

PolyHeater Accessory for Jupiter XR AFM



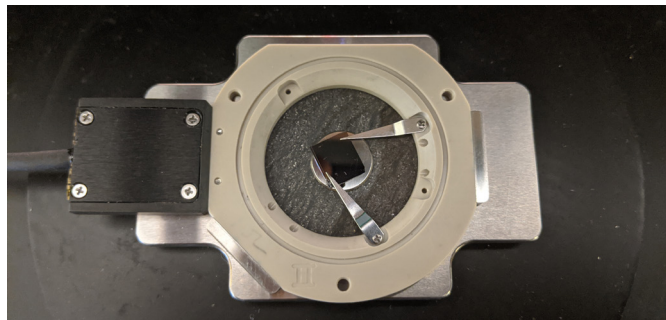
The PolyHeater™ accessory for the Jupiter™ XR AFM heats samples, up to 15 mm in diameter, from room temperature to 300°C while allowing for high quality imaging. In combination with blueDrive™, the PolyHeater is an ideal accessory for a wide range of thermally-controlled experiments.

PolyHeater Experiments

From polymer melting and crystallization, to device failure testing, the ability to cool and heat samples as they are imaged by an AFM is important for material characterization. The PolyHeater allows for nanoscale structural and mechanical changes to be observed at the same time as the sample temperature is varied.

PolyHeater Ease of Use

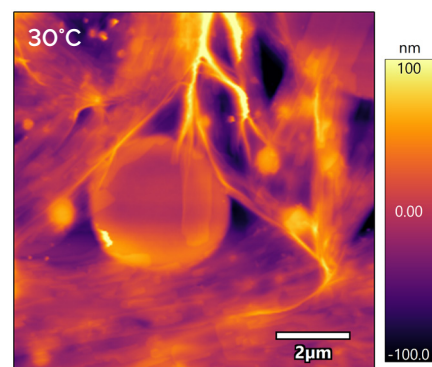
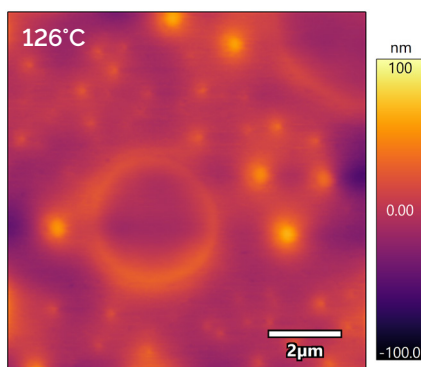
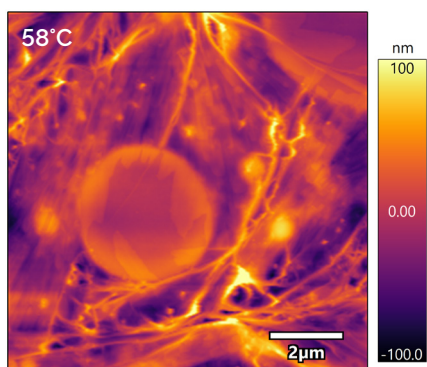
Several options exist to immobilize samples on the heating sample mount. Samples attached to standard metal AFM sample discs can be placed directly on the temperature controlled metal surface of the stage and are held magnetically. Free standing samples can be immobilized using metal clips. Alternatively, thermally conductive paste can serve as the sample immobilization method. The temperature controlled surface of the PolyHeater stage has an active area of 15 mm in diameter and can hold slightly larger samples. The stage has four convenient access ports that allow for dry or inert gas input or electrical access. An optional cantilever holder with a flexible membrane can be used to create a semi-sealed imaging environment.



PolyHeater sample stage. The sample can be immobilized on the heating stage using clips (shown here), thermally conductive paste, or magnetically.

blueDrive for Imaging Stability

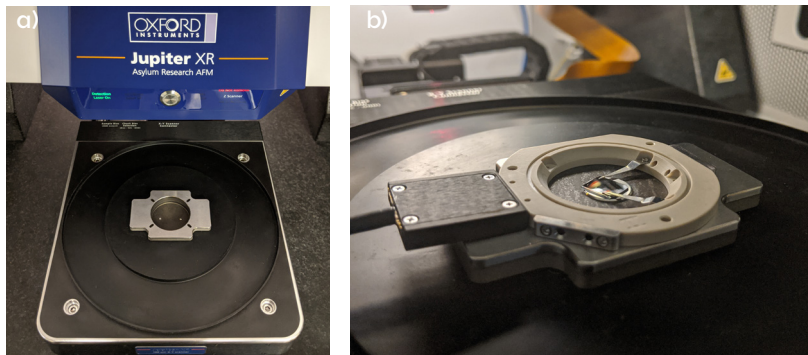
Asylum Research's exclusive blueDrive technology improves tapping mode-based imaging techniques by replacing piezoacoustic excitation of the cantilever with photothermal excitation. With blueDrive, cantilever tuning is clean and avoids the so-called "forest of peaks". Having only one peak simplifies the tuning procedure and speeds up the experimental setup. Additionally, unlike piezoacoustic drive, blueDrive is both stable over time, enabling extended periods of data collection without any adjustments by the user, and lower noise.



Thin polymer film melting was performed on the PolyHeater accessory to demonstrate the environmental control, high imaging speed (13 Hz, ~20 sec per image), and imaging stability over several hours. Polystyrene/Polypropylene thin film on silicon substrate was heated gradually from room temperature to 58°C to 126°C and then back down to 30°C.

Accessory chuck for safe accessory operation

The accessory chuck has an embedded ID chip which is automatically recognized by the software to simplify the experimental setup. The accessory chuck provides a stable XY scanner attachment base for the accessories and its flexible membrane protects the AFM from accidental liquid spills.



a) Accessory chuck placed on the XY scanner b) Close up view of the input ports of the PolyHeater stage mounted on the accessory chuck.

Environmental Control Card Closed Loop Accuracy

The PolyHeater requires the environmental control expansion card, which plugs directly to the Jupiter expansion port. It ensures closed-loop performance independent of the AFM controller. All control and measurement functions are fully programmable through the software interface, including built-in support for temperature ramps. Fully integrated temperature information is stored with each AFM image. SmartStart allows plug and play operation without the use of parameter files.

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Specifications

The PolyHeater kit includes the sample heater stage and an accessory kit containing an initial supply of consumable items required for operation. The PolyHeater accessory also requires an environmental control expansion card and an accessory chuck that can be shared with other environmental control accessories.

Temperature control

- Heats from ambient to 300°C
- 0.2°C sensor precision and 0.5°C sensor accuracy with <0.2°C overshoot

Environmental control

- Four 1/16" access ports are provided for tubing or electrical connections
- The sample chamber can be semi-sealed to control gas environment with optional cantilever holder

Sample compatibility

- Samples up to 20 mm diameter (15 mm recommended) and 2 mm thickness
- Supports up to 10 mm sample translation

Cleaning

- Wipe with alcohol; do not immerse in fluid

System compatibility

Jupiter XR
MFP-3D Infinity™



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