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1 Starting the ECR ion source (ECRIS)

1. Check before switching on
   - source pressure $p < 10^{-7}$
   - chamber pressure $p < 10^{-7}$
2. Set gas (eg. Argon) pressure on 0.5 bar
3. Close inner and outer shield (high voltage)
4. Switch on Mains (See figure 1

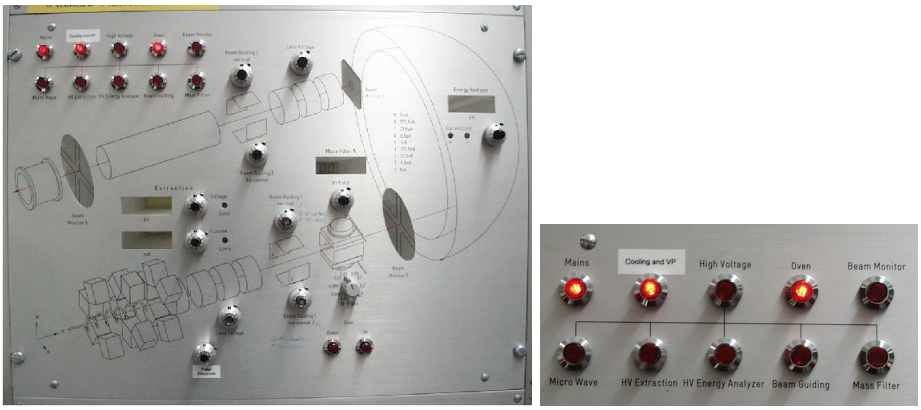

Figure 1: Ion Optics Control

5. Switch on High Voltage
6. Open Gas Valve (See figure 2)

Figure 2: Valve for ion gas

   - Set Mode switch on CTRL
   - pressure should be between 10^{-6} and $5 \cdot 10^{-6}$ bar
7. Switch on Microwave
8. Switch on HV Extraction
9. Switch on HV Analyzer

10. Switch on Beam Guiding
11. Switch on Massfilter (Control that B-Field is 0!)
12. Switch on Beam Monitor
13. Set Extraction on V=3 kV, I=0 A, Energy analyzer on 440 V
14. Switch on Microwave (see figure 3)
    - Check that all shields are set
    - Power on
    - Turn Set Valve until Plasma starts burning
      pressure shouldn't arise more than to $5 \cdot 10^{-6}$

Figure 3: Microwave control

2 Switching off ECRIS

1. Close Gate valve to Instrument Chamber (`Gate valve`) (See figure 7)
2. Switch off Oven
3. Switch off Power Micro Wave, close Valve (`Mode close`) (See figures 3 and 2)
4. Turn back B-Field Current
5. Turn back E-Field of Wienfilter
6. Switch off Beam monitor
7. Switch off Mass filter
8. Switch off Beam guiding
9. Switch off HV Analyzer
10. Switch off HV Extraction
11. Switch off Micro wave
12. Check if Gas Valve is closed (pressure below 10^{-6} mbar)
13. Switch off High Voltage
14. Make sure the temperature of the furnace is below 80^0 C
15. Switch off Mains

3 Starting Mefisto Beam Analyzer

1. Start Windows by typing `win`
2. Start `Strahlausmesssystem` in `Mefisto Related Applications`
3. Check if power supply of the motors is on (`Power Supply Strahlausmessger\"at`)
4. Switch on Keithley electrometer (Press: `I, Zero Check, Filter, Autorange`)
5. Press on arrow (LabView programm starts)
6. `Configure Step motor` press `yes`-Button
7. `Configure Blende` press `cancel`-Button
8. Select which detector you want to use (`faraday cup, channelplate_CW, channelplate_pulse...`)
   Check that the right detector is connected to the electro motor
9. Press `center`-button (selected detector is centered)

4 Acquire Beam Spectrum

1. Turn on chosen electrostatic values of Wien filter (See figure 4)

Figure 4: Knobs to adjust electrostatic values of Wien filter

2. Press `Acquire Spectrum`-Button in `Mefisto Beam Sense System`-programm
3. Select Step range of B-Field current (0.001, 0.002, . . . , 1)
4. Set offset current for Wien filter
5. Press `up`-Button
6. Stop increasing B-Field current by pressing on `up`-Button. (Lights are on when max or min value are reached)
7. Decrease B-Field current to appropriate value.

