



兰州大学西部环境教育部重点实验室

电感耦合等离子质谱仪ICPMS 培训和操作使用说明手册

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特别声明

本材料所列出的有关仪器的操作方法和实验步骤，仅用于西部环境教育部重点实验室内部学生上机前的培训材料，不作为同类仪器操作的指导教程，任何单位或个人不得擅自转载或发表，利用本材料操作仪器发生的人身伤害和仪器损坏问题，本实验室和作者本人不承担任何责任，特此声明。



目录

- 基本介绍
- 工作原理
- 外观结构示意图
- 操作步骤



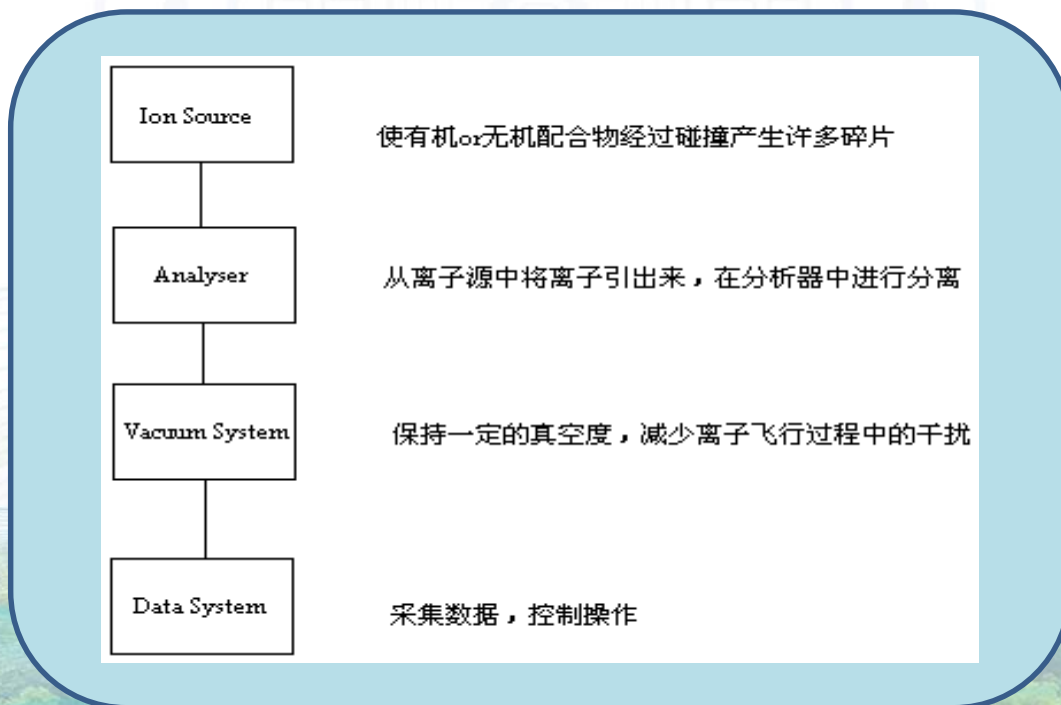
基本介绍

- 中文名称：电感耦合等离子质谱仪
- 英文名称：Inductively Coupled Plasma Mass Spectrometer
- 所属分支实验室：地球化学实验室
- 型号：7700X
- 价值：120万元
- 制造商：安捷伦
- 仪器功能：快速同时测定样品中几十种无机痕量元素
- 预约类型：提前预约
- 仪器位置：兰州大学祁连堂602室



工作原理

使样品通过离子源离子化，形成离子流，通过接口进入真空系统，在离子镜中，负离子、中性粒子以及光子被拦截，而正离子正常通过，并且达到聚焦的效果。在分析器中，仪器通过改变分析器参数的设置，仅使我们感兴趣的核质比的元素离子顺利通过并且进入检测器，在检测器中对进入的离子个数进行计数，得到最终的元素的含量。

