Agilent Temperature Control for 5100, 5400 & 5500 AFM

Data Sheet

Features and Benefits

- Precise temperature control from -30°C to 250°C with accuracy up to ±0.025°C offers lowest thermal drift available
- Open-access, modular design provides ease of use and quicker setup
- Simultaneous electrochemical and temperature control ensures full support of a broad range of applications
- Eliminates condensation with environmental control so there is no need to heat the AFM/SPM tip
- Works in air, liquid, and controlled environment to afford excellent versatility
- Patented design enables high-resolution imaging at extreme temperatures
- Rapid settling time helps yield results faster
- Three temperature ranges available to best meet application needs
  - Heating: ambient to 250°C
  - Single Peltier: 0°C to 40°C
  - Triple Peltier: -30°C to ambient

Overview

Agilent's temperature controller uses a patented thermal insulation and compensation design to deliver precise temperature control for high-resolution scanning probe microscopy (SPM). It allows imaging during temperature changes and is fully compatible with all imaging modes.

The unique sample plate has built-in temperature control and offers excellent thermal stability for SPM imaging. The temperature controller provides a rapid settling time, thereby allowing the sample plate to reach temperature quickly and hold constant temperature for long periods of time.

Temperature	Drift rate in X-Y	Drift rate in Z
Room Temp.	< 5 Å/min	<0.2 Å/min
100°C, 30-60 min. setting time	< 30Å/min	<2 Å/min
230°C, 30-60 min. setting time	<45 Å/min	<4 Å/min

Extremely low drift rate demonstrated at various temperatures

Agilent's temperature control design isolates the sample plate from the rest of the SPM system. An insulated ceramic fixture protects the surrounding apparatus from the effects of heating or cooling, thus providing the most precise, stable temperature control available for SPM. (Figure 1)

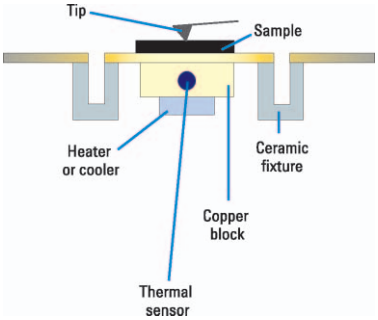

Figure 1. Patented design Ceramic fixtures insulate the stage from the sample plate and are symmetrically designed to compensate for thermal expansion and/or contraction. The Peltier device quickly heats or cools the stage to create a temperature gradient across the element

Agilent Technologies

Three Plates Available

Three temperature control plates are available. These plates can heat, cool, and precisely maintain extreme temperatures (from -30°C to 250°C; ±0.1°C or ±0.025°Cfor the 5100 & 5500 and 5º C to 250ºC for the 5400) during SPM imaging and spectroscopy. (Figure 2)

The Agilent temperature plates are easily added to any member of the AFM/SPM product lines. The plates are seamlessly integrated with the compact, rigid design of the microscope and top-down multi-purpose scanners in order to provide exceptional flexibility and ensure high-resolution results.

These three plates are also compatible with Agilent's environmental chambers, so vapor condensation can virtually be eliminated — even at extreme temperatures. The plates are compatible with Agilent's fluid cells as well.

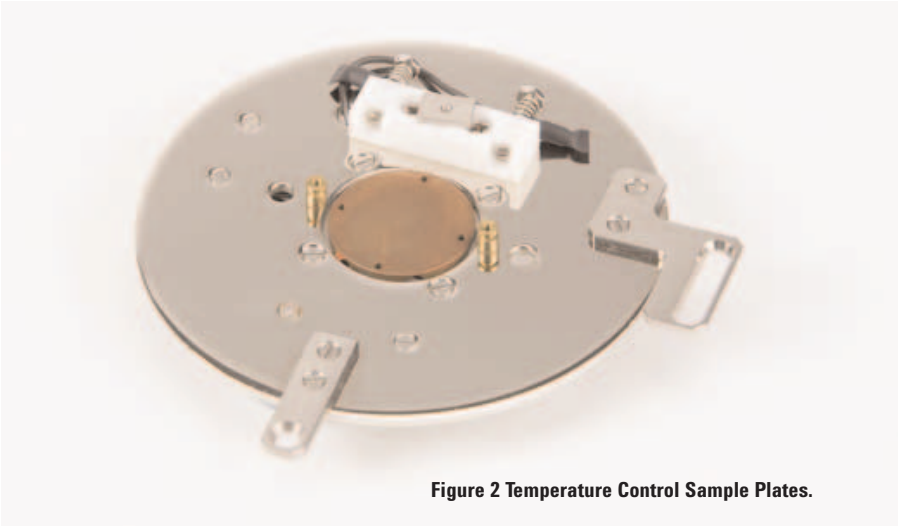

Figure 2 Temperature Control Sample Plates.

Temperature and Environmental Control

Agilent offers a complete solution for AFM and SPM imaging in ambient air or fluids under controlled temperature and environmental conditions. When used with our environmental isolation chamber or glove box, the Agilent temperature controller provides unparalleled capability for high-resolution imaging. Sample contamination and water condensation are eliminated.