5 Open Valve ECRIS/Chamber (Gate valve)

1. Check that vp-lamps are on. (`vp2` and `vp5`) (See figure 7)
2. Open gate valve.
   Lights show the status of the valve (`open/close`)

6 Vent Instrument Chamber

1. Switch off Stabil-Ion Gauge
2. Pressure in N_2 bottle must be more than 50 bar ($p > 50$ bar)
   (40 bar needed for venting)
3. Check that instrument chamber bolts are closed (venting stops by overpressure)
4. Close all valves (i.e. Cryo pump!) (See figure 7)
5. Switch off turbo pump of UV-lamp
6. Switch off all electrical equipment plugged in the blue power sockets (`vp off`)
7. Press vent on Main Board
   starts ventilation (approx. 15 min)
8. Check that $p \approx 10^3$ mbar or pressure in bottle is 50 bar less than before venting
9. If venting does not stop, unplugg Vent-Valve connector on the backside of the control unit
10. Open door

7 Pump down Chamber

1. Carefully close door
2. Open turbo valve by key switch
3. Switch on turbo pump, pressure (sensor A2, B2) should decrease
4. Check cooling of the turbo pump
5. Switch on turbo pump of UV-lamp and start degasing of UV-lamp (after $\approx$ 10 min lights on)
6. Unplugg key when `vp1` and `vp2` are lit
7. Check if `vp3` lights (after $\approx$ 2 h)
8. Close turbo valve to chamber
9. Open cryo valve, check if cryo works well
   (Wait $\approx$ 5 min before proceeding)
10. Shut down turbo pump

8 Baking out Chamber

Use only turbo pump during baking.
Close Valve to Cryo Pump (see figure 7). Switch on Turbo Pump when not running as described in section 7.

1. Select duration time of heating on mainboard (see figure 5)
   Right knob for duration, left for factor (e.g. 1 day times 0.8)

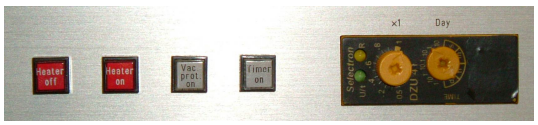

Figure 5: Knobs for heater

2. Press `Heater On`, `Timer on` and `Vac. prot. on`

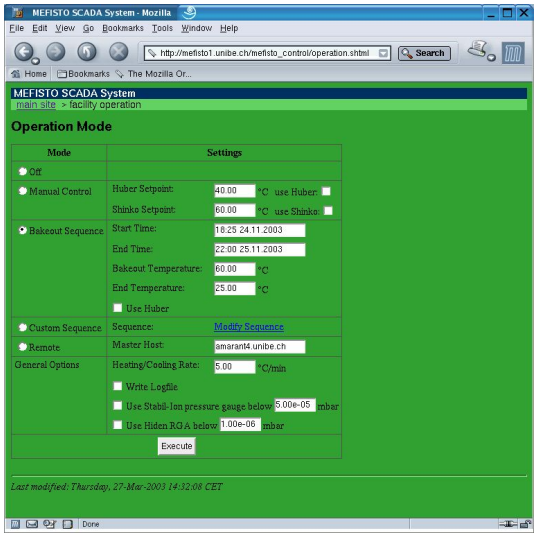

Figure 6: MEFISTO Control Page

3. Go on web page `http://mefisto1.unibe.ch/mefisto_control/` (See figure 6
4. Choose `Facility Operation`
5. Select button `Bakeout Sequence` ...
6. Type in start and end time, baking tempertur and end temperature in °C.
7. Press `execute`-Button
8. Check by pressing the reload button of your browser that your choice has been saved.
9. After the selected time the temperature will decrease to defined end temperatur.
10. Switch off Heater after the temperatur has reached end temperatur.
    Press `Heater Off`-Button
11. Start Cryo Pump as described in section 7