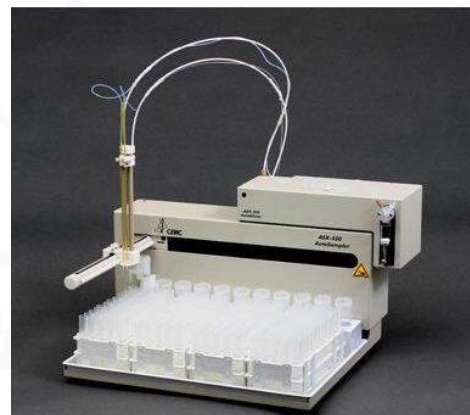




外观结构示意图



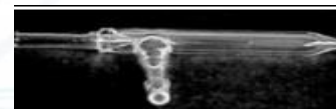
7700X ICPMS主机



ICPMS自动进样器



石英炬管

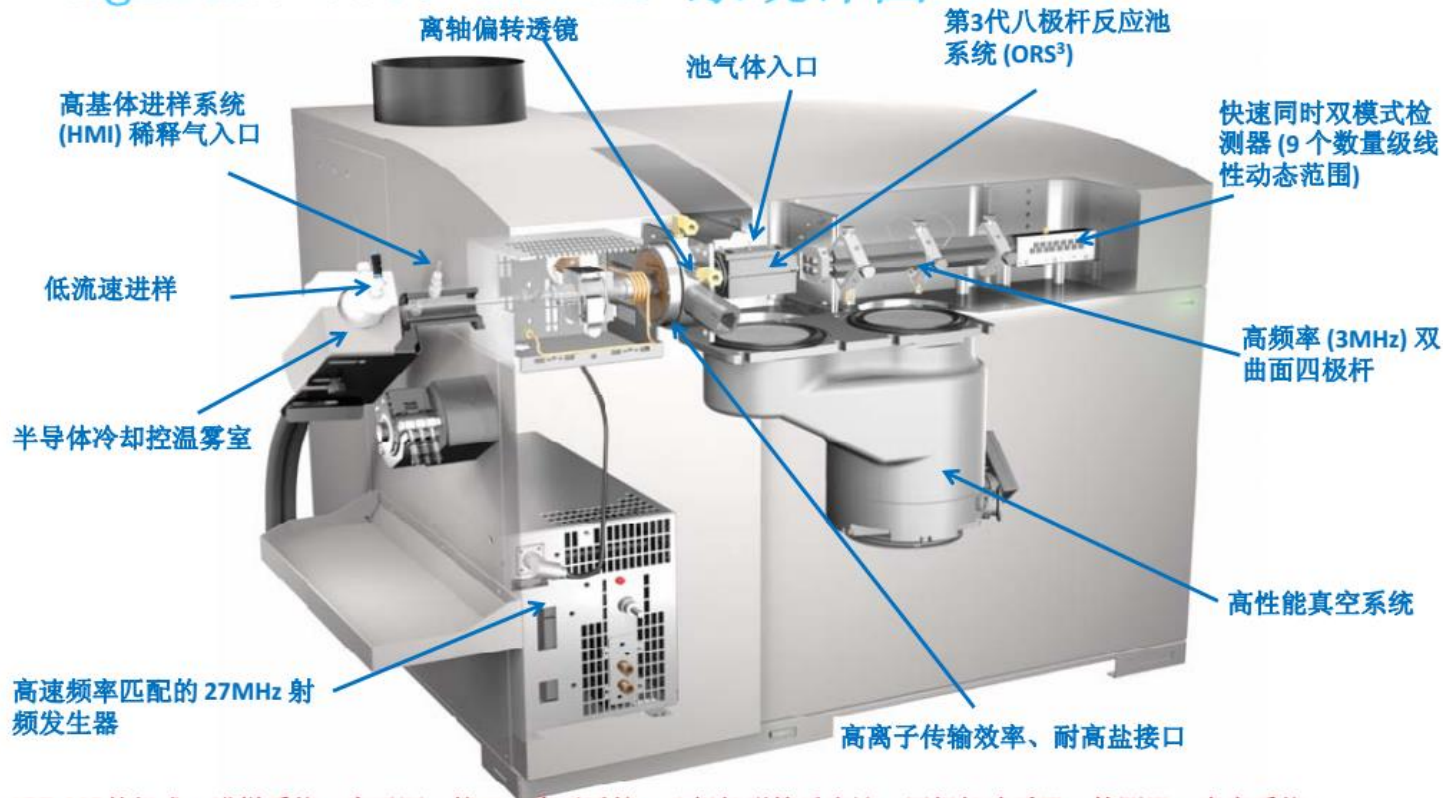


同心雾化器



外观结构示意图

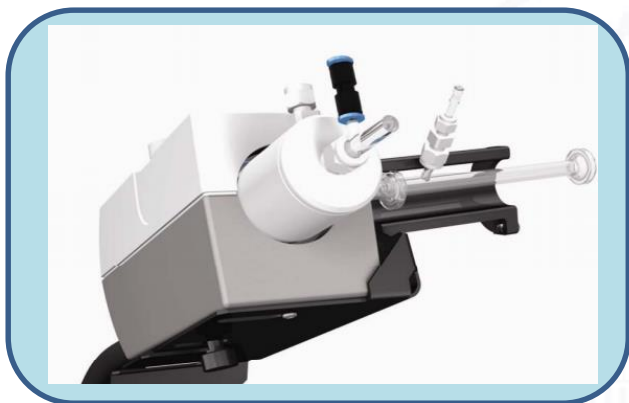
Agilent 7700 ICP-MS 系统详图



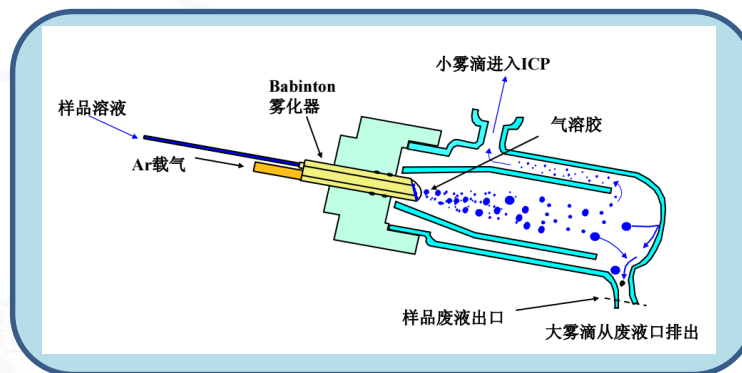
ICP-MS的组成：进样系统、离子源、接口、离子透镜、八极杆碰撞反应池、四极杆滤质器、检测器、真空系统



外观结构示意图



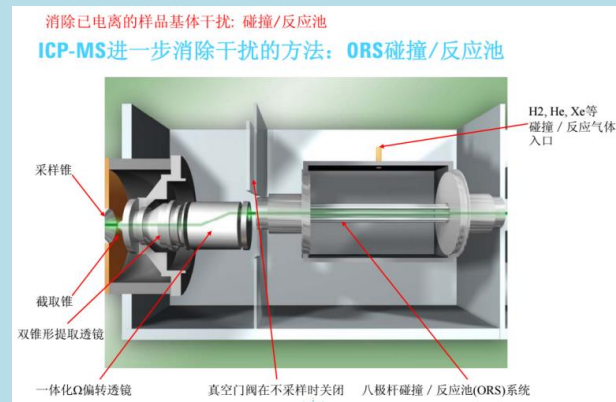
进样系统 HMI高基体系统



同心雾化器



采样锥孔径: 1mm 截取锥孔径: 0.4mm



碰撞/反应池



外观结构示意图



新型双模式检测器



双通道模式电子倍增检测器(脉冲模式和模拟模式)

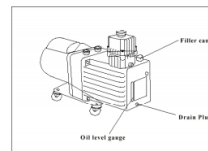
检测低含量信号时, 检测器使用脉冲模式, 此时直接记录的是撞击到检测器的总离子数量, 从而给出每秒计数值(cps)。如果离子撞击到检测器的量大于每秒一百万个(1,000,000), 则检测器会自动使用模拟模式进行检测, 以保护检测器, 延长其使用寿命。此时测量的是检测器中间部分电子流产生的电势, 并给出模拟电压, 最后将电压转换成数字信号, 给出cps值。

真空系统

(G31XXB with split turbo)

接口Interface

18 m³/hour 机械泵
• 典型操作压力 350 Pa (2.6 torr)



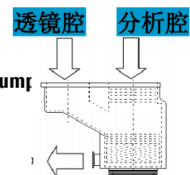
透镜腔Intermediate chamber

170 L/sec Split分子涡轮泵主进口 main inlet of Split turbo molecular pump
• 典型操作压力 6×10^{-2} Pa (3.7×10^{-4} torr)

分析腔Analyzer/detector chamber

155 L/sec Split分子涡轮泵侧进口 side inlet of Split turbo molecular pump
• 典型操作压力 3×10^{-4} Pa (3.7×10^{-6} torr)

好的真空意味:
更低的噪音
更好的灵敏度和峰形





操作步骤


开机:

1. 开PC 显示器、打印机。
2. 开PC 主机。(password: 3000hanover)
3. 开ICP-MS 7700 电源开关。（仪器背后总电源及前面板左下角的电源开关）