Application Suitability

Temperature control plays a critical role in SPM research. Temperature can be used to modify molecular structures and accelerate, inhibit, and control the rates of many chemical reactions. In material sciences, temperature is used to control phase transition of materials such as co-polymer and crystal growth. Temperature also plays a very important role in life sciences. For example, physiological processes can be accelerated or decelerated, the structures of many biological molecules can be altered, and biomolecular binding events can be controlled all by heating or cooling.

Applications

- Biomolecular studies: decrease temperature to stabilize or anneal molecules; increase temperature to induce melting transition or denature molecules; perform experiments at physiological temperature
- Surface chemistry and polymer studies: control reaction rates; induce phase transitions; induce thermal degradation
- Corrosion studies: accelerate oxidation reactions; mimic corrosion conditions
- Studies of mechanical or electrical temperature-dependent properties in all applications

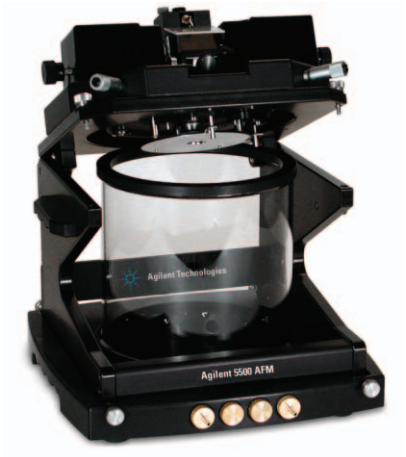

Figure 3. Industry Leading Environmental Control

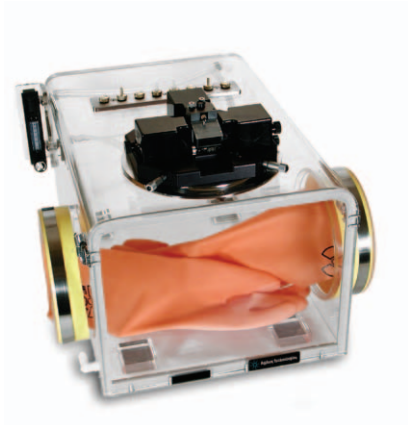

Figure 4. Minature Glove Box

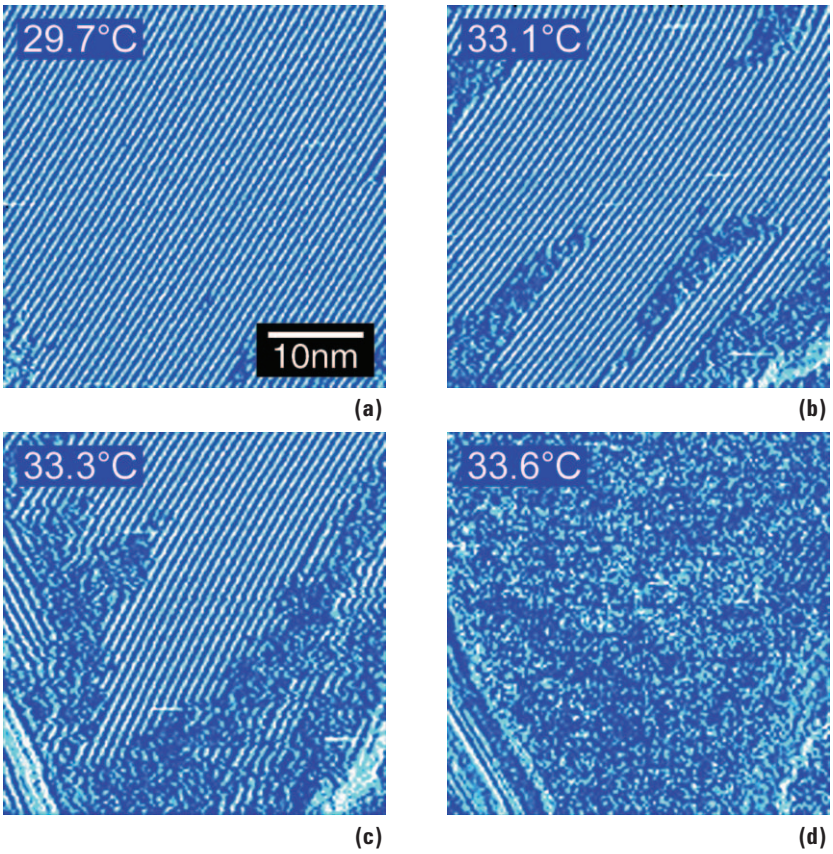

Figure 5. In situ images of 2,2′-bipyridine molecules on Au(111) in 50 mM H_2SO_4 under electrochemical and temperature control.