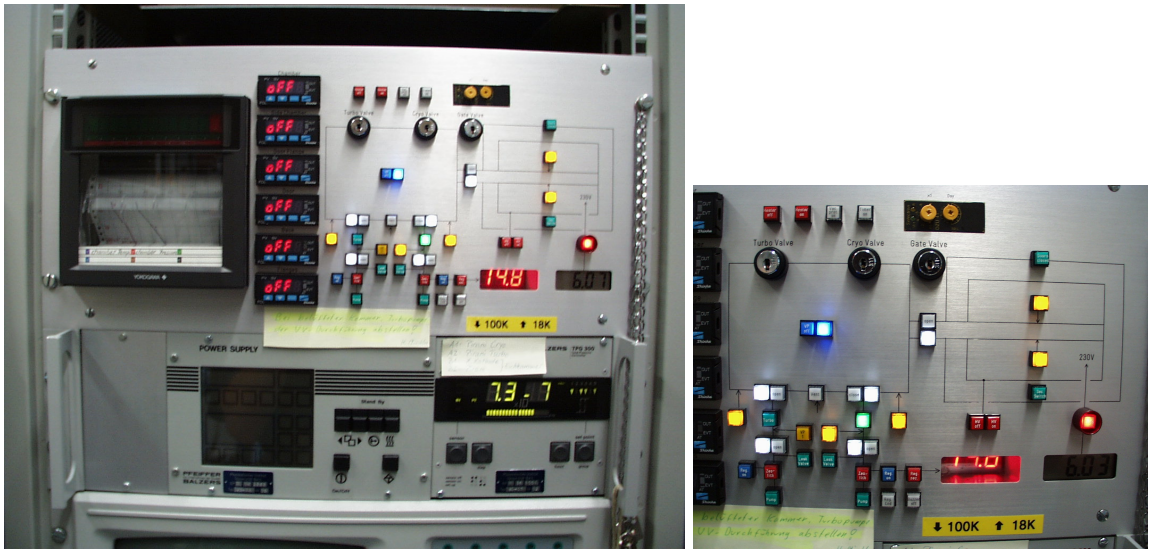

Figure 7: Main Board Vacuum System

9 Vent ECRIS

1. Make sure the temperature of the furnice is below 80 °C.
2. Switch off Mains (See figure 1)
3. Close gate valve (See figure 7)
4. Close pump valve (press `close` button) (See figure 8)
5. Switch off pump (press `power on`) (See figure 8)
6. Open `vent valve source` by key switch (See figure 8)
7. After venting has stopped turn key switch (venting takes $\approx$ 5 min)
8. After $\approx$ 12 min turbo pump vents automatically

10 Pump down ECRIS

1. Open Pump Valve by key switch (See figure 8)
   (Before open the valve make sure the pump is vented: Pressure `Vorvakuum` on control unit of the source is near ambient pressure)
2. Start turbo pump: Press `Power on`
3. Take off key when triangle No. 1 of the source control unit lights (See figure 2) (Pressure A1 below $6 \cdot 10^{-2}$ mbar)
4. Pressure should decrease to 10^{-6} mbar

Remark: If the turbo pump does not reach 65 % of its full speed in 18 min, the pump will automatically switch off $\Rightarrow$ the system has a leak

Figure 8: MEFISTO Valve Control

11 Change of Operation Gas

1. Make sure Gas Inlet Valve is closed (`Mode` Switch to `close`)
2. Close all valves of gas bottles
3. Pump gas system with Pfeiffer-Vakuum-Pumpe through tube attached to gas system
4. Before switching off pump, close all valves

5. In the meantime change gas bottle
6. Open bottle valve of desired gas until pressure reaches 0.5 bar, close valve
7. Pump again (Cleaning of system)
8. Open valve again (pressure 0.5 bar)
9. close bottle valve

12 Use of furnace (High temperature oven)

1. Make sure desired metall is in MEFISTO (See Section 13)
2. Make sure furnace is mounted and well outgassed
3. Set in rod for furnace control (see figure 10)
4. Press button `oven` on ion optics control
5. Slowly start heating, check temperature and pressure
6. When desired evaporation rate is reached (See figure 9), look for metall signal in plasma chamber (`Acquire spectrum` in Beam Sense System)