操作步骤



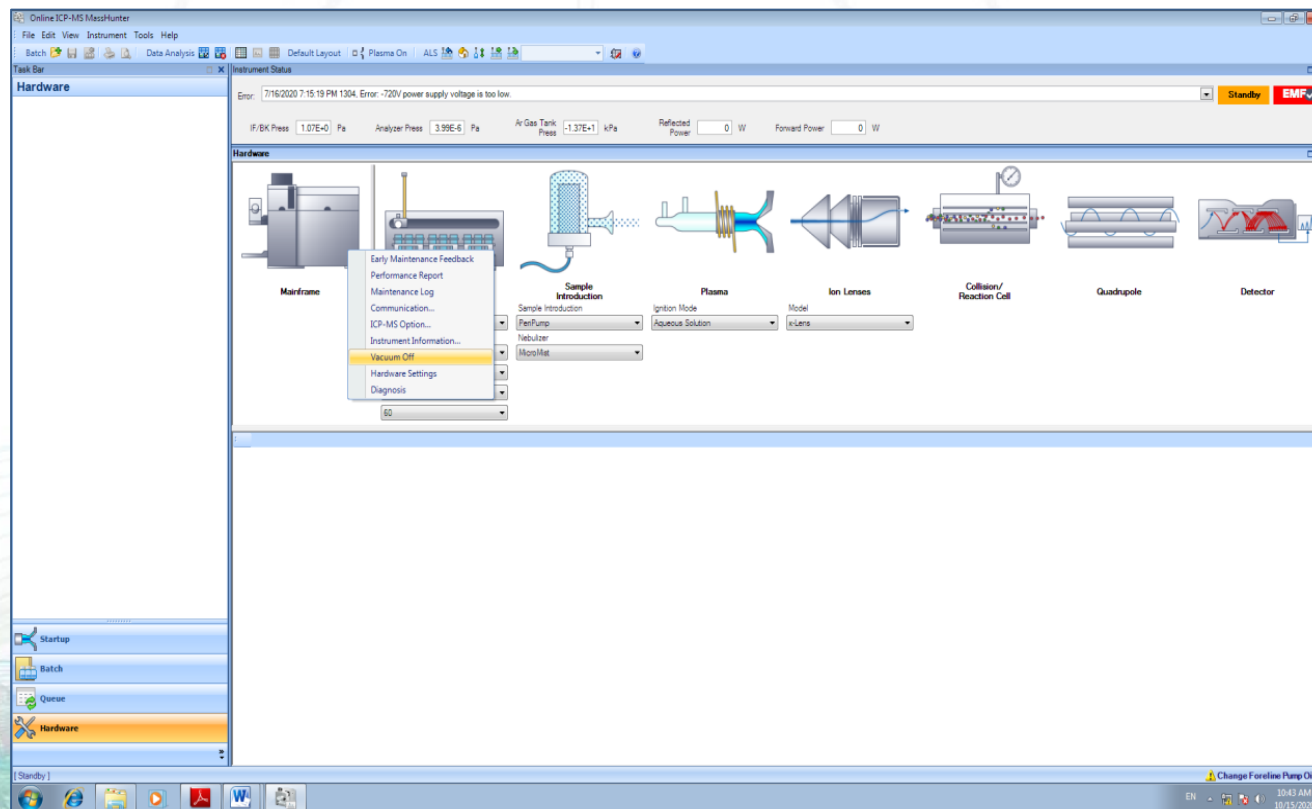
4. 双击桌面的“ICP-MS Instrument control”图标  进入 MassHunter，如下图所示：





操作步骤

5. 如图所示，点击硬件Hardframe右键，从“Vacuum”菜单中选择“vacuum on”，抽真空，仪器由Shutdown状态向Standby状态转换。

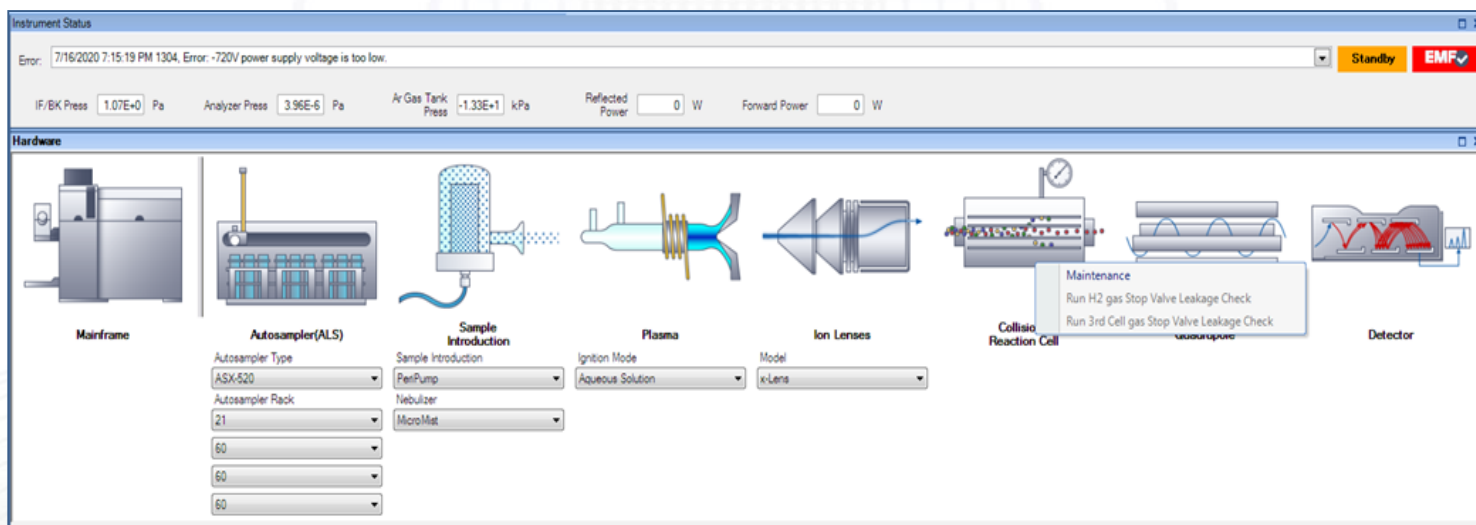




操作步骤



6. He气吹扫：仪器状态显示Standby，如使用碰撞反应池，点击图标碰撞反应池Collision/Reaction Cell右键，选择Maintenance。



The screenshot displays the instrument's software interface. At the top, the 'Instrument Status' window shows an error message: '7/16/2020 7:15:19 PM 1304, Error: -720V power supply voltage is too low.' The status is 'Standby' and 'EMF' is checked. Below this, various pressure and power readings are shown: IF/BK Press (1.07E+0 Pa), Analyzer Press (3.96E-6 Pa), Ar Gas Tank Press (-1.33E+1 kPa), Reflected Power (0 W), and Forward Power (0 W).

The 'Hardware' section shows a schematic diagram of the instrument components. A context menu is open over the 'Collision Reaction Cell' component, listing maintenance tasks: 'Maintenance', 'Run H2 gas Stop Valve Leakage Check', and 'Run 3rd Cell gas Stop Valve Leakage Check'.

Below the schematic, configuration options are listed for several components:


- Autosampler(ALS):** Autosampler Type: ASX-520; Autosampler Rack: 21; 60; 60; 60.
- Sample Introduction:** Sample Introduction: PerPump; Nebulizer: MicroMat.
- Plasma:** Ignition Mode: Aqueous Solution.
- Ion Lenses:** Model: k-Lens.



操作步骤



He气吹扫:

在下图中He Gas flow Rate一栏设置所需反应气流量2-5ml/min，打开旁通阀  “Open bypass valve”，进行反应气气路吹扫。如果每天使用反应池吹扫5-10min即可；如长期不用使用前建议提前2ml/min吹扫过夜。

The screenshot shows the 'Hardware' status window of the instrument control software. It displays various parameters and their values:


Parameter	Output (Manual Control)	Input (Meter Reading and Status)	Unit
H ₂ Gas Flow Rate			mL/min
He Gas Flow Rate	0.00	0.13	mL/min
3rd Cell Gas Flow Rate			%
IF/BK Pressure		1.07E+0	Pa
Analyzer Pressure		3.96E-6	Pa
TMP Rotation		100.0	%
TMP Current		0.450	A

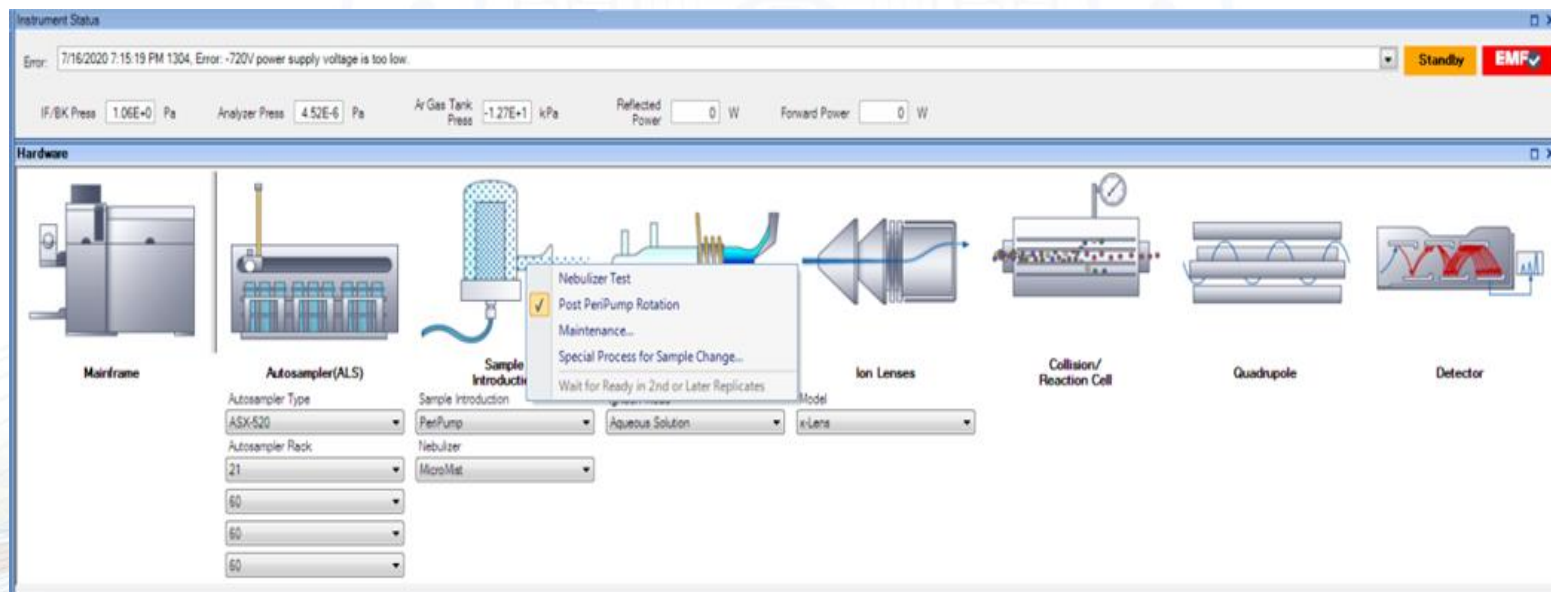
The interface also shows a schematic diagram of the instrument components, including the Autosampler (ALS), Sample Introduction, Plasma, Ion Lenses, Collision/Reaction Cell, Quadrupole, and Detector. The 'He Gas Flow Rate' parameter is highlighted in the table.



操作步骤



7. 氩气吹扫：仪器状态转换为“Standby”状态后，打开氩气（0.7Mpa），循环水、排风。清空废液桶，卡上蠕动泵管，样品管必须放入DIW (去离子水)中，若连有内标管，亦放入DIW中。点击图标Sample introduction  右键，选择Maintenance。





操作步骤



设置氩气吹扫流量：选择Open Ar valve, Enable Temperature, Plasma Gas输入15L/min, Auxiliary Gas输入1L/min, Carrier Gas输入1L/min, Spray Chamber Temp输入2°C, Nebulizer Pump输入0.1rps, 点击Enter。检查确认进样管、内标管是否插入液体，蠕动泵上固定的进样管、内标管及排废液管排列均匀，工作正常，排液平滑。氩气吹扫5-10分钟后，点击Close。

The screenshot shows the instrument control software interface. At the top, there are status indicators for IF/BK Press (1.06E+0 Pa), Analyzer Press (4.48E-6 Pa), Ar Gas Tank Press (-1.23E+1 kPa), Reflected Power (0 W), and Forward Power (0 W). The main window displays a hardware diagram with components like Mainframe, Collision/Reaction Cell, Quadrupole, and Detector. A 'Sample Introduction Maintenance' dialog box is open, showing manual control and meter reading/status tables.

Output (Manual Control)			Input (Meter Reading and Status)		
Parameter	Value	Unit	Parameter	Value	Unit
Open Ar Gas Valve	<input type="checkbox"/>		Ar Gas Tank Press	-12.3	kPa
Open Option Gas Valv	<input checked="" type="checkbox"/>		Option Gas Tank Pr		kPa
Select Gas	Dilution		Carrier Gas Pressur	-5	kPa
Enable Temperature C	<input type="checkbox"/>		Plasma Gas	0.0	L/min
Plasma Gas	0.00	L/min	Auxiliary Gas	0.00	L/min
Auxiliary Gas	0.000	L/min	Carrier Gas	0.00	L/min
Carrier Gas	0.000	L/min	Makeup/Dilution Ga	0.00	L/min
Makeup/Dilution Gas	0.000	L/min	Option Gas		%
Option Gas		%	Spray Chamber Te	21.27	°C
Spray Chamber Temp	2	°C			

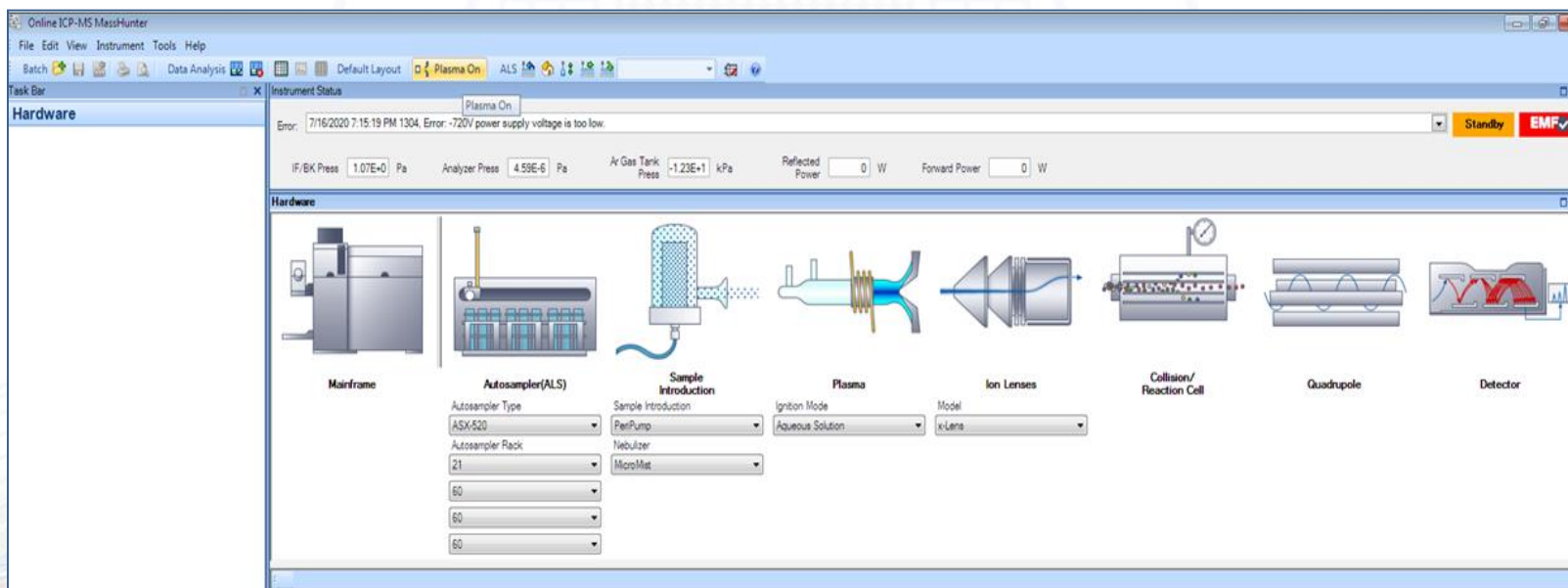
Below the tables, there are sections for 'PeriPump' and 'Torch Position'. The 'PeriPump' table shows 'Nebulizer Pump' at 0.00 rps. The 'Torch Position' section has 'Initialize' and 'Maintenance' buttons. At the bottom of the dialog box are 'Enter' and 'Close' buttons.



操作步骤



8. 从Instrument control界面选择Plasma菜单中的Plasma On或单击下图所示的点火图标进行点火，仪器由Standby 状态向Analysis状态转换。



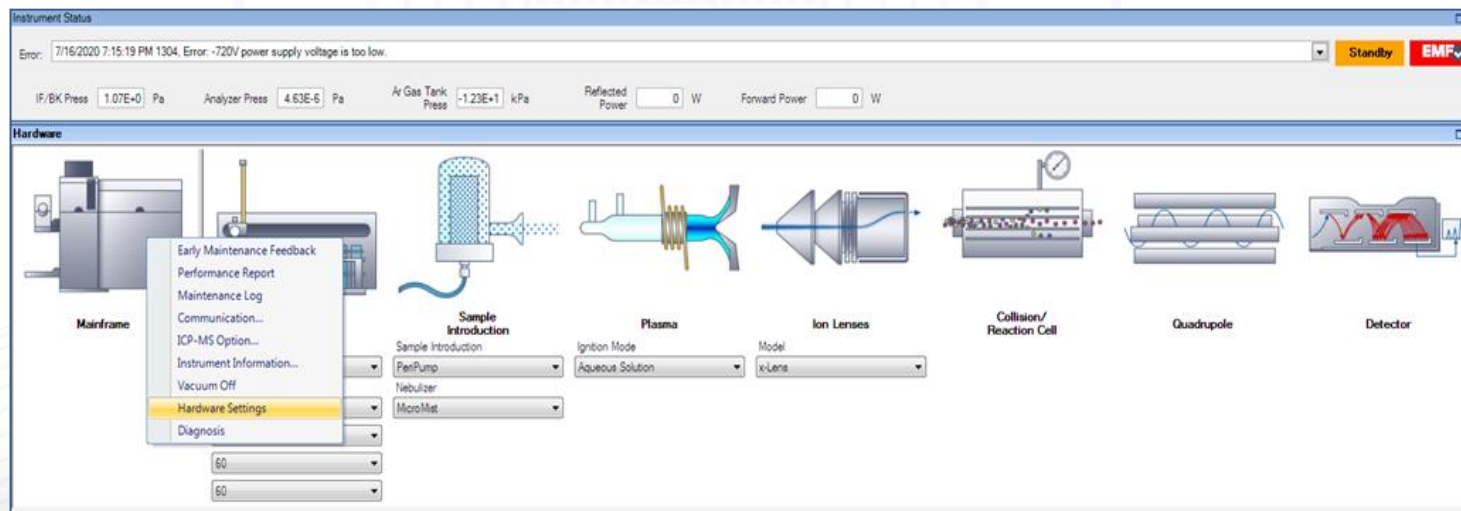


操作步骤



性能调谐（硬件优化）：

1. 点击硬件Hardframe右键，选择Hardware Settings，选择仪器性能调谐的内容。





操作步骤



Standard Lenses, Tune Resolution/Axis, Performance Report每次都选择；进样系统（如矩管、样品锥、截取锥）更换后，选择Torch Axis和Plasma Correction；若长时间未测样，选择EM调节功率。选择完毕，点击Add to Queue。将进样管放入1 ppb 调谐液中，同时将内标管放入DIW中。点火后，仪器预热（约15-30分钟）完成，程序自动开始性能调谐。

The screenshot displays the 'Hardware' settings page in the MassHunter software. At the top, there is an error message: 'Error: 7/16/2020 7:15:19 PM 1304: Error: -220 power supply voltage is too low.' Below this, the 'Hardware' section is divided into several components: Mainframe, Autosampler (ALS), Sample Introduction, Plasma, Ion Lenses, Collision/Reaction Cell, Quadrupole, and Detector. Each component has specific settings, such as 'Autosampler Type' set to '6300-000' and 'Sample Introduction' set to 'Perfume'. A table at the bottom lists 'Monitored Masses' with columns for 'Hardware Settings', 'On', 'Vial #', 'Monitored Masses', and 'PerfPump'. The table is populated with various mass values and their corresponding settings.

Hardware Settings	On	Vial #	Monitored Masses	PerfPump
Torch Axis	<input checked="" type="checkbox"/>	1	7 89 205	Set
EM	<input checked="" type="checkbox"/>	1		Set
Plasma Correction	<input checked="" type="checkbox"/>	1		Set
Standard Lenses Tune	<input checked="" type="checkbox"/>	1	7 89 205	Set
Resolution/Axis	<input checked="" type="checkbox"/>	1	7 89 205	Set
Performance Report	<input checked="" type="checkbox"/>	1	Oxide: 140 Doubly Charged: 140	Set
Full Spectrum	<input checked="" type="checkbox"/>	1		Set
PIA Factor	<input checked="" type="checkbox"/>	1	24 44 45 51 52 55 56 59 60 63 66 89 90 103 111	Set



操作步骤



2. 性能调谐报告

在Queue中可以看到性能调谐的实时进展，性能调谐完成后，点击Hardframe右键，选择Performance Report。

Hardware Settings	On	Vial #	Monitored Masses	PenPump
Torch Axis	<input type="checkbox"/>	1	7 89 205	Set
EM	<input type="checkbox"/>	1		Set
Plasma Correction	<input type="checkbox"/>	1		Set
Standard Lenses Tune	<input type="checkbox"/>	1	7 89 205	Set
Resolution/Axis	<input checked="" type="checkbox"/>	1	7 89 205	Set
Performance Report	<input checked="" type="checkbox"/>	1	Oxide 140; Doubly Charged 140	Set
Full Spectrum	<input type="checkbox"/>	1		Set
PIA Factor	<input type="checkbox"/>	1	24 44 45 51 52 55 56 59 60 63 66 89 90 103 111	Set



操作步骤



性能调谐报告 从Create Data一栏中根据本次性能调谐的时间，就可以看到本次性能调谐的数据报告。

Created Date	Sensitivity			Background			Standard Tune Parameters - Ion Lenses		
	Channel 1 Count	Channel 2 Count	Channel 3 Count	Channel 1 Count	Channel 2 Count	Channel 3 Count	Extract 1	Extract 2	Omega Bias
7/16/2020 11:14:02 AM	1270.01	10402.25	9025.79	1.20	1.05	4.00	0 V	-140 V	-70 V
7/16/2020 10:27:19 AM	1442.27	11277.68	9244.99	1.50	1.25	3.60	0 V	-140 V	-70 V
1/6/2020 1:28:59 PM	1124.24	9805.91	9244.87	1.10	1.05	3.55	0 V	-145 V	-80 V
9/30/2019 2:28:34 PM	8436.12	24098.95	19163.81	1.95	2.15	7.60	0 V	-145 V	-80 V
9/30/2019 11:40:02 AM	7728.37	20827.74	17255.57	1.35	1.55	6.00	0 V	-145 V	-80 V
9/30/2019 10:50:37 AM	5249.58	21483.31	14910.13	2.15	1.60	6.75	0 V	-145 V	-80 V
9/30/2019 10:37:33 AM	5144.10	21131.26	14654.87	3.45	2.05	7.15	0 V	-145 V	-80 V
9/30/2019 10:24:13 AM	100.16	59.16	49.25	2.50	2.55	6.05	0 V	-145 V	-80 V
7/2/2019 10:10:35 AM	5665.60	37354.25	23553.66	3.00	2.90	10.60	0 V	-145 V	-80 V
12/11/2018 10:50:23 AM	6243.11	38031.28	23891.06	2.80	2.35	11.90	0 V	-145 V	-80 V
12/12/2017 10:12:56 AM	9605.66	35958.30	23217.10	2.85	2.75	10.90	0 V	-145 V	-80 V
10/20/2017 10:40:15 AM	7743.07	30280.08	20684.92	2.10	2.10	11.55	0 V	-145 V	-80 V
9/12/2017 3:48:01 PM	460.37	2857.57	3488.28	1.00	0.45	0.50	0 V	-145 V	-80 V
9/12/2017 3:03:58 PM	1785.37	5212.09	4861.55	1.00	1.15	2.30	0 V	-150 V	-90 V
05/22/2017 3:43:10 PM	1162.21	2418.07	2767.26	0.85	1.05	1.80	0 V	-100 V	-60 V



操作步骤



参考信号范围如下：

项目	范围
质量轴	Li (7) $\pm 0.1 \text{ amu}$
	Y (89) $\pm 0.1 \text{ amu}$
	Tl (205) $\pm 0.1 \text{ amu}$
分辨率(W 10%)	0.65-0.80amu
Sensitivity灵敏度(0.1sec, 1ppb)	Li ≥ 3000
	Y ≥ 10000
	Tl ≥ 6000
Oxide氧化物(156/140)	$\leq 2\%$
Doubly Charged双电荷(70/140)	$\leq 3.0\%$



操作步骤

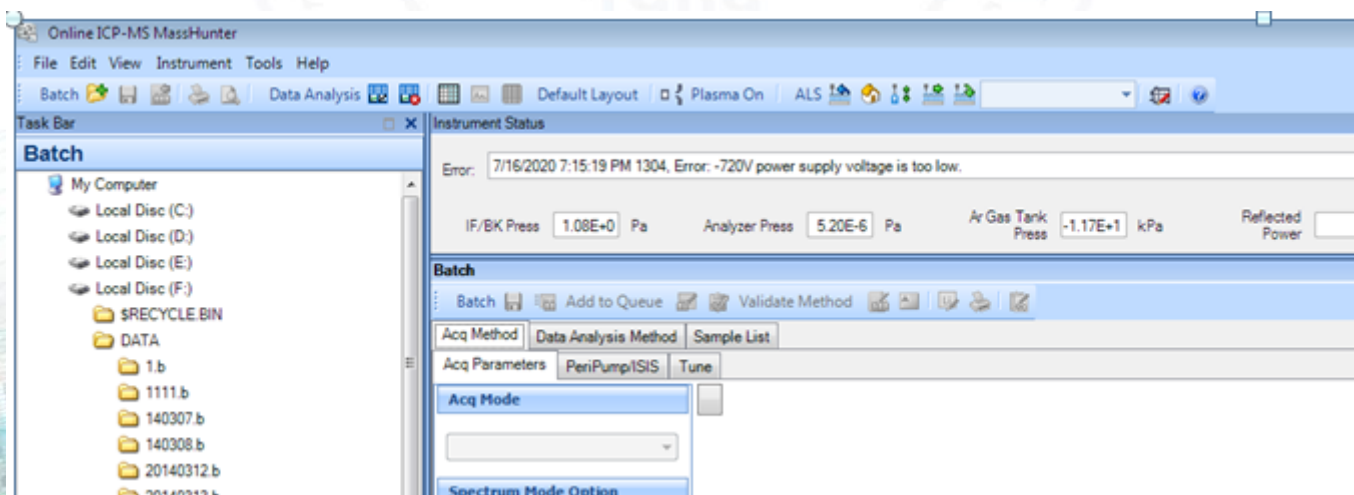


采集方法的建立:

性能调谐（性能优化）成功后，就可以开始测试批处理了。

批处理编辑流程如下：点击批处理图标Batch，进入批处理界面。

- 点击File，选择New Batch folder, Present Method, Select, 选择RoHS，点击OK，批处理生成。（RoHS 适用于高基体的环境样品）
- 在New Batch Name中输入本次实验的名称，点击Create，开始编辑批处理。





操作步骤



➤ 在Acq method里选择Tune,点右键，选择Configure,删除不需要的模式，只剩He模式。

The screenshot shows the 'Tune' method configuration window in the MassHunter software. The 'Plasma Mode' is set to 'Low Matrix'. The 'Cell' section is expanded, showing 'Use Gas' settings for He, H2, and 3rd Gas Flow. The 'Energy Discrimination' is set to 3.0. A data table is visible at the bottom right of the window.