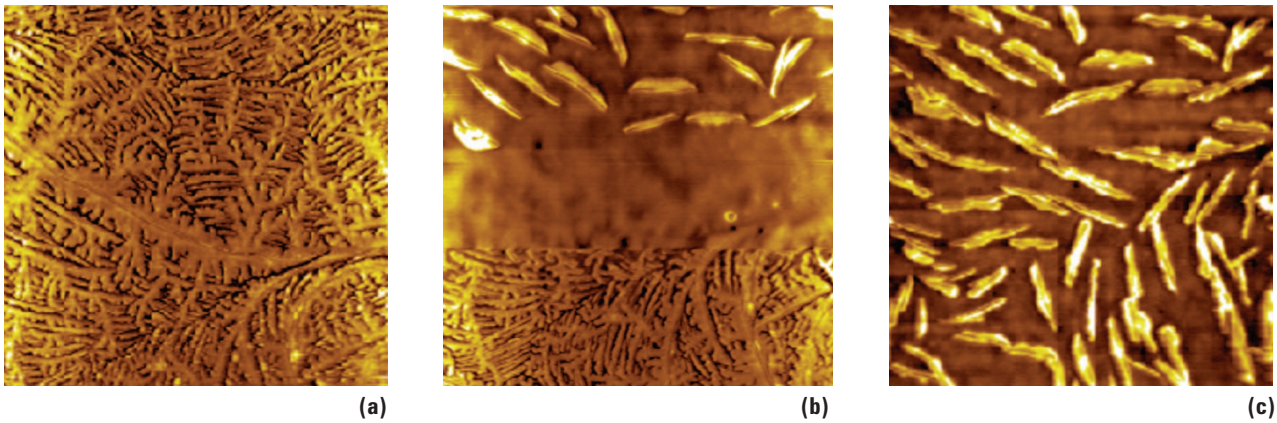

Figure 6. MAC Mode AFM image of paraffin at 120°C (a) before and (c) after phase transition, and at 126°C (b) during phase transition. 10µm x 10µm.

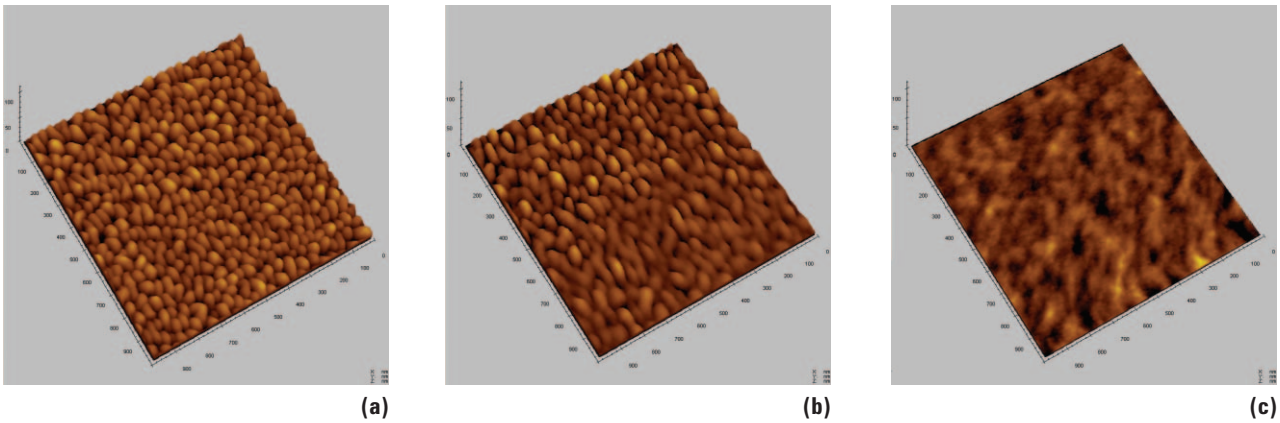

Figure 7. PMMA PS blend phase transition at Tg (Image 1) (a) at room temperature; image 2 (b) at 212ºC Image 3 (c) at 218ºC

AFM Instrumentation from Agilent Technologies

Agilent Technologies offers high-performance, modular AFM solutions for research, industry, and education. Exceptional worldwide support is provided by experienced application scientists and technical service personnel. Agilent's leading-edge R&D laboratories are dedicated to the timely introduction and optimization of innovative, easy-to-use AFM technologies.

---

www.agilent.com

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

www.agilent.com/find/contactus

Phone or Fax

United States:
(tel) 800 829 4444 (fax) 800 829 4433

Canada:
(tel) 877 894 4414 (fax) 800 746 4866

China:
(tel) 800 810 0189 (fax) 800 820 2816

Europe:
(tel) 31 20 547 2111

Japan:
(tel) (81) 426 56 7832 (fax) (81) 426 56 7840

Korea:
(tel) (080) 769 0800 (fax) (080) 769 0900

Latin America:
(tel) (305) 269 7500

Taiwan:
(tel) 0800 047 86 (fax) 0800 286 331

Other Asia Pacific Countries:
(tel) (65) 6375 8100 (fax) (65) 6755 0042
Email: tm_ap@agilent.com
Revised: 09/14/06

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2006
Printed in USA, November 17, 2006
5989-6092EN

www.agilent.com/find/afm

Agilent Technologies