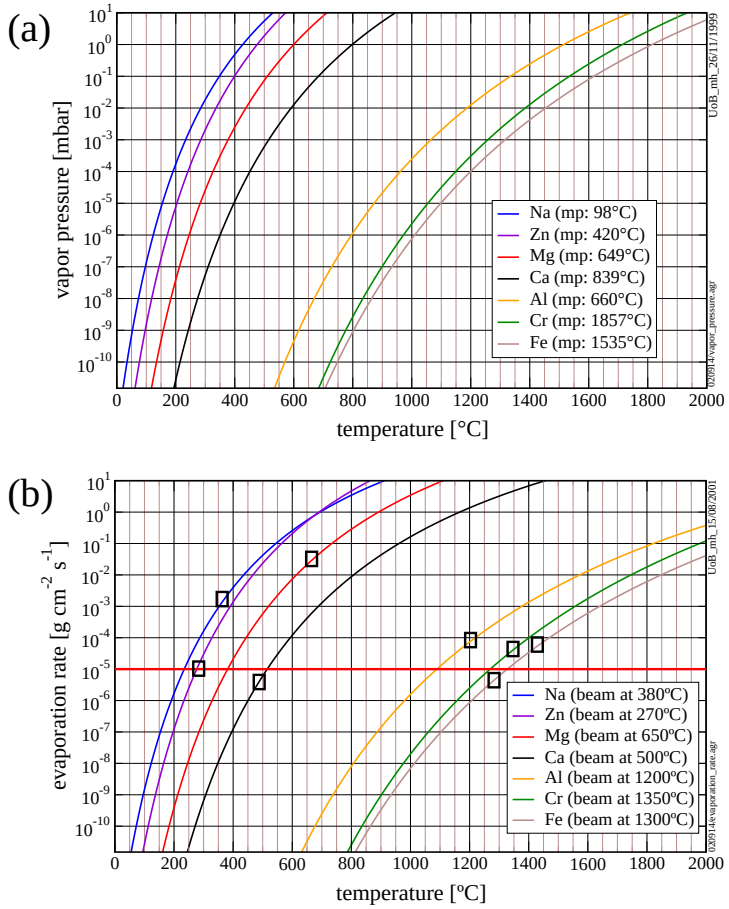

Figure 9: Rates of evaporation for metals

7. Optimize ion optics on desired ion species
8. Shut down:

- Slowly decrease temperature
- When temperature reached room temperature switch off furnace (`oven`)
- Only switch off `Mains`, when temperature is low enough (below 80 °C) (stops cooling)

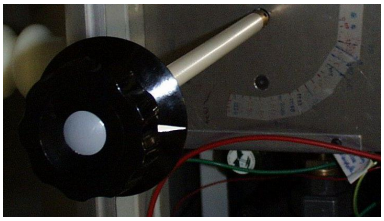

Figure 10: Furnace rod

13 Change of metall in furnace (Oven)

1. Switch off all power supplies (eg. `Mains`)
2. Vent ECRIS (See section 9)
3. Carefully dismount furnace
4. Select furnace, appropriate crucible and hat (high or low temperature) (See figure 11)
5. Fill in metall in crucible , mount it in furnace, put on hat
   Consider metall characteristics!
6. Carefully mount furnace in ECRIS (See figure 12)
7. Connect wires for temperature measuring and heating
8. Pump down ECRIS
9. Start Outgassing furnace

Figure 11: Crucible and hat for furnace

14 Homer Autotuner

(For details see diss Markus Hohl, p. 63)

1. Connect RS232 cable (9 pin) to free `CAN` connector on the autotuner system
2. Switch on external computer (presently: Compaq Deskpro XE 466)
3. Switch on Microwave (Autotuner system starts)
4. On the computer change directory to `C:\HOMER`
5. Start the program by typing: `mt`
6. The program is described in the operation manual *Autotuner II.*