Color	Display	Mass	Range	Count	Avg Count	RSD [%]
Blue	<input checked="" type="checkbox"/>	7	100	0	0.0	0.00
Green	<input checked="" type="checkbox"/>	89	100	0	0.0	0.00
Red	<input checked="" type="checkbox"/>	205	100	0	0.0	0.00
Yellow	<input checked="" type="checkbox"/>	51	100	0	0.0	0.00
Purple	<input checked="" type="checkbox"/>	59	100	0	0.0	0.00
Black	<input checked="" type="checkbox"/>	78	100	0	0.0	0.00



操作步骤



➤ 在Acq method里，Peak patteen输入 3points。

The screenshot shows the 'Acq Method' configuration window in the ICP-MS software. The 'Peak Pattern' is set to '3 Points'. The 'Total Acq Time' is 29.740 sec. The 'Spectrum Mode Options' table is as follows:

Mass	Element Name	Monitor	Inlet Time (Mass) (sec)
51	V	<input checked="" type="checkbox"/>	0.30
52	Cr	<input type="checkbox"/>	0.30
55	Mn	<input checked="" type="checkbox"/>	0.30
60	Ni	<input type="checkbox"/>	0.30
63	Cu	<input type="checkbox"/>	0.30
66	Zn	<input type="checkbox"/>	0.30
88	Y	<input checked="" type="checkbox"/>	0.30
103	Rh	<input type="checkbox"/>	0.30
111	Cd	<input type="checkbox"/>	0.30
157	Gd	<input type="checkbox"/>	0.30
195	Re	<input type="checkbox"/>	0.30
208	Pb	<input type="checkbox"/>	0.30



操作步骤



- 点击Elements Name右键，选择Select Elements，跳出元素周期表对话框，Clear all，选择需要测试的元素和内标元素。Correction Equations校正公式只针对nogas模式，He模式检测时，需要取消四个校正公式。

The screenshot displays the Online ICP-MS MassHunter software interface. The main window shows a list of elements with their masses and monitor settings. A context menu is open over the 'Select Elements' option. An inset window shows the 'Select Elements on Periodic Table' dialog, where a grid of elements is displayed, and a list of selected elements (Ca, Ti, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Kr, Rb, Sr, Y, Zr, Nb, Mo, Tc, Ru, Rh, Pd, Ag, Cd, In, Sn, Sb, Te, I, Xe, Cs, Ba, La, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg, Tl, Pb, Bi, Po, At, Rn, Fr, Ra, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr) is shown on the right. The 'Correction Equations' section at the bottom of the dialog shows 3 equations selected.



操作步骤



- 点击OK后，在Integ Time/Mass sec输入元素扫描时间0.30s，某些电离能较大的元素，如Hg，扫描时间要长一些。
- 在PeriPump/ISIS里需要对自动进样器中清洗位置定义。

Online ICP-MS MassHunter - 20200716 15:19 PM 1304. Error: -720V power supply voltage is too low.

Batch

Acq Parameters | PeriPump/ISIS | Tune

Sample Introduction:	Time [sec]	Speed [rpm]	Nebulizer Pump	Vial#
Pre Run				
Sample Uptake	30	0.3		Sample
Stabilize	40		Tune Parameter	Sample
Acquisition				
Speed			Tune Parameter	Sample
Post Run				
Probe Rinse (Sample)	10	0.3		Rinse Port
Probe Rinse (Std)	10			Rinse Port
Rinse 1	60	0.1	2	
Probe Rinse 1	0			Rinse Port
Rinse 2	0	0		
Probe Rinse 2	0			Rinse Port
Rinse 3	0	0		
Probe Rinse 3	0			Rinse Port

Intelligent Rinse

Preemptive Rinse

Start rinse before acquisition complete: 40 sec

Move to the next rinse step at acquisition complete



操作步骤



➤ 数据分析:

在Data Analysis Method菜单下，Basic information选择FullQuant Analysis，Analyte中，删除已有的元素列表，点击Load List From Acquisition Method，从采集方法中调出前面所选的元素。在Analyte/ISID里标出元素的性质（Analyte/ISID）。

	Tune Mode	Mass	Name	Analyte/ISID
1	1: He	44	Ca	Analyte
2	1: He	45	Sc	Analyte
3	1: He	47	Ti	Analyte
4	1: He	55	Mn	Analyte
5	1: He	56	Fe	Analyte
6	1: He	59	Co	Analyte
7	1: He	60	Ni	Analyte
8	1: He	63	Cu	Analyte
9	1: He	66	Zn	Analyte
10	1: He	75	As	Analyte
11	1: He	85	Rb	Analyte
12	1: He	88	Sr	Analyte
13	1: He	103	Rh	ISTD
14	1: He	111	Cd	Analyte
15	1: He	137	Ba	Analyte
16	1: He	185	Re	ISTD
17	1: He	208	Pb	Analyte
18	1: He	238	U	Analyte



操作步骤



➤ 数据分析:

在Full Quant中, Analyte里, ISTD一栏要选择最近质量数的内标元素。

The screenshot displays the 'Full Quant' analysis window in MassHunter. The 'Analyte' table lists various elements with their corresponding ISTD (Internal Standard) values. The 'ISTD' column is highlighted, and the 'ISTD' selection options are visible below the table.

Tune Mode	Mass	Name	Curve Fit	Origin	ISTD	Min Conc	Units	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Level 11	Level 12	Level 13	Level 14	Level 15	Level 16	Level 17	Lu
1	He	45	Sc	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780	0	478	4948	49806				
2	He	55	Mn	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780								
3	He	59	Co	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780								
4	He	60	Ni	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780								
5	He	63	Cu	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780								
6	He	66	Zn	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780								
7	He	75	As	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780								
8	He	111	Cd	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780								
9	He	208	Pb	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780								
10	He	44	Ca	Linear	Blank offset	103	0	ppt					0	46044	466068	4687752	48780488								
11	He	47	Ti	Linear	Blank offset	103	0	ppt					0	46	466	4688	48780					0	50	519	5271
12	He	56	Fe	Linear	Blank offset	103	0	ppt					0	46044	466068	4687752	48780488								

ISTD Selection Table:

Tune Mode	Mass	Name	Units	
1	He	103	Rh	ppt
2	He	185	Re	ppt



操作步骤



- 在Sample List菜单中，Calibration Standards对话框中，根据测试需要，Sample Type 一栏，输入样品的性质：CalBlk（标准曲线的空白），Calstd（标准曲线中的标准点），FQBlk（待测样品的空白），Sample（待测样品）。Vial#是标准液及待测样品（包括标准和样品空白）在自动进样器中的位置。Level一栏里，根据上一步对标准液的定义，输入对应的Level。

Sample Type	Sample Name	Comment	Vial#	File Name	Replicates	Level	Dilution	Skip
1	Sample	HNO3	2					
2	Sample	HNO3	2					
3	CalBlk	multiBLK	2101			Level 1		
4	CalStd	multi50ppt	2102			Level 2		
5	CalStd	multi500ppt	2103			Level 3		
6	CalStd	multi5ppb	2104			Level 4		
7	Sample	HNO3	2					
8	CalBlk	En-multiBLK	2101			Level 5		
9	CalStd	En-multi50ppt	2106			Level 6		
10	CalStd	En-multi500ppt	2107			Level 7		
11	CalStd	En-multi5ppb	2108			Level 8		
12	CalStd	En-multi50ppb	2109			Level 9		
13	Sample	HNO3	2					
14	CalBlk	REEBLK	2101			Level 10		
15	CalStd	REE500ppt	2111			Level 11		
16	CalStd	REE5ppb	2112			Level 12		
17	CalStd	REE50ppb	2201			Level 13		
18	Sample	HNO3	2					
19	CalBlk	TBLK	2101			Level 14		
20	CalStd	T500ppt	2203			Level 15		
21	CalStd	T500ppb	2204			Level 16		
22	CalStd	T5ppb	2205			Level 17		
23	Sample	HNO3	2					
24	FQBlk	Blank1	3101					
25	Sample	SGH161	3102					
26	Sample	SGH161	3103					
27	Sample	SGH183	3104					
28	Sample	SGH185	3105					



操作步骤



- 在空白处点击右键，跳出对话框，Configure Batch.Acquisition,选择P/A factor adjustment(P/A因子调节)，点击OK。

The screenshot displays the 'Online ICP-MS MassHunter' software interface. The main window shows the 'Batch' configuration page with a 'Sequence Flow' table and a 'Calibration Standards' table. A context menu is open over the 'Batch' table, with 'Configure Batch Acquisition...' selected. A dialog box titled 'Configure Batch Acquisition' is overlaid on the screen, showing options for batch acquisition settings:

- Auto tune before batch
- Print Tune Report
- P/A factor adjustment
- Print batch log at end
- Rinse after batch
- Set Rinse after Batch...

