Short manuals for BAL-TEC RES 010

ATTENTION

- Use argon gas: Q (**99,999 vol% Ar**)
- Water is open
- Agon is open

In general

- Vakuum is **10^{-5} Pa**
- Water is open
- Argon is closed
- MAINS/NATZ is turn off (MC 010)

Sample preparation

- Sample for ion milling has to be correctly prepared

Check!

- Thickness of the sample (measure thickness by dimple grinder or use optical microscope) has to be ~15 µm

Inserting sample into the holder

- Insert sample into sample holder
- Sample has to be set on the center of suitable support
- Cover the sample with upper support and carefully tighten screw

VENT the chamber

- Press **PUMP/VENT (TPC 010)**
- Open general valve for argon (Ar)
- Wait for vacuum **10^{-2}**
- Switch to **ON** (up position) on the left side of chamber
- When the chamber is open, switch to **OFF** (down)

Inserting holder into the chamber

- Slide part of holder carefully set into a proper position (**do not use force!**)
- If the jag does not match, put out the holder, rotate the jag and try again

When closing the chamber, be careful that holder do not touch one of guns!

Holder alignment

- Open chamber till the end and hold it with left hand
- With right hand turn wheel from +10 to -10
- Selected dot on the sample has to be on the center
  If dot is not on the center make alignment with UP/DOWN button

VAC the chamber

- Press **PUMP/VENT** button **(TPC 010)**
- AUX shut down, when:
  - Vacuum reaches 10^{-4}
  - On display (**EPM 010**) is ERR (press 2x on *GUN1 and GUN2 button*)
  - If the light HOLE is on press LIGHT button
  - ion-mill has to be clean in general
- Wait for vacuum **$1 \cdot 10^{-5}$ Pa**

Start

Before ion milling

- Press **ON/OFF (RC 010)** button for rotation
- With potentiometer SPEED set speed of sample holder (usually *4-5*)
- Light for observing the sample:
  - Reflection illuminator **(RC 010)**
  - Transmission illuminator **(EPM 010)**

Ion milling

During milling close the screen to protect the glass!

Gun 1 (GUN 1) Go step by step!

- Set and rotate current till the end and press **ON (VC 010)**
- Set voltage to desire value (*example **4 keV***)
- Press **(EPM 010) GUN 1** button and turn current to desire value (*example **1.2 mA***)

Gun 2 (GUN 2) Go step by step!

- Do the same as for Gun 1

When perforation occurs, reduce voltage to 3.70 keV, and current to 0.8 mA!

End of milling

- Reduce current to 0 mA and press GUN 1 button (turn off) **(EPM 010)**
- Slowly reduce voltage to 0 keV **(VC 010)**
- Press **OFF** (turn off voltage)
- Reduce current to the end

End of work and remove the sample

- Turn off rotation; SPEED **OFF (RC 010)**
- Turn off the light

Wait 10 min, guns have to stabilize

- Press **PUMP/VENT** button **(TPC 010)**
- Wait for vacuum 10^{-2}
- Switch to **ON** (up position) on the left side of chamber
- When the chamber is open, switch to **OFF** (down)
- Remove the holder
- Press **PUMP/VENT (TPC 010)**
- Starting position to **0°**
- Close general valve for argon (Ar)

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How to use timer

- Estimate how long (h/min) is needed for perforation
- Press **UP** and/or **DOWN** button to set desire time **(EPM 010)**
- Press **TIMER** button (green light appeared); after finish counting down the time, milling will be automatically interrupted
- When time count down, high current and pipe of argon automatically interrupt (**ERR** in **AUX** lights are on**)**
- If you want to milling further, set the current again (see Ion milling paragraph)

Cross-section ion milling

- Use normal procedure (see Ion milling paragraph)
- With potentiometer **DEGREE** set desire angle (*10° or more*); usually is **30° (EPM 010)**
- Under binocular observe sample rotation
- When the cross is perpendicular at interface, press **ROTAT.**; under desire angle sample starts to oscillate
- When perforation occur, end with ion milling (see End of milling)

Ion milling the sample with thin layer on substrate

- Use normal procedure (see Ion milling paragraph) (use **only one gun**: ***GUN 2***- *upper gun*)
- Go step by step!
- When perforation occur, turn off **GUN 2** (see End of milling paragraph)
- Then turn on **GUN 1** (go step by step!) (voltage to 3.5 kV, current to 0.6 mA)
- Milling the sample for 5min to achieve clean thin layer

Problems

AUX turns off, when:

- Vacuum reaches 10^{-4}
- On display (**EPM 010**) is ERR (press 2x on *GUN1 and GUN2 button*)
- If the light HOLE is on, press LIGHT button
- Ion-mill has to be clean in general

ERR on guns:

- Not right procedure for starting (see Ion milling paragraph)
- Reduce voltage and current to 0
- Press GUN 1 and GUN 2

More problems

- Ask CEMM