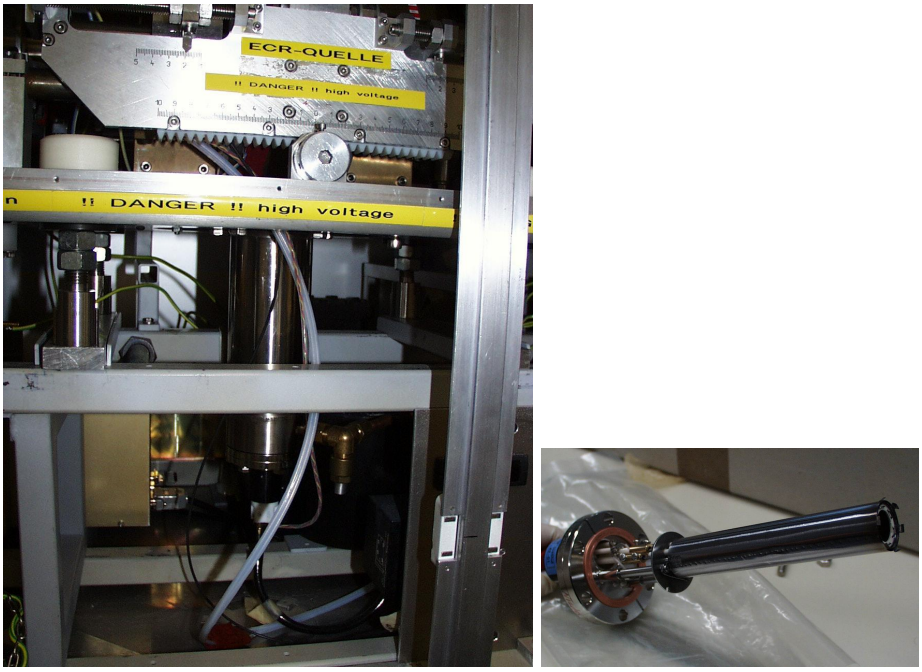

Figure 12: Right: Furnace position in MEFISTO, Left: Furnace for low temperature

15 Cooling shroud with liquid nitrogen

15.1 General remarks

- It needs half a bottle to cool down (to -100 deg C)
- One bottle last for about 11 hour
- Put Thermocuples on table, table support (important) and instrument to monitor temperature during cooling
- Indication for empty bottle: Temperature for `Shroud Chamber out` increases
- When bottle is empty it last one hour until pressure rises
- When stop cooling maybe start Turbo pump again (pressure can rise up to 10^{-4} mbar during warm up of shroud)
- Don't open chamber when temperature anywhere inside chamber (i.e. on instrument, table, table support, shroud) is below 10 deg C!

15.2 Connecting N_2 bottle and start cooling down

1. Make sure UV lamp is off

   on Gallerie

2. Make sure valve `THERMALPUMPSTAND` is closed (See figure 14)
3. Make sure blue valve of bottle `TRYCOOK VENT` is closed
4. Connect tube to bottle (See figure 15)
5. Open valve `MEFISTO`
6. Open green valve `PRESSURE RAISING` (See figure 15) (may already be open)
7. Open blue valve `LIQUID FILL/DECANT` (Use gloves when cold)

8. Pressure monitore should increase to $\sim$ 1 bar (above 0.5 bar is good)

in MEFISTO lab

9. Both switches for shroud control to `auto` (See figure 16)

15.3 Stop cooling and disconnecting bottle

1. Switch off Shroud controls (see figure 16)
2. Close valve `LIQUID FILL/DECANT` (Use gloves!)
3. Disconnect tube to bottle (Use gloves!) (See figure 15)
4. Close valve to Mefisto `MEFISTO`
5. Close valve `PRESSURE RAISING`
6. Make sure blue valve of bottle `TRYCOOK VENT` is closed
7. Change bottle

Figure 13: Place for bottles on Gallerie

Figure 14: Valves MEFISTO and THERMALPUMPSTAND

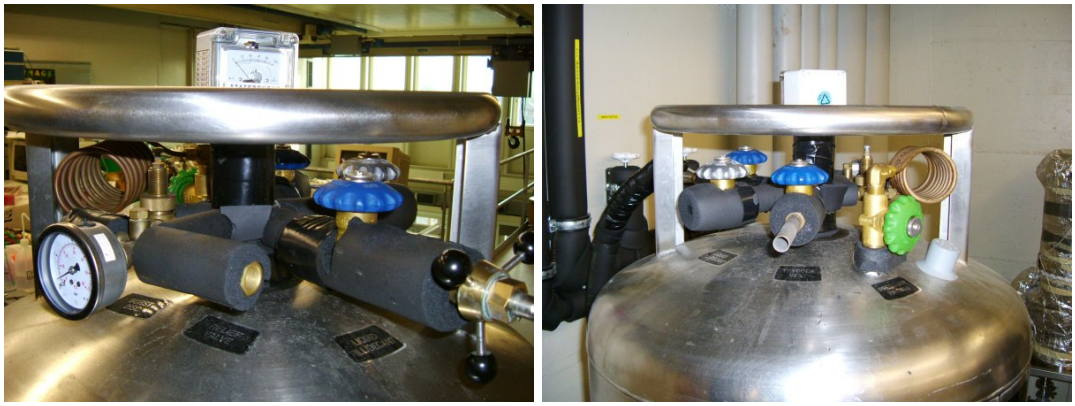

Figure 15: Valves of bottle

Figure 16: Shroud controls