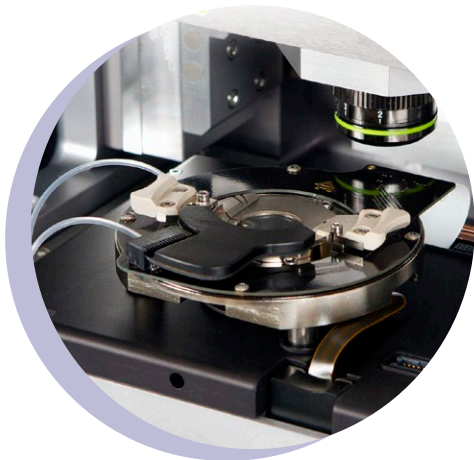


POWERFUL

Hassle-Free Environmental Control

Cypher ES enables hassle-free AFM under controlled environments



The **Cypher ES** features a unique modular scanner design that seamlessly integrates environmental control with normal operation.

All Cypher ES environmental control features are:

- Simple to set up and easy to use
- Uniquely designed to be robust for routine, worry-free operation
- Compatible with fast scanning to help observe dynamics, not just static images
- Compatible with blueDrive photothermal excitation for even simpler, more stable imaging

Choose a Sample Stage + Probe Holder to create your ideal environment

SAMPLE STAGES

- **Ambient**- Operate in gases or liquids at ambient temperature (*standard*)
- **Heating and cooling**- Operate in gases or liquids at temperatures between 0–120°C (*optional*)
- **Heating**- Operate in gases at temperatures from ambient to 250°C (*optional*)
- **Humidity sensing**- Operate in gases and measure the humidity in the cell (*optional*)

PROBE HOLDERS

- **Standard**- For most AFM modes in gas environments (*standard*)
- **Liquid Droplet**- For most AFM modes in a fixed liquid droplet (*optional*)
- **Liquid Perfusion**- Ports allow exchange and perfusion of liquid (*optional*)
- **Conductive AFM**- CAFM measurements in gases (*optional*)
- **Scanning tunneling microscopy**- For STM operation in gas environments (*optional*)
- **Electrochemistry Cell**- For EC-AFM (*optional*)

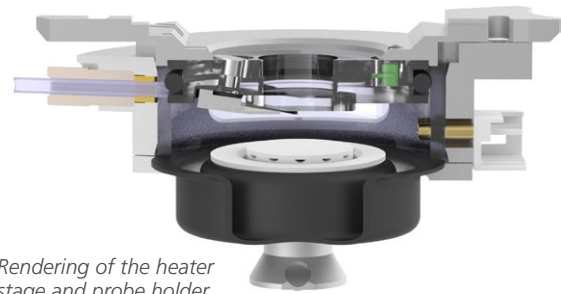
Need to Heat or Cool? Just Pick a Temperature

Cypher ES makes temperature control easy over a wide 0–250°C range

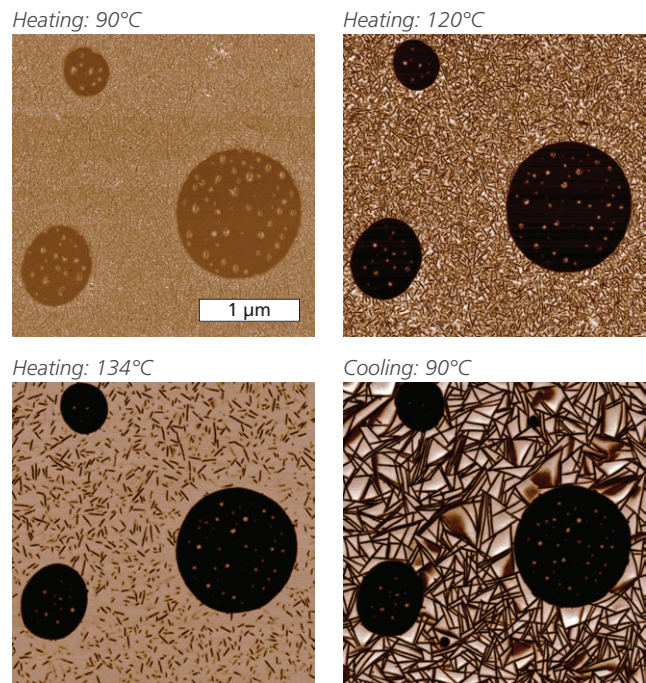
Two temperature control stages are available for the **Cypher ES**. The heater stage controls the sample temperature up to 250°C in gas environments. The cooler-heater stage enables sample temperatures from 0°C to 120°C in both gas and liquid environments.

No other AFM controls sample temperature this easily

- Fully sealed sample chamber can be purged with gas during imaging. For instance, flow an inert gas to prevent oxidation at high temperatures, or a dry gas to prevent condensation at low temperatures, or operate in a liquid droplet surrounded by saturated vapor to avoid net evaporation
- Low-drift design allows large temperature changes while maintaining the same imaging area
- All operating modes supported by the Cypher ES are compatible with the temperature control stages
- Temperature is controlled through software, manually or programmatically (e.g. ramp and soak cycles)
- Passive heat transfer and insulation eliminate the need for heat exchange liquids and pumps
- No external control boxes or other modules are required. No extra clutter or complexity



Rendering of the heater stage and probe holder



Melt and recrystallization dynamics in a syndiotactic polypropylene (sPP) and polystyrene (PS) polymer thin film

These four images were selected from the movie linked on the left. They show round, isolated domains of PS ($T_m \approx 240^\circ\text{C}$) surrounded by a continuous matrix of sPP ($T_m \approx 130\text{--}170^\circ\text{C}$). As the film is heated, the sPP crystallites begin to melt. Before they completely melt, the sample is allowed to cool. The remaining crystallites act as nucleation sites, rapidly recrystallizing and growing. The phase data channel is shown because it shows the best contrast between the two components. Recent work has shown that the loss tangent, which can be calculated from the phase data, begins to change as the polymer approaches a phase transition, even before obvious structural changes. See *J. Appl. Phys.* **119**, 134901 (2016).



AFM.oxinst.com/WatchCypher
Scan for the movie

VERSATILE

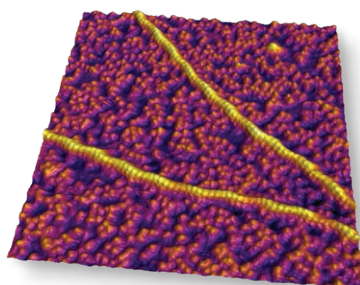
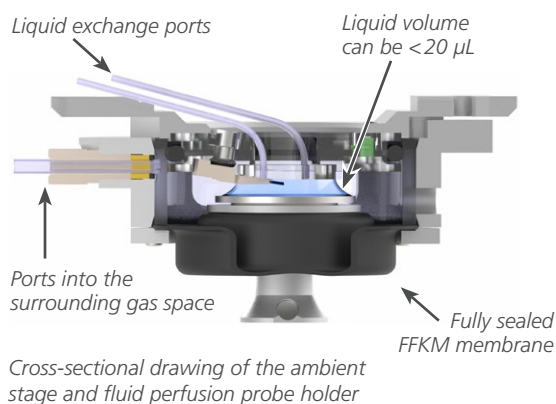
Simple and Safe AFM Measurements in Liquids

Cypher ES makes liquid setup easy and eliminates the risk of leaks

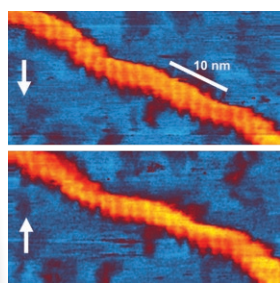
Cypher ES handles liquids with ease

Loading samples and adding liquid is easy, whether you prefer to operate in a fixed droplet or exchange/perfuse solutions. It's not a problem if a little liquid spills over; it will just get caught in the sealed membrane. If you want to be extra cautious, use a syringe to slightly pressurize the chamber and then monitor the integrated pressure sensor to verify it's fully sealed.

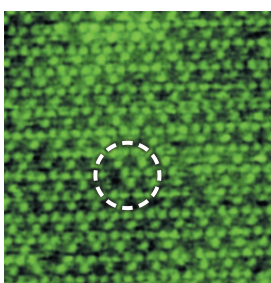
The Cypher ES is the only AFM with a fully sealed liquid cell that can be pressure tested.



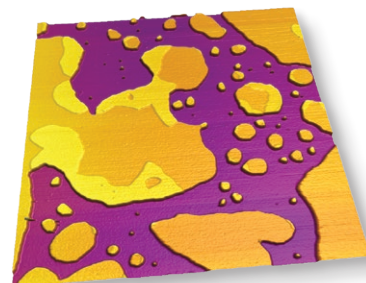
F-actin filaments, imaged in tapping mode, 340 nm scan. The measured helical pitch is 37.8 nm, consistent with literature values. Sample courtesy E. Reisler, UCLA.



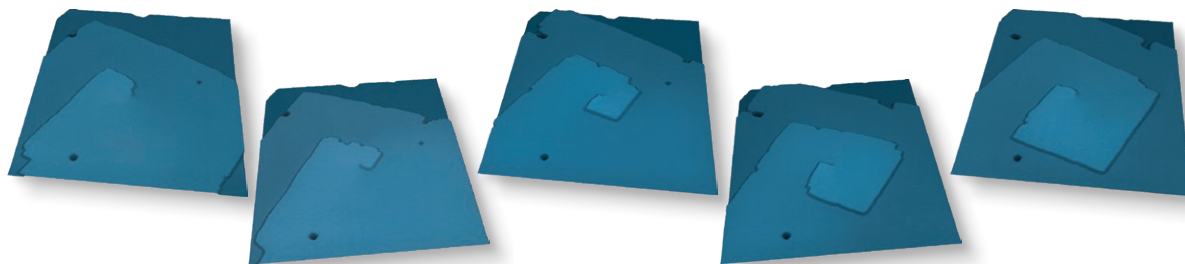
Successive scans of DNA in buffer scanning down (top) and back up (bottom). Both the major and minor grooves of the double helix are clearly resolved.



Bacteriorhodopsin protein membrane imaged in tapping mode in buffer, 75 nm scan. Missing subunits (white circle) are observed in some trimers.



Mixed lipid bilayers (50:50 DOPC:DPPC), imaged in tapping mode using blueDrive, 3 μm scan. The DPPC phase is ~ 1.3 nm thicker than the DOPC phase.



Crystal growth at a screw dislocation in calcite imaged in tapping mode with blueDrive, 500 nm scans. Calcium carbonate growth solution was perfused through the Cypher ES liquid perfusion cell while images were captured at high speed. The sequence here shows only about 30 seconds of the 45 minute experiment.



AFM.oxinst.com/WatchCypher

Scan for the movie