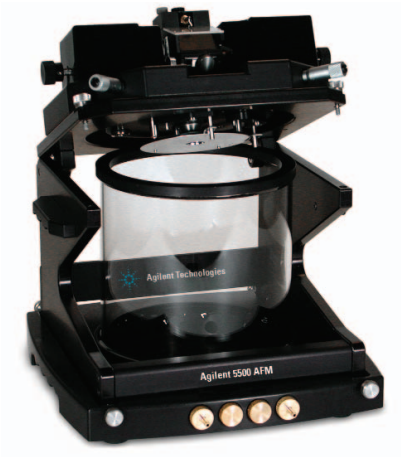
Agilent Environmental Isolation Chamber

5500 and 5100 AFM/SPM

Data Sheet



Features and Benefits

- Simple, versatile chamber designed for a variety of experimental conditions, including extremely harsh conditions
- Full compatibility with Agilent's modular AFM/SPM microscopes offers simple upgrade path for extended capabilities
- Convenient access to all microscope controls affords excellent ease of use
- Quick, easy setup facilitates efficient research
- Sample protected from the external environment to prevent damage and contamination
- Delivers reproducible data to ensure consistent, reliable results
- No condensation while cooling preserves sample integrity during temperature-dependent studies
- Eight inlet/outlet ports provide excellent flow-through control
- Dry gas and humidity control facilitates effective work with materials such as polymers
- Saturated vapor control prevents evaporation of imaging buffer
- Sealed environment permits experiments involving reactive or harsh gases

Overview

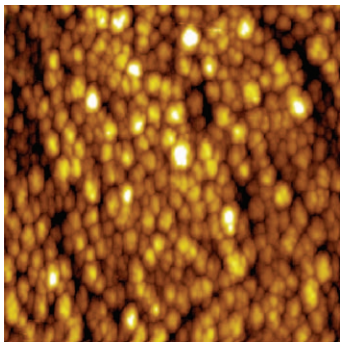
Agilent's environmental isolation chamber (EIC) is unique in the industry. Specifically developed to meet the many requirements of intricate, demanding atomic force microscopy (AFM), it offers researchers an extraordinarily reliable tool for imaging in a controlled environment. Agilent's EIC is particularly useful for experiments involving polymers, films, and electrochemistry.

The EIC mounts directly to the Agilent 5500 or 5100 AFM/SPM microscope and provides a hermetically sealed sample compartment that is completely isolated from the rest of the system. Eight inlet/outlet ports permit the flow of many different gases into or out of the sample area. The EIC is compatible with Agilent's temperature controller and patented MAC Mode®, as well as with an array of other powerful options from Agilent.

Agilent's scanners reside outside the EIC, so they are protected from contamination, harsh gases, solvents, caustic liquids, and other damaging experimental conditions. With the EIC, humidity levels can be controlled, oxygen levels monitored and controlled, and reactive gases

easily introduced into and purged from the sample chamber. The flexibility of the environmental system permits control of several distinct parameters during the course of the same experiment.

The ability to control the environment offers many significant benefits to SPM researchers. Environmental control keeps harsh elements compartmentalized, controls experimental dynamics for the most sensitive materials, and isolates even non-toxic samples from the ambient environment. It also ensures the ability to obtain meaningful, reproducible results.



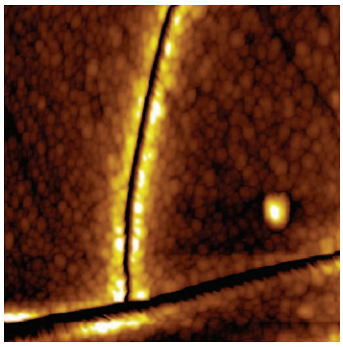


Figure 2. Si-Sn films on copper electrode in lithium battery (a) before and (b) after cycling for 30 hours. 37µm x 37µm.

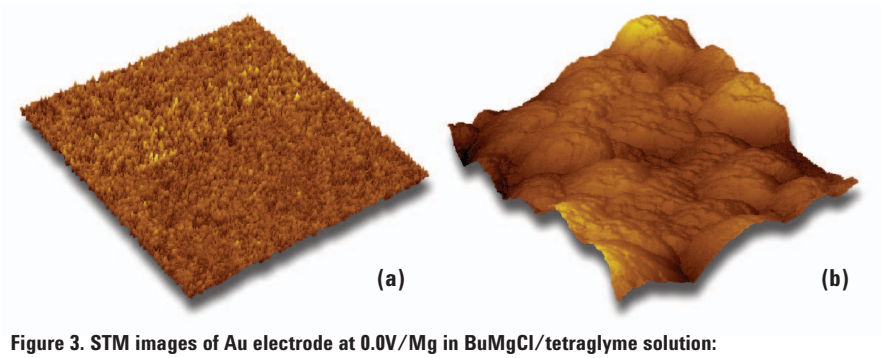


Figure 3. STM images of Au electrode at 0.0V/Mg in BuMgCl/tetraglyme solution: (a) before and (b) after Mg deposition. 5µm x 5µm.

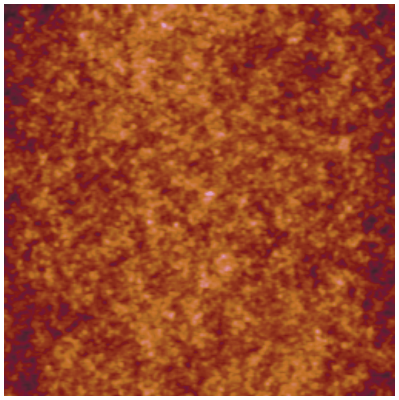
Sample Isolation

The hermetically sealed Agilent environmental isolation chamber allows high-resolution imaging of oxygen-sensitive materials, such as lithium film for battery research. The environmental control provided by the EIC is also an essential requirement when working with a reactive gas, such as hydrogen in fuel cell research. When working with polymers, control of environmental parameters like humidity is key to achieving results. Furthermore, SPM studