thermo scientific

DATASHEET

High Vacuum Heating Stage

Cleaner conditions, better image quality and more information at high sample temperatures

The High Vacuum Heating Stage allows for an easy workflow to heat samples up to 1100° C while preserving excellent image quality.

Understanding the properties and functions of metals and other materials in real-world conditions requires high resolution, high contrast microscopy of samples at high temperature and in a controlled environment. The High Vacuum Heating Stage meets these requirements with a unique design and an accessible workflow – it enables clean heating experiments that are controlled through the user interface of the SEM or DualBeam instrument. With temperature logging integrated in the image data, the High Vacuum Heating Stage allows for recording all experiment data including images and videos in one go.

The High Vacuum Heating Stage is capable of working in high vacuum conditions without significant outgassing. This provides several advantages over working in low vacuum conditions: the SEM can work over a large parameter space that includes high beam energy, low beam energy, immersion, and in-column secondary / backscatter electron detection, greatly improving the achievable resolution and contrast. Operating at high speed, the high-vacuum detectors make it easier to track transient processes with fast image acquisition.

Moreover, high vacuum provides a cleaner environment – heated surfaces will run a much reduced risk of reaction with oxygen or water when there is no imaging gas to react with. This provides more room for observing heated surfaces that would otherwise be covered in oxide.

Finally, high vacuum operation improves the backscatter signal that is detected in electron backscatter diffraction (EBSD) analysis – with this stage, high quality EBSD maps can be acquired at temperatures up to 900° C.

Covering a wide range of heating experiments while allowing excellent image quality and easy operation, the High Vacuum Heating Stage is an essential tool for materials scientists studying high-temperature phenomena at the nanoscale.

Software and control

- Heating stage control is fully integrated into the SEM User Interface
- Multiple set-points, ramp and soak times can be programmed
- Capability to hold and restart a sequence or to proceed to the next step
- Manual control of heater power is available
- Movie acquisition is built in for both direct AVI or sequential TIFF acquisition

Key Benefits

Easy operation from room temperature to 1100° C

Clean heating experiments – Minimized risk of oxidation due to cleaner sample environment

Excellent image quality and more sample information with no compromises on advanced SEM functionalities such as in-column detection, magnetic immersion and fast scanning

Improved analytical performance – compatible with simultaneous acquisition of EBSD at high temperatures up to 900° C

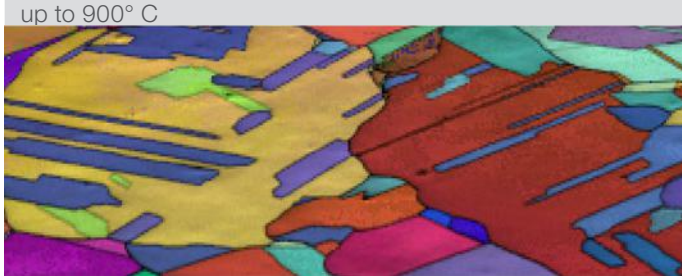

Figure 1. EBSD map of a copper surface acquired at 600° C – The High Vacuum Heating Stage enables good quality EBSD at temperatures up to 900° C

ThermoFisher SCIENTIFIC

thermo scientific

- Software for combining individual TIFF files into a movie is provided with user defined timing and databar composition
- Live measured temperature and power display

Sample mounting
All samples should be placed on a silicon heating substrate. Samples are mounted using:

- Press clamp with round central hole of diameter: 2mm, 3mm, 5mm, without screws (consumable)
- Two (up to four) clamps with screws

Installation requirements and compatibility
The high vacuum heating stage is compatible with Quattro, Apreo and Scios and occupies one port for hot/cold feedthrough.

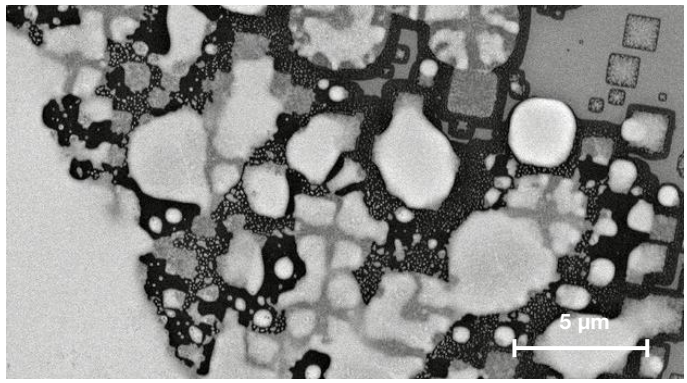

Figure 2. Gold on a silicon substrate at approximately 1080° C – The High Vacuum Heating Stage allows all in-lens detectors and imaging modes to be used for images with excellent resolution and contrast.

High Vacuum Heating Stage Specifications

Kit includes	• Module • Mounting base • Silicon heating substrates	• Screw clamps and press clamps • Two heat shields (top-down / EBSD) • Tools for sample mounting
Sample size	Up to 10x10x2 mm^3	
Temperature range	• Standard operation: room temperature to 1100°C with top-down heat shield • In EBSD use case: up to 900° C • Without heat shield: up to 400° C	
Temperature setting precision	1° C	
Temperature stability	< 5K after stabilization	
Drift	Sample drift: less than 100 µm / 1000° C	
Heating rate	Standard software limit: 1 - 50° C/minute; faster heating is possible but will decrease heater lifetime.	
Heater lifetime	200 hours guaranteed under standard conditions	
Cooling	Recirculating water flow from small chiller	
Calibration accuracy	±25°C @ 1064°C (Au melting point)	
Pressure range	High vacuum only; Cryo Cleaner recommended for cleanest chamber conditions	
Compatible SE/BSE detectors	ETD and in-lens detectors	
EDS compatibility	Up to 500° C	
EBSD compatibility	Up to 900° C	
Heat shield type	Top-down and EBSD heating shields; needed above 400°C	
Biasing	Sample bias range: -50V to +50V Heat shield bias range: 0V to +315V	

Find out more at **Thermofisher.com/EM-Sales**

ThermoFisher SCIENTIFIC