The 'Batch' configuration window includes the following tables:

Acq Method	Data Analysis Method	Sample List							
IR BK Press	1.00E+0 Pa	Analyzer Press	6.13E-6 Pa	Air Gas Tank Press	-1.13E+1 kPa	Reflected Power	0 W	Forward Power	0 W

Block Name	Period	Unit	Reset By
1	Calibration Standards	Calib Standards	
2	Unknown Samples	Unknown Samples	
3	Blank Samples	Blank Samples	

Sample Type	Sample Name	Comment	Val#
1	Sample	HNO3	2
2	Sample	HNO3	2
3	CalBlk	muBLK	2101
4	CalStd	mu450opt	2102
5	CalStd	mu450opt	2103
6	CalStd	mu450opt	2104
7	Sample	HNO3	2
8	CalBlk	En-mu4BLK	2101
9	CalStd	En-mu450opt	2106
10	CalStd	En-mu450opt	2107
11	CalStd	En-mu450opt	2108
12	CalStd	En-mu450opt	2109
13	Sample	HNO3	2
14	CalBlk	REES0opt	2101
15	CalStd	REES0opt	2111
16	CalStd	REES0opt	2112
17	CalStd	REES0opt	2001
18	Sample	HNO3	2
19	CalBlk	TBLK	2101
20	CalStd	T50opt	2203
21	CalStd	T50opt	2204
22	CalStd	T50opt	2205
23	Sample	HNO3	2
	Blank1	Blank1	3101
	SGH161	SGH161	3102
	SGH181	SGH181	3103
	SGH183	SGH183	3104
	SGH185	SGH185	3105



操作步骤



- 点击Validate Method，验证方法是否有错误，方法无误后，点击Add to Queue，开始排队等待测试。

Block Name	Block Type
1 Calibration Standards	Calib Standards
2 Unknown Samples	Unknown Samples
3 Check Samples 1	Check Samples
4 Check Samples 2	Check Samples
5 Blank Samples	Blank Samples

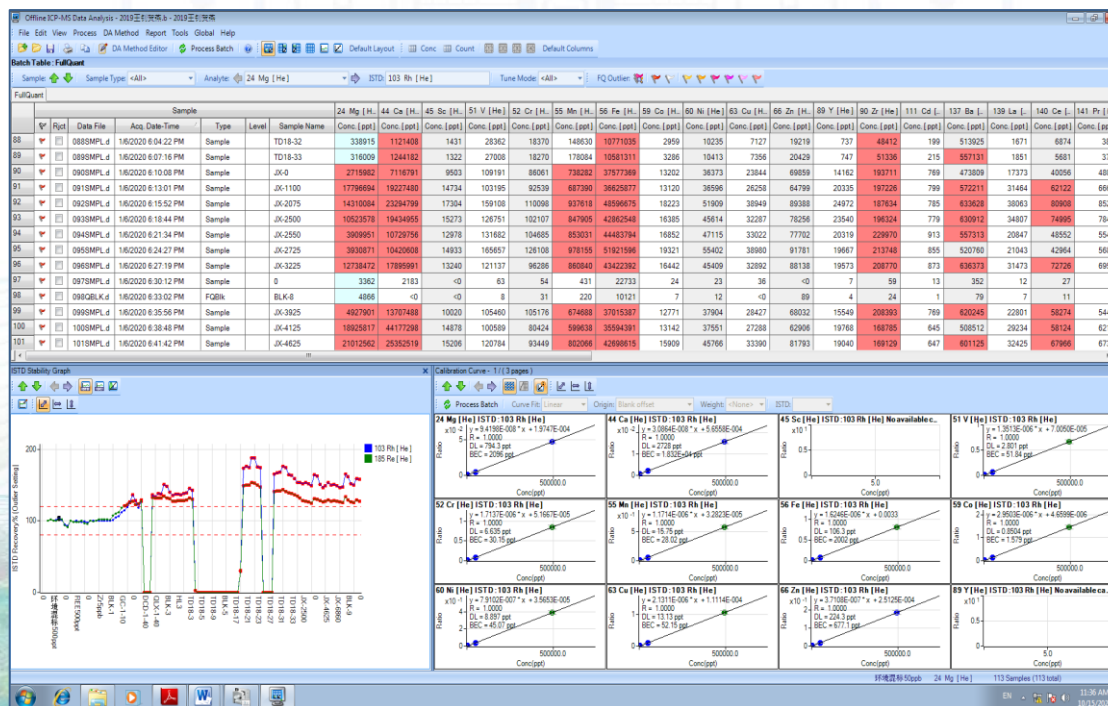
Sample Type	Sample Name	Comment
1 Sample	HNO3	
2 Sample	HNO3	
3 CalBlk	multBLK	
4 CalStd	mult50ppt	
5 CalStd	mult500ppt	
6 CalStd	mult5ppb	
7 Sample	HNO3	
8 CalBlk	En-multBLK	
9 CalStd	En-mult50ppt	
10 CalStd	En-mult500ppt	
11 CalStd	En-mult5ppb	
12 CalStd	En-mult50ppb	
13 Sample	HNO3	
14 CalBlk	REEBLK	
15 CalStd	REE500ppt	
16 CalStd	REE5ppb	
17 CalStd	REE50ppb	
18 Sample	HNO3	
19 CalBlk	TIBLK	
20 CalStd	TIF50ppt	



操作步骤



- 批处理程序开始工作后，会自动进行优化调谐及P/A因子调节，此时应提前做好1ppb的调谐液，此步骤结束，立即将内标管插入1ppm的内标溶液，进入标准曲线测试。
- 自动优化调谐及P/A因子调节结束，批处理开始进行，在左侧的Batch和Queue中都可以看到程序采集的进度，此时，工作站数据库在线分析打开，实时显示测试的标线、样品数据结果。





操作步骤

- 批处理工作时，应随时在Batch和Queue中检查样品的位置和编号是否正确，如果异常，立即暂停实验，修改后再继续。

关机

- 批处理样品采集完成后，先用5% HNO_3 冲洗系统5Min，再用DIW 冲洗系统5Min。
- 点击等离子体熄火图标，仪器由分析状态向待机状态转换。等到仪器进入待机状态，把进样管和内标管放入DIW中，打开蠕动泵，松开进样管、内标管、废液管，依次关闭自动进样器，冷却循环水，氩气，氦气。实验结束。