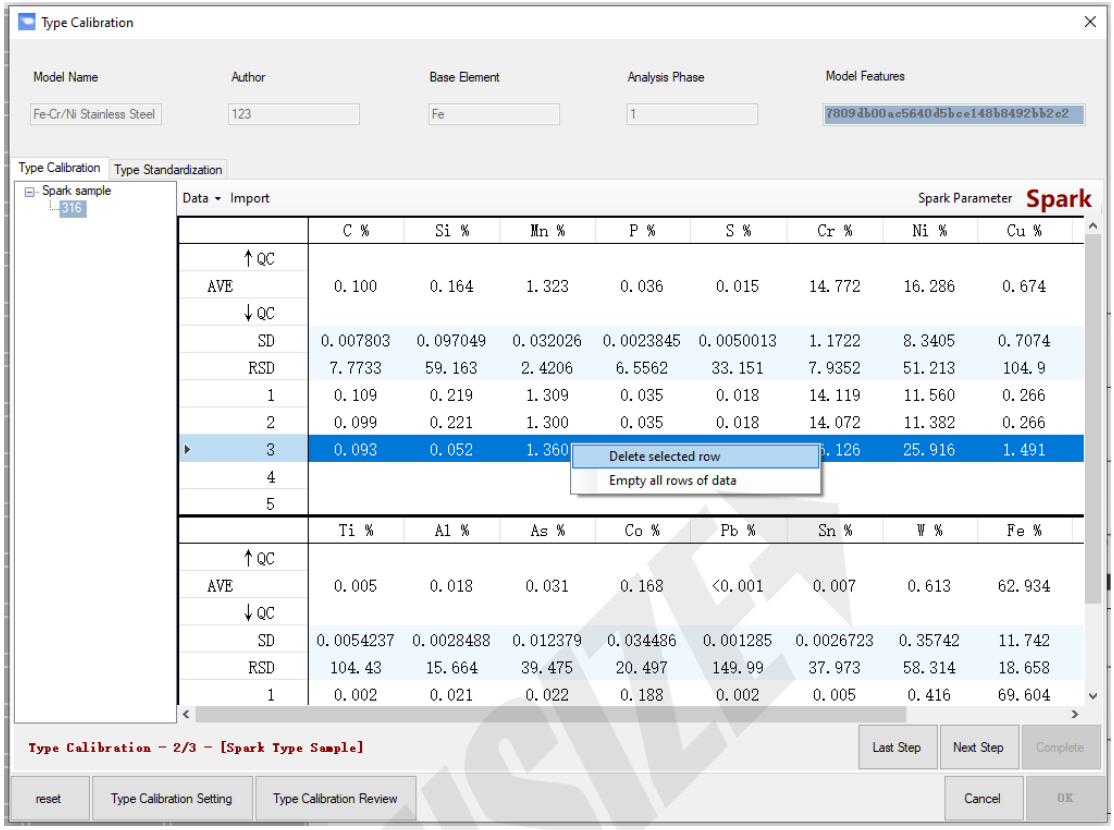


Figure 4-26 spark sample

Same as the optical intensity standardization, check the RSD after two sparks to ensure that the RSD of the main elements are all less than 3, you can spark the third time or more, and finally click “Next Step” and confirm “Save”.

Notice

- When do spectrum calibration, the optical intensity must be greater than 1000. If it is less than 1000, the lens must be cleaned;
- The steps in daily work should be operated from top to bottom, and sometimes it is not necessary to complete them all.

Chapter 5. Analytical data processing

5.1 Query and print the data of the day

5.1.1 Simple data processing

Step 1 Enter “Name” and click “Save”, as shown in Figure 5-1:

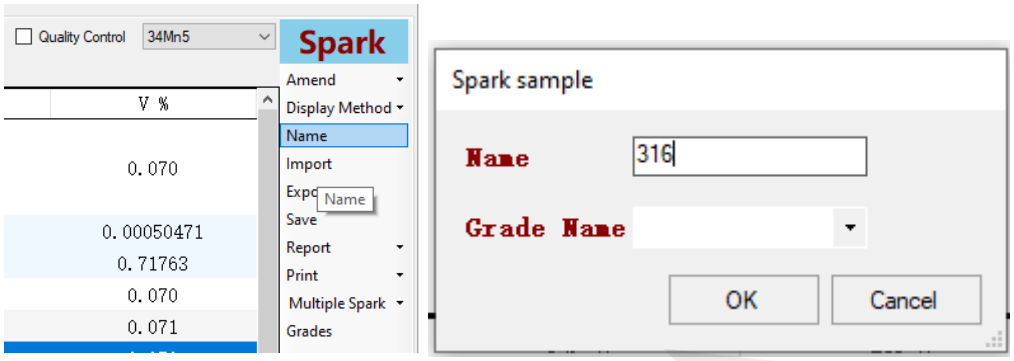


Figure 5-1 Simple data processing

5.1.2 Report data processing

Step 1 Click “Detail” or “Average” under “Report”, as shown in Figure 5-2:

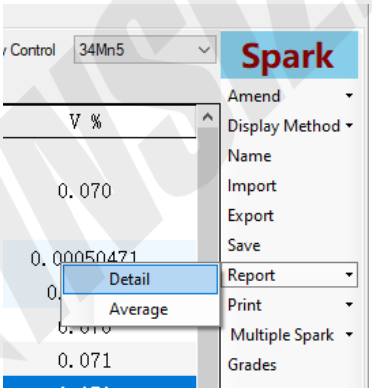


Figure 5-2 Report data

Step 2 Automatically jump to Excel software to complete printing of relevant reports

5.2 Query historical data and print

Step 1 Find “Query information setting” under “Data” on the menu bar, as shown in Figure 5-3:

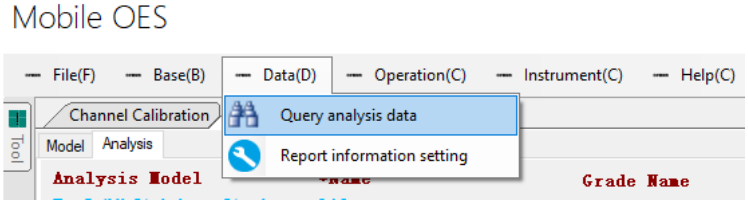


Figure 5-3 Query analysis data

Step 2 Click " Quick Query", which means the data saved today, and "Advanced Query" can query historical data according to time. After selecting the time and corresponding data, you can click Print, and the Excel report will pop up automatically, as shown in Figure 5-4:

