

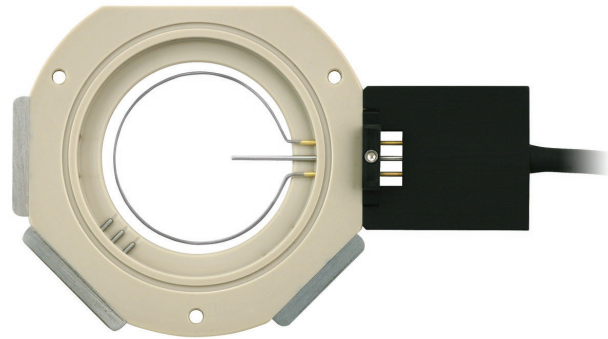
# BioHeater™ Closed Fluid Cell Accessory for the MFP-3D™ AFM

# Asylum Research

## Introduction

The **BioHeater** is a temperature controlled sample stage for the **MFP-3D** AFM for heating samples in liquids from ambient to 80°C. It is ideal for many applications such as protein conformational changes, enzymatic activity, lipid phase transitions and others.

The BioHeater consists of a closed fluid cell with an immersed heating element which symmetrically heats the surrounding fluid. The fluid cell has a total of ten ports. Seven are available for liquid and gas exchange and electrical access to the sample. The remaining three are used by the heating element. The fluid cell can be operated in either an open configuration where the membrane cover acts as an evaporation shield, or with a clamp for a completely sealed and controlled environment. It supports samples up to 2 mm thick. A stainless steel temperature probe extends near the sample for closed loop control within 0.1°C. Materials in contact with the liquid are glass, cantilever holder materials, silicone rubber, FKM (Viton® equivalent O-rings), stainless steel (temperature probe), PEEK, and FEP Teflon® coating (on the heating element). The BioHeater fluid cell can be completely disassembled for cleaning and most parts can be sonicated and autoclaved.



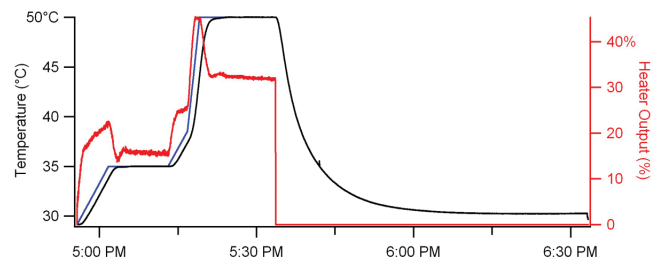
*The BioHeater allows thermally controlled experiments in liquids in a totally sealed environment.*

## Versatile Configuration

The BioHeater can be used with varying levels of setup complexity ranging from heating with perfusion, just heating with all available ports plugged, or for closed fluid cell imaging without heating capabilities. Setup is easily accomplished by simply removing the heating element. The accessory kit also includes a portless fluid dish.

## Closed Loop Accuracy with the Environmental Controller

The BioHeater requires the Environmental Controller (purchased separately) which features closed loop temperature control of the sample to within 0.1°C in a steady state, with less than 0.1°C overshoot during heating. The temperature is controlled from within the MFP-3D software environment, allowing coordination of heating events with imaging techniques, force measurements, and lithography functions. Sample temperature is recorded in each AFM image file and in a temperature log graph. The BioHeater is compatible with all MFP-3D AFMs except the MFP-3D Origin.™ The transparent fluid cell bottom allows use with both top and bottom view optics.



*Temperature vs. time graph which includes temperature setpoint (blue line), sensor (sample) temperature (black line), and heater output (red line).*



*The Business of Science®*



## Specifications

The BioHeater includes the BioHeater stage, cooling fluid pump, and an accessory kit containing an initial supply of consumable items required for operation. The BioHeater also requires the Environmental Controller, which must be purchased separately and can be shared with other MFP-3D environmental control accessories.

### Temperature control

- Heats from ambient to 80°C
- 0.02°C precision and 0.1°C accuracy with <0.1°C overshoot

### Environmental control

- Sample chamber operated open or sealed for liquid flow
- Fluid volume up to 5 ml before engage, 1.5-2.55 ml while engaged and sealed
- Four 1/16" access ports and six 0.036" ports are provided for tubing connections

### Sample compatibility

- Samples up to 25 mm diameter and 2 mm thickness
- Supports up to 10 mm coarse sample translation with open cell
- Supports 1-3 mm coarse sample translation with sealed cell
- Optical access from both top and bottom with clearance for high NA objectives from below

### Materials

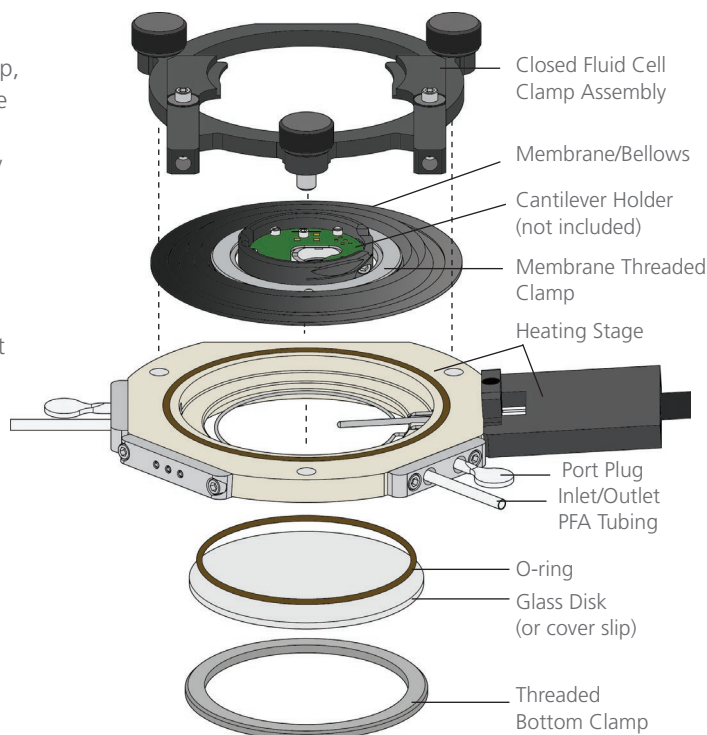
- PEEK, glass, silicone or FKM

### Cleaning

- Can be fully disassembled for cleaning
- Autoclavable, except for detachable temperature sensor

### System compatibility

- Compatible with all MFP-3D AFMs except the MFP-3D Origin™



Visit [www.AsylumResearch.com](http://www.AsylumResearch.com) to learn more

The foregoing datasheet is copyrighted by Oxford Instruments Asylum Research, Inc. Oxford Instruments Asylum Research, Inc. does not intend the datasheet or any part thereof to form part of any order or contract or regarded as a representation relating to the products or service concerned, but it may, with acknowledgement to Oxford Instruments Asylum Research, Inc., be used, applied or reproduced for any purpose. Oxford Instruments Asylum Research, Inc. reserves the right to alter, without notice the specification, design or conditions of supply of any product or service. Data Sheet 4 – 6/2014.

6310 Hollister Avenue  
Santa Barbara, CA 93117  
Voice +1 (805) 696-6466  
Toll free +1 (888) 472-2795  
Fax +1 (805) 696-6444

[www.AsylumResearch.com](http://www.AsylumResearch.com)  
[info@AsylumResearch.com](mailto:info@AsylumResearch.com)  
[sales@AsylumResearch.com](mailto:sales@AsylumResearch.com)



*The Business of Science®*