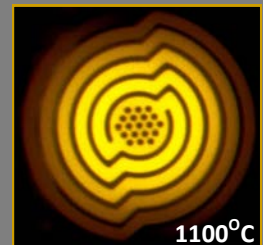
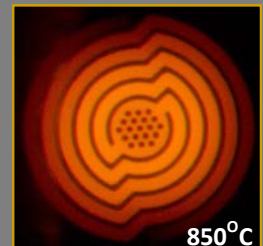
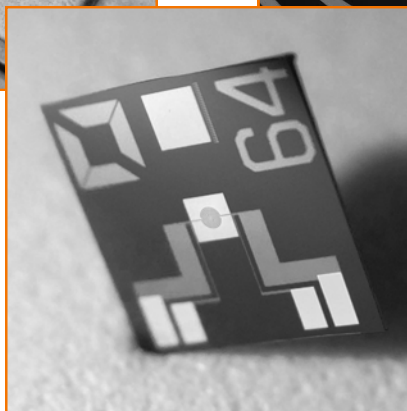
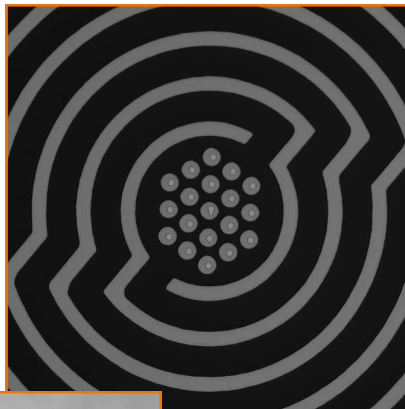
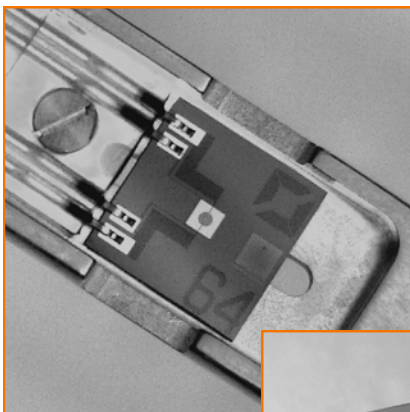


## MEMS IN-SITU HEATING

- Temperature reading and control feedback
- Tested up to 1100°C
- Excellent temperature uniformity in the sample area
- Dedicated, ultrathin and location tagged sample area
- Heating and cooling settling time of less than 1 second
- Ultra small lateral drift and lateral displacement at high temperatures
- Compatible with SEM, TEM and X-ray microscopy applications
- Compatible with Norcada and Hitachi Holders
- Hermetically sealed to work well with Liquid and Gas flows
- Provided with controller, software and sample biasing option



### CONTACT:

NORCADA Inc.  
4548-99 Street NW  
Edmonton, AB  
T6E 5H5  
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Phone: 780-431-9637  
Toll Free: 877-431-9636  
Fax: 780-431-9638  
E-mail: [info@norcada.com](mailto:info@norcada.com)

### SALES CONTACT IN JAPAN:

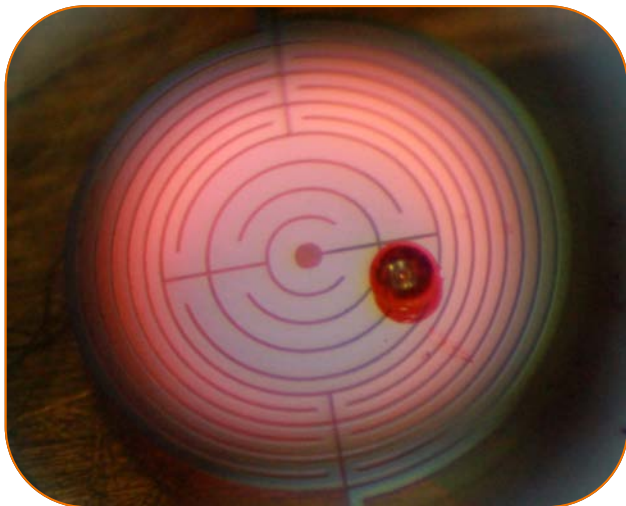
LxRay Co., Ltd.  
3-28-22, Koshienguchi, Nishinomiya  
Hyogo 663-8113  
Japan

Tel: +81-798-31-0500  
Fax: +81-798-31-0505  
[www.lxray.jp](http://www.lxray.jp)

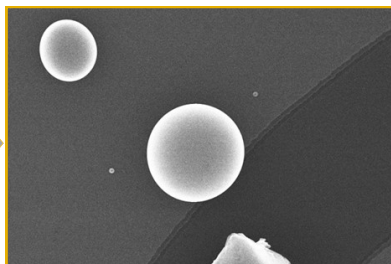
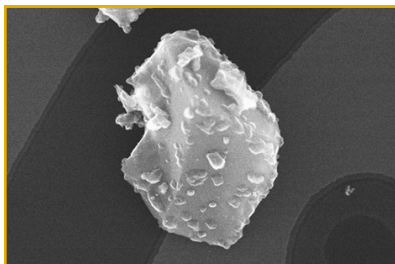
Customizable designs for your electrode configuration and heater designs  
Manufactured, inspected, tested and packaged in a Class 100 cleanroom

## LARGE AREA MEMS IN-SITU HEATING

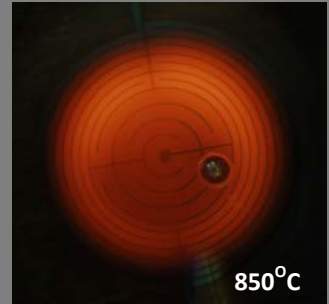
- Temperature reading and control feedback
- Tested up to 1100°C
- Excellent temperature uniformity in the sample area
- Sample viewing holes and sample wells
- Heating and cooling settling time of less than 1 second
- Ultra small lateral drift and lateral displacement at high temperatures
- Compatible with SEM, TEM and X-ray microscopy applications
- Compatible with Norcada and Hitachi Holders
- Hermetically sealed to work well with Liquid and Gas flows
- Provided with controller, software and sample biasing option



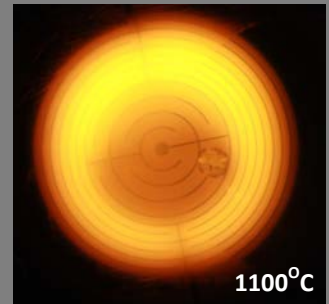
Customizable designs for your electrode configuration and heater designs  
Manufactured, inspected, tested and packaged in a Class 100 cleanroom



Copper particles melting on Norcada Heating Chips



850°C



1100°C

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Toll Free: 877-431-9636  
Fax: 780-431-9638  
E-mail: [info@norcada.com](mailto:info@norcada.com)

### SALES CONTACT IN JAPAN:

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Hyogo 663-8113  
Japan

Tel: +81-798-31-0500  
Fax: +81-798-31-0505  
[www.lxray.jp](http://www.lxray.jp)

## **In-situ electro-biasing and heating for SEM**

**Heating/Biasing Metallic Holder compatible with standard FEI, ZEISS, JEOL and Hitachi stages. Each holder will be made and delivered to your SEM specifications.**

**Metallic Holder will ship with contacts, connector cables that can reach the vacuum chamber feed through port (inside and outside SEM connectors and cables), standard electrical feed through for the SEM, software, controller and computer system capable of electro-biasing as well as in-situ Heating.**

**This configuration is for SEM units without a load-lock option. All units are made and tested in Canada.**

### **Great Value in one package:**

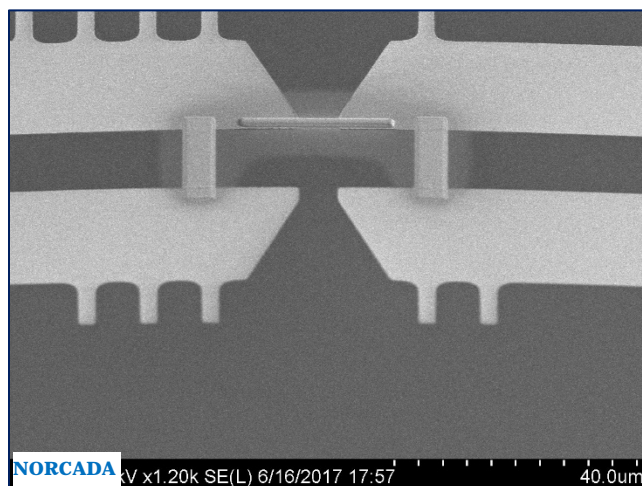
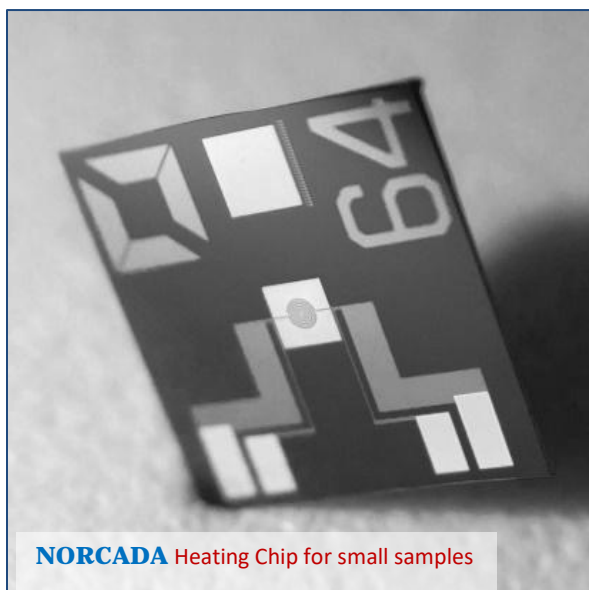
- The same holder package can offer both in-situ heating and in-situ biasing capabilities. The end user can easily switch modes by using a different chip
- The holder package will ship with 4 types of electro-biasing chips
- The package will also come with 2 types of in-situ heating chips
- Chips can be customized by Norcada in the future

### **In-situ Electro-biasing Capabilities:**

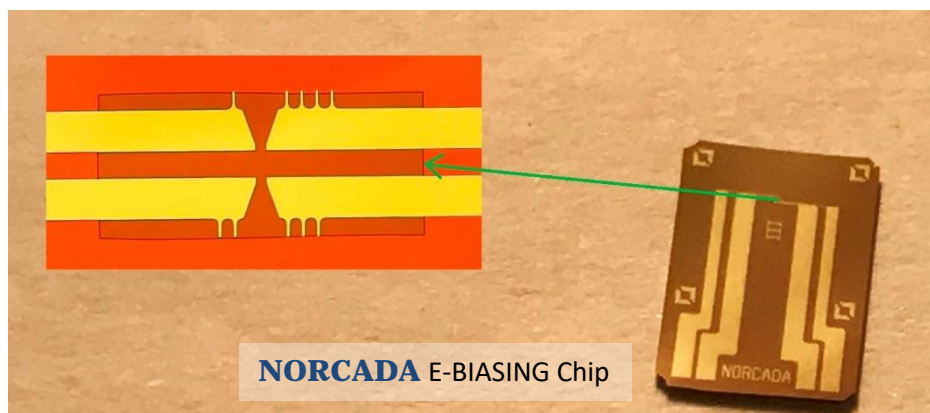
- I/V cycling and resistance measurements (2 Probe and 4 Probe)
- Noble metal leads for low-loss measurement
- Electrical noise cancelling in chip structure
- 12 standard electrode designs and unlimited room for customized E-biasing chips
- Custom designs with up to 32 lead branches (standard chip has 4 contacts)
- 10 kS/s sample rate on standard biasing controller. Faster rates possible with higher end control systems detailed as extra options below.
- Some biasing chips can provide/accommodate nano-electrodes
- Norcada's unique FIB-ready electro-biasing chips can fit into this holder
- The system and unique chips can offer AC and/or DC in-situ measurements inside SEM
- Norcada's standard controller can provide I/V measurement in mA /mV range.

## In-situ Heating Capabilities:

- Heating chips come in two standard heater sizes, and in 21 various heating element configurations. This allows the end user to choose between large and small sample size, as well a variety of sample preparation techniques including FIB.
- Norcada's unique FIB-ready electro heating chips can fit into this holder
- Temperature reading and control feedback on every chip, using the holder's proprietary software and controller setup
- Tested resolution 0.14 nm at 800°C
- Heaters can last for hours and heat/cool across 1000oC span in < 1 Sec
- Large in-situ heater can accommodate up to 1.2mm dia 100um thick samples, tested up to 1100°C with excellent temperature uniformity on all chips
- Small in-situ heater can accommodate 0.1mm dia 50um thick samples, tested up to 1200°C with excellent temperature uniformity on all chips
- Heater temperature can be controlled with 0.1C steps
- Heater temperature accuracy:  $\pm 1^\circ\text{C}$

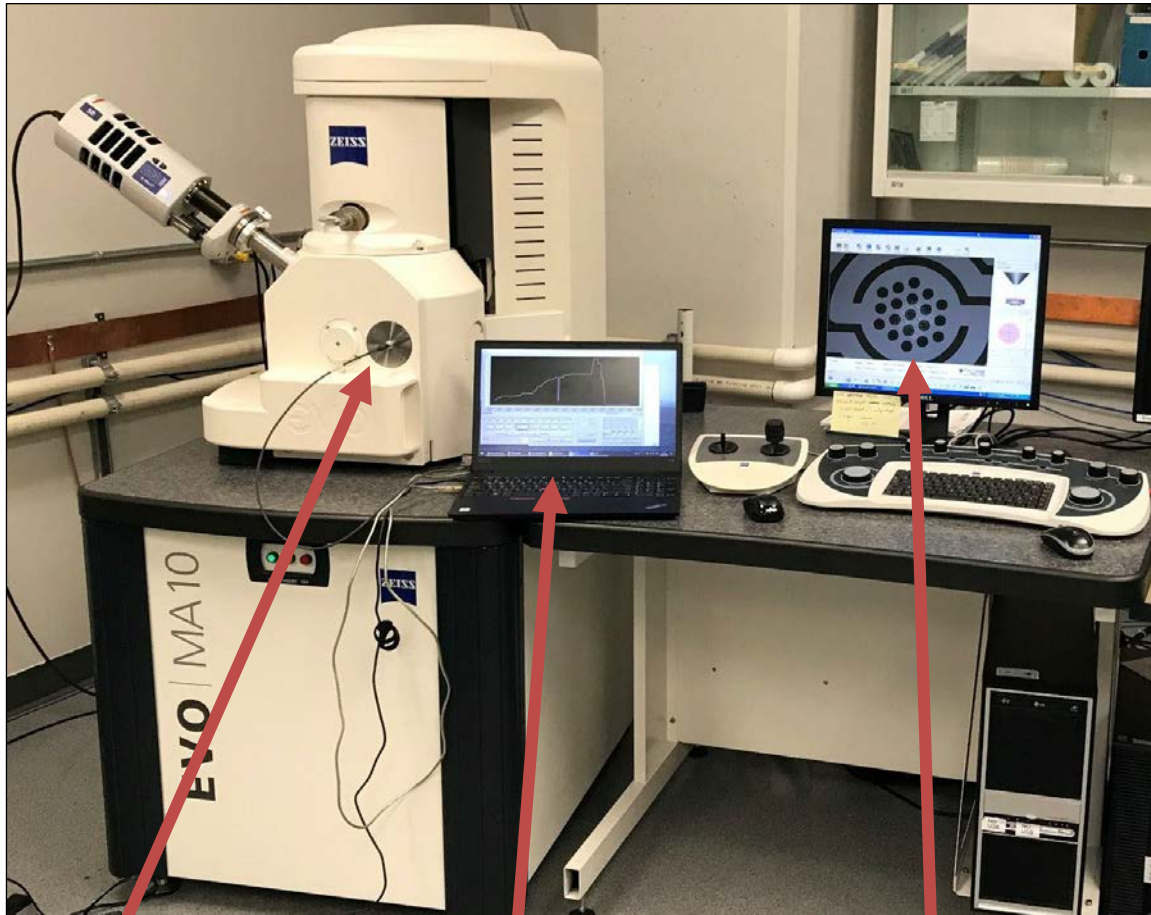


FIB prepared sample for biasing





A standard configuration example shown for a ZEISS SEM. Other models follow the same structure:



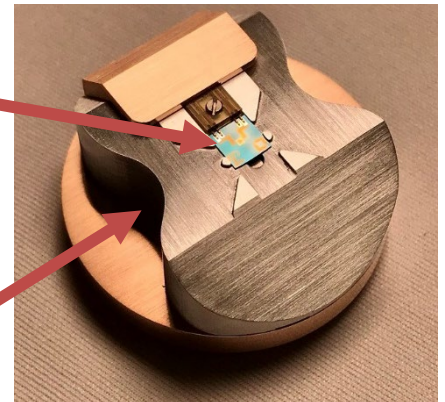
**NORCADA** E-BIASING AND HEATING FEEDTHROUGH

**NORCADA** CONTROLLER AND COMPUTER WITH PROPRIETARY SOFTWARE

LIVE SEM IMAGE OF **NORCADA** HEATING CHIP

**NORCADA** in-situ heating chip

**NORCADA** E-Biasing and Heating holder



**Standard Lead time: 6-11 business weeks after the receipt of order and design approval for made to order units. 1-3 weeks for stocked units.**

Holders are manufactured and serviced in Canada. Holders warranty on parts and labour is One (1) year from delivery. All repairs shall be done in Edmonton Canada by Norcada approved personnel. The items are only warranted under these conditions if the end-users are trained by Norcada and only if the units are used as per standard procedures detailed in Norcada operating manuals and training material.

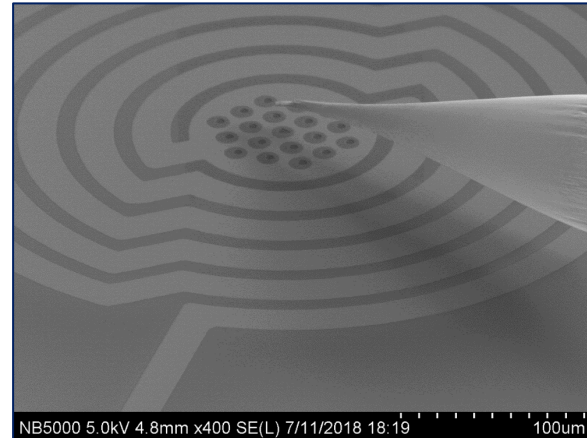
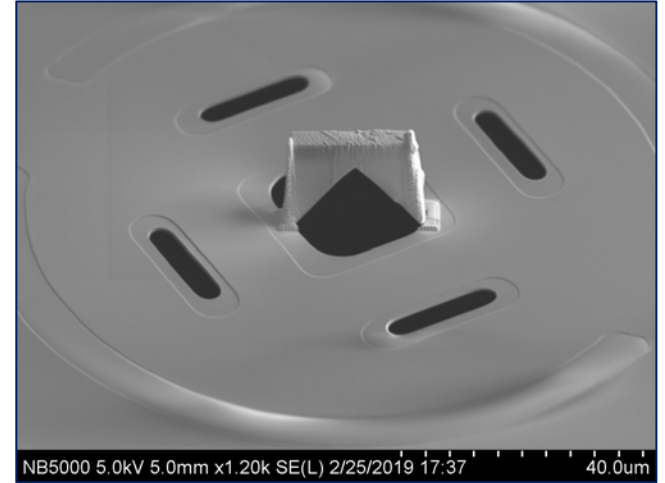


# In-Situ Heating Chips

Every chip is TEM, SEM, X-ray and FIB compatible  
All components UHV compatible



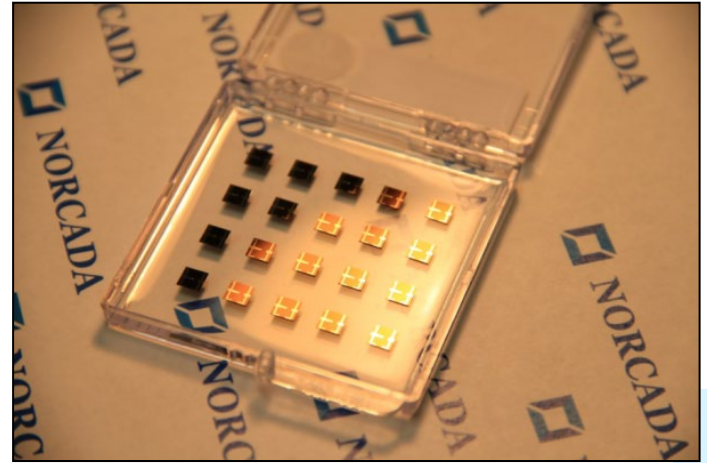
- Established 2002
- Nano devices for scientific research
- MEMS components for telecom & sensors
- Specialty mid-IR laser for sensing
- Terahertz Polarizers and Filters
- X-ray optics
- Differential pressure windows





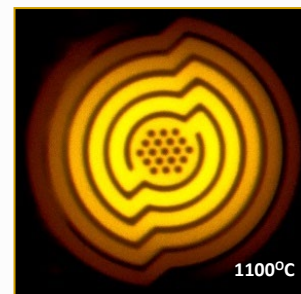
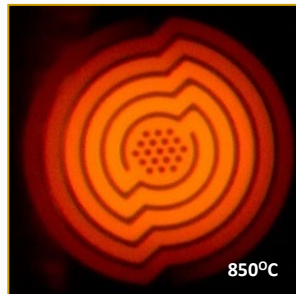
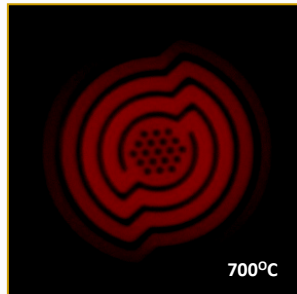
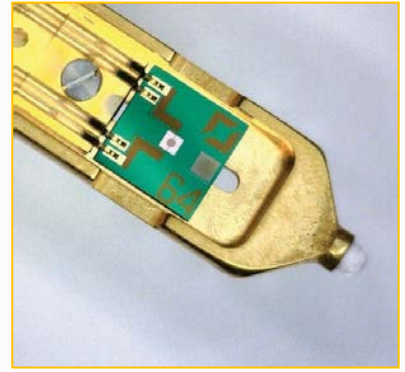
# MEMS Membrane Devices

- Silicon and Silicon Nitride membrane windows
- Electrode Integration
- Heating Chips
- Electrochemistry Cells
- Liquid Cells
- Holey Patterns
- Hydrophobic and Hydrophilic Coating
- Tomography and FIB-TEM devices
- X-ray transmission pressure windows

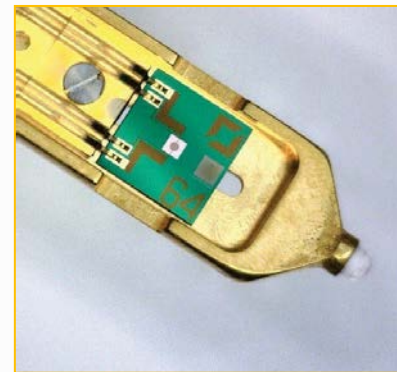
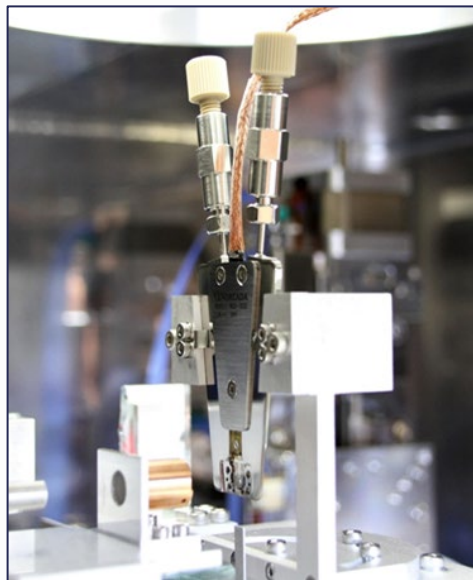
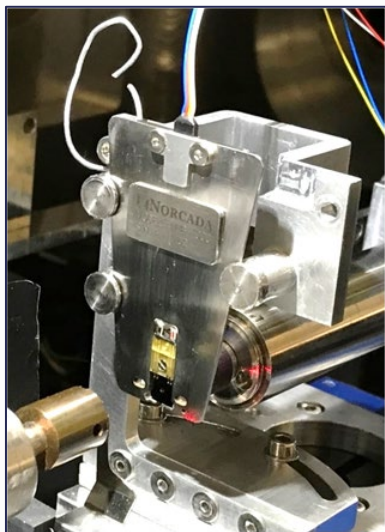
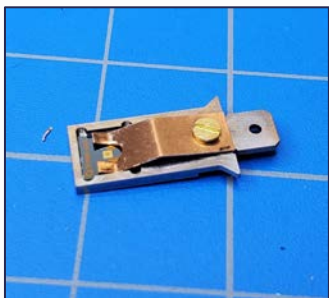


# MEMS IN-SITU HEATING CHIPS

- Temperature reading and control feedback
- Tested up to 1100°C with excellent temperature uniformity
- Resolution: 0.14 nm at 800°C
- Dedicated, ultrathin and location tagged sample area
- Suitable for in-situ heating with two chip configurations:
  - Heating chip suitable for soft Xray and TEM (pictured here)
  - Heating device for <0.1mm samples, also suitable for Hard Xray and SEM
- Heaters can last for hours and heat/cool across 1000°C span in < 1 Sec



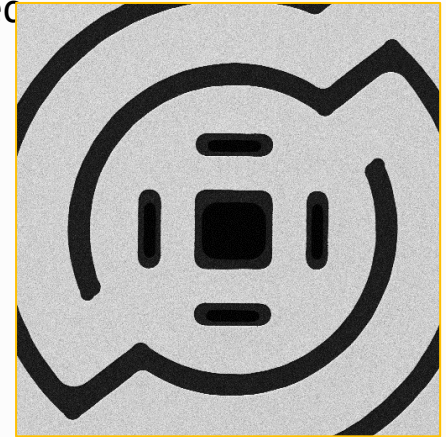
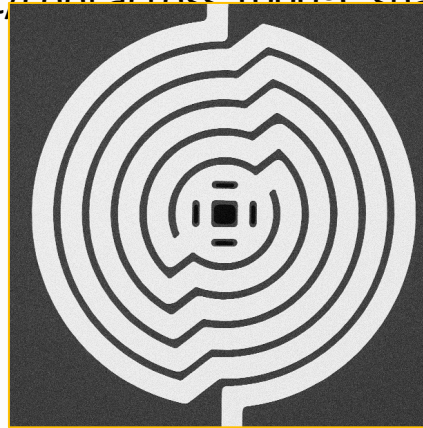
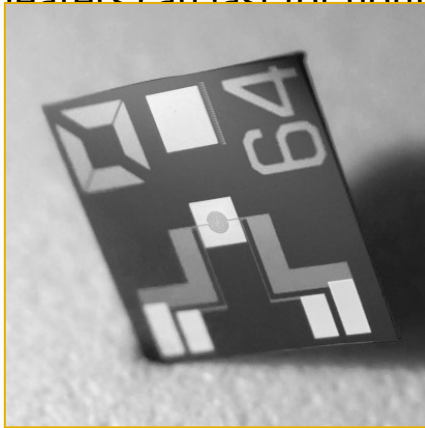
# MEMS IN-SITU HEATING HOLDERS



# MEMS IN-SITU FIB HEATING CHIP – HFN-0101H



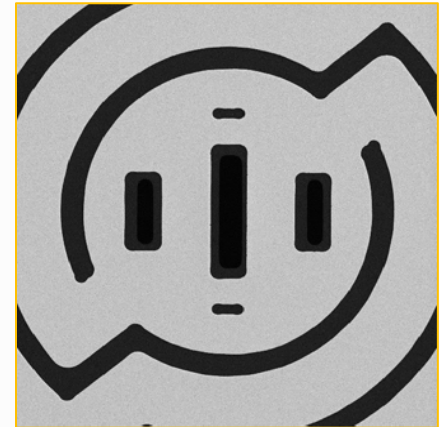
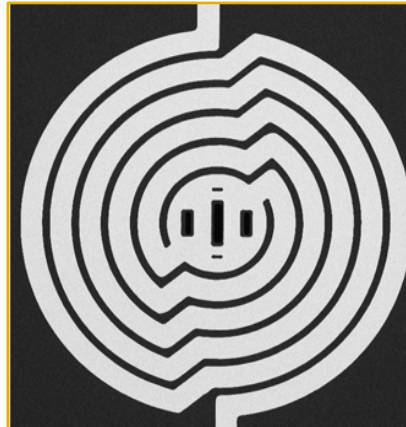
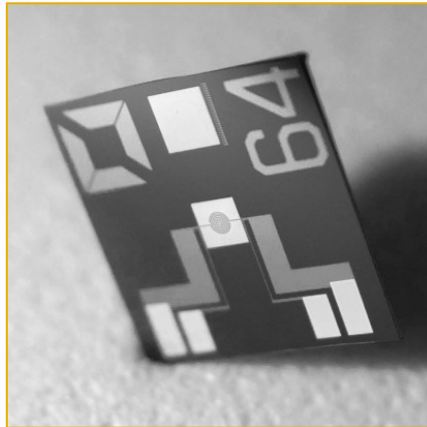
- Temperature reading and control feedback in SEM, TEM and FIB
- Tested up to 1100°C with excellent temperature uniformity
- Resolution: 0.14 nm at 800°C
- Five dedicated slits through the chips for easy sample preparation, sample lengths: 10μm to 40μm
- Suitable for in-situ heating with two chip configurations:
- Heaters can last for hours and heat/cool across 1000°C span in < 1 Sec



# MEMS IN-SITU FIB HEATING CHIP – HFN-0102H



- Temperature reading and control feedback in SEM, TEM and FIB
- Tested up to 1100°C with excellent temperature uniformity
- Resolution: 0.14 nm at 800°C
- Three dedicated slits through the chips for easy sample preparation, sample lengths:  $30\mu\text{m}$  to  $60\mu\text{m}$
- Suitable for in-situ heating with two chip configurations:
- Heaters can last for hours and heat/cool across 1000°C span in < 1 Sec

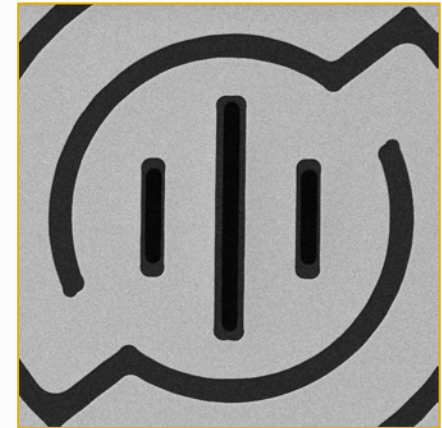
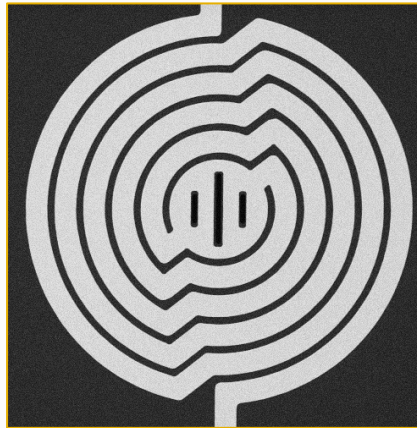
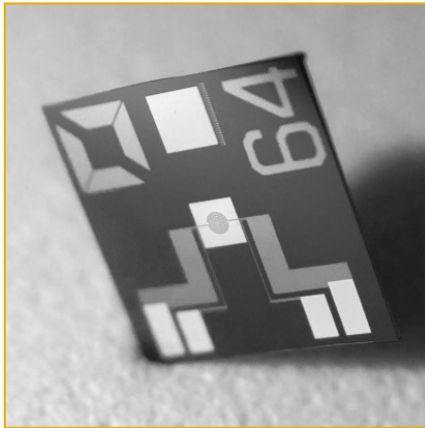




# MEMS IN-SITU FIB HEATING CHIP – HFN-0103H



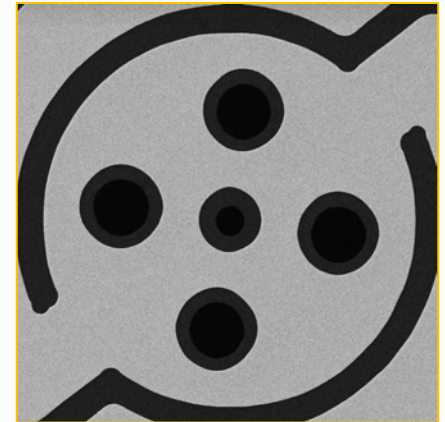
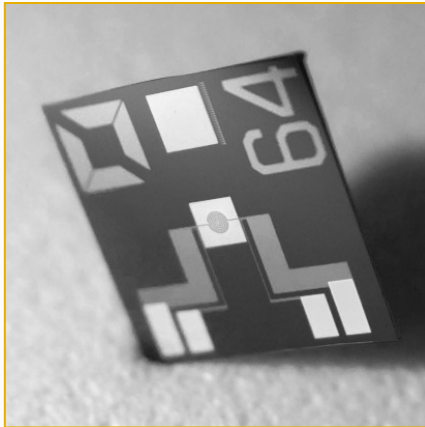
- Temperature reading and control feedback in SEM, TEM and FIB
- Tested up to 1100°C with excellent temperature uniformity
- Resolution: 0.14 nm at 800°C
- Three dedicated slits through the chips for easy sample preparation, sample lengths:  $30\mu\text{m}$  to  $80\mu\text{m}$
- Suitable for in-situ heating with two chip configurations:
- Heaters can last for hours and heat/cool across 1000°C span in < 1 Sec



# MEMS IN-SITU FIB HEATING CHIP – HFN-0100H

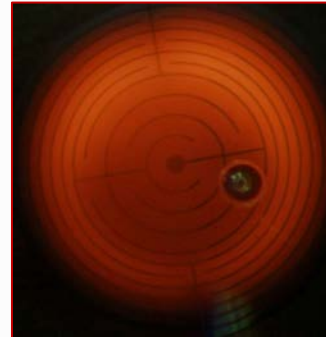
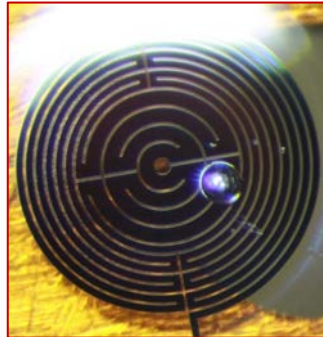
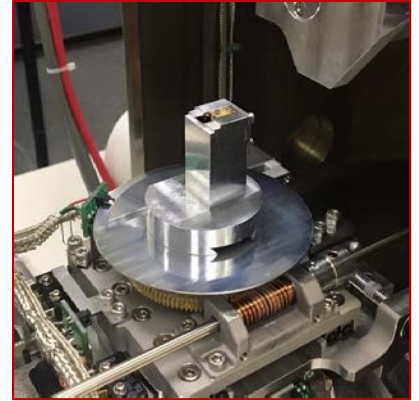


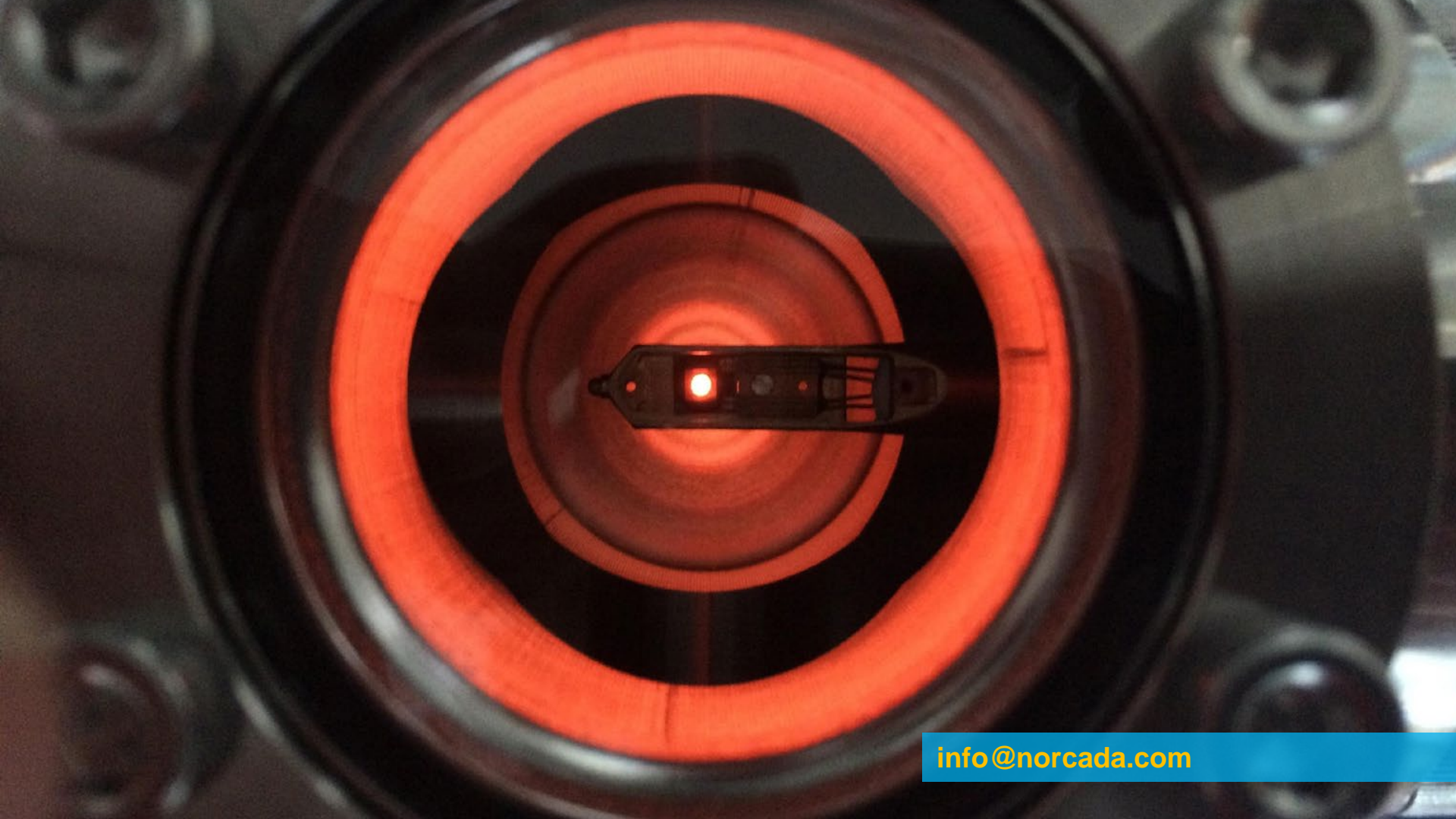
- Temperature reading and control feedback in SEM, TEM and FIB
- Tested up to 1100°C with excellent temperature uniformity
- Resolution: 0.14 nm at 800°C
- Five dedicated slits through the chips for easy sample preparation, sample lengths:  $10\mu\text{m}$  to  $40\mu\text{m}$
- Suitable for in-situ heating with two chip configurations:
- Heaters can last for hours and heat/cool across 1000°C span in < 1 Sec



# MEMS IN-SITU HEATING XL CHIPS

- Temperature reading and control feedback
- Tested up to 1100°C
- Excellent temperature uniformity
- Dedicated, through hole sample region
- Suitable for in-situ heating with two chip configurations:
  - Heating chip suitable for XPS, Hard Xray and SEM
  - Heating device for >1mm samples, limited on the heater area
- Heaters can last for hours and heat/cool across 1000°C span in < 1 Sec





[info@norcada.com](mailto:info@norcada.com)