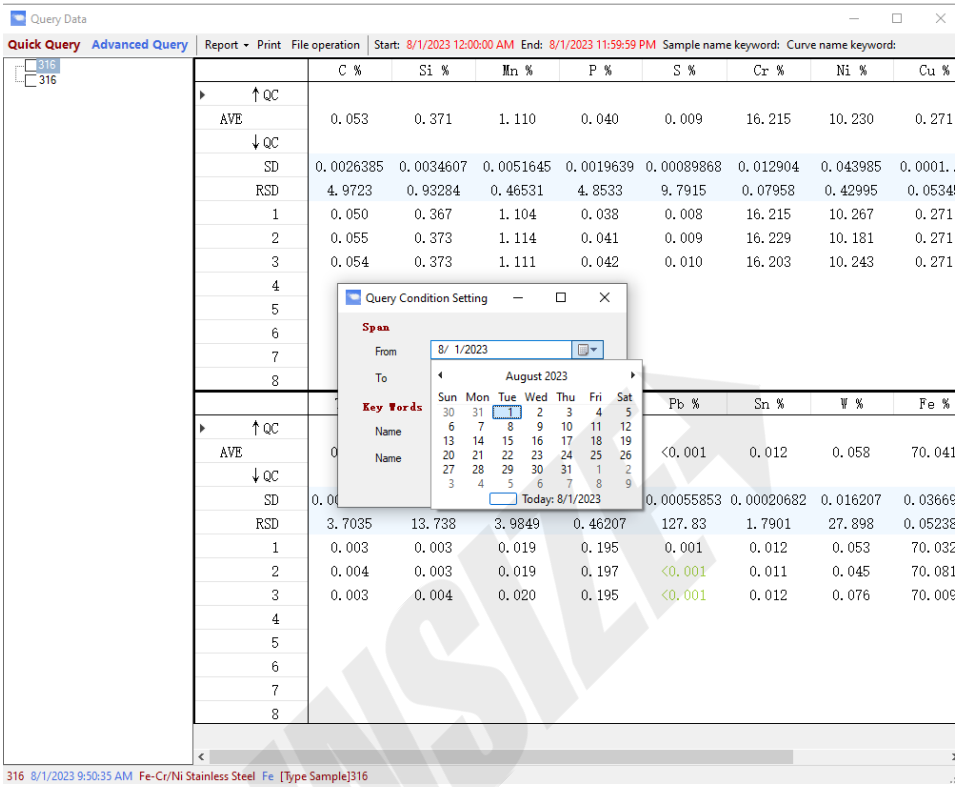


Figure 5-4 Advanced query

5.3 Change and export data

Step 1 Find " Report information setting " under "Data" on the menu bar , as shown in Figure 5-5 :

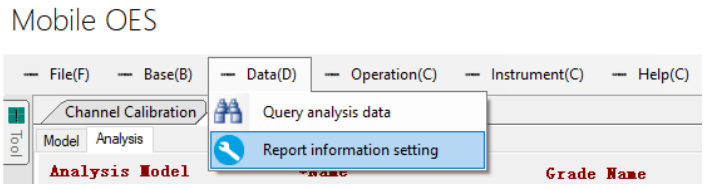


Figure 5-5 Report Information Settings

Step 2 Modify the information in the template as needed, as shown in Figure 5-6:

Figure 5-6 Template

Chapter 6. Daily maintenance

6.1 Device maintenance cycle

No.	Maintenance items	Maintenance cycle
1	Electrode cleaning	before each spark
2	Spark stand maintenance	(3-7) days or 300 sparks (need to turn off the optical source)
3	Lens maintenance	6 months or 600 sparks (the optical source needs to be turned off, and need spectral line calibration after completion)

(1) When the instrument is in standby mode or not used for a long time, a sample should be placed on the spark stand to prevent the spark stand from entering the debris;

(2) When turning off the instrument, first turn off the green key and then turn off the red key. When turning on the instrument, first turn on the red key and then turn on the green key;

(3) If you need to use the instrument every day, you can only turn off the green button and the argon main valve when you are not using the instrument temporarily, keep the red button open;

(4) If the instrument does not need to work for a long time (more than 5 days), and finally close the argon main valve and the total power supply, please turn on the instrument three hours in advance when using it;

(5) There should be no trachoma or small holes in the preparation of the sample, the surface must be flat, and the spark pores can be completely covered. The surface of the sample should not be touched by hand, so as not to affect the data results;

(6)When the argon gas in the standard 40L argon cylinder is only 1Mpa, the argon gas should be replaced in time to avoid contamination of the argon cylinder.

(7) After each sample is sparked, the electrode is cleaned with an electrode brush.

6.2 Quartz plane mirror cleaning

Step 1 Turn off the optical source key and main power key, and unscrew the two hexagon socket screws on the spark stand of the spark gun, as shown in Figure 6-1:

Figure 6-1 Loosen the fixing screws

Step 2 Remove the spark stand panel, pay attention to the sealing ring on the panel, and wipe it clean, as shown in Figure 6-2:

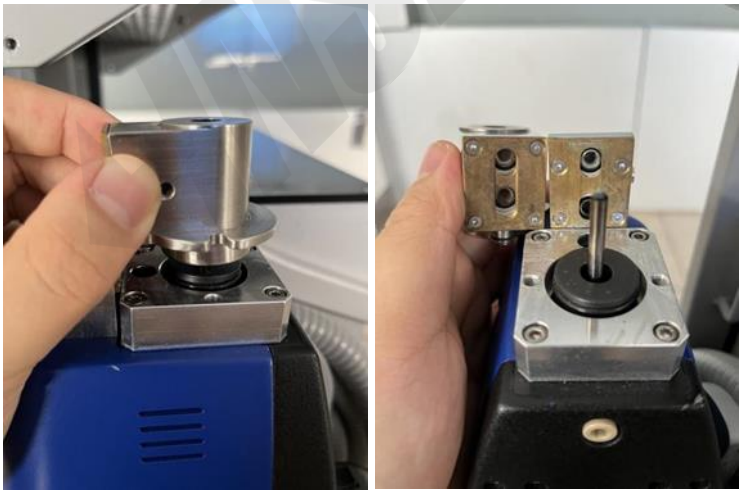


Figure 6-2 Remove the spark stand panel and clean it

Step 3 Use a wrench to open the lens cover and clean the quartz plane mirror, as shown in Figure 6-3:

Figure 6-3 Install the spark stand

Step 4 Prepare absolute ethanol with a purity of more than 99% and a purified cotton swab, and use the purified cotton swab to dip in the absolute ethanol solution to clean the dirt on the quartz flat mirror and sealing ring, as shown in Figure 6-4:

Figure 6-4 Cleaning the quartz flat mirror

Step 5 After cleaning is complete, use tweezers to install all parts into their original positions.

Warning

- Don’t use too much absolute ethanol to wipe the lens to avoid melting the fixing glue around the lens;
- The lens is made of quartz. Do not use hard objects (never use metal tweezers to hold cotton), to avoid scratching the lens surface;
- After wiping the lens, "spectral line calibration" must be performed. For details, see **4.3 Spectral Line Calibration**.

6.3 Check spark stand clearance

Step 1 Turn off the optical source key and main power key, and use a screwdriver to unscrew the hexagon socket screw in front of the adjustment hole, as shown in Figure 6-5:

Figure 6-5 unscrew

Step 2 Use a small hex wrench to loosen the screw fixing the tungsten electrode from the adjustment hole, as shown in Figure 6-6:

Figure 6-6 Adjustment tungsten electrode

Step 3 Use a 3.4mm spacing gauge to cover the spark hole (the other end of the sample pressing bar), loosen the electrode fixing screw on the left side of the spark stand, and then use the spacing gauge to press the electrode until the spacing gauge is tightly against the surface of the spark stand. The protruding part of the spacing gauge should be completely placed into the hole on the spark stand, and then the electrode fixing screws can be tightened, as shown in Figure 6-7:

Figure 6-7 Adjustment position

Step 4 Install the screw of the adjustment hole.

Chapter 7 Common troubleshooting

7.1 Data instability

Heal to keep temperature constant for over half an hour;

Whether the argon gas meets the standard;

Whether the sample grinding meets the standard;

The spark point cannot be repeated;

Ensure that there is no optical leakage when the sample is sparked;

Whether the pollutants in the spark stand need to be cleaned;

Whether the lens has not been cleaned for a long time;

Ensure the spectral line calibration, optical intensity standardization and control sample calibration are done accurately.

7.2 Unable to open software

Ensure that the correct analytical procedures are used;

Check the wrong information, reload analyzing environment;

If the software fails to start due to data loss, you can use backup software. The common reason is that the curve model is damaged due to sudden loss of conductance.

Whether to open the software repeatedly;

Make sure the computer's IP address is set properly.

7.3 Interference problem

Whether to use the instrument while charging.

7.4 Abnormal displays on the software operation interface

7.4.1 "Instrument not connected" alarm prompt

Check whether the network cable of the instrument is normal;

Check that the network icon in the lower right corner of the computer stand is an exclamation mark;

Check that the computer IP address is set correctly.

7.4.2 "Exception occurred in equipment: trigger timeout" alarm prompt

Turn off the main power of the instrument for one minute and turn the instrument on again.

7.5 The instrument status bar displays abnormally (red progress bar)

Including excessive temperature in the optical chamber, abnormal environment of the temperature control board, soft reset of the Ethernet chip, insufficient argon gas pressure, abnormal reference voltage of the temperature control board, abnormal reading and writing of the FPGA memory, abnormal communication between the CPU and the temperature control board, and abnormal communication between the CPU and the optical source module, fatigue optical abnormalities, fatigue optical feedback abnormalities, etc. Problems need to be investigated according to the actual situation, or solved with the help of relevant communication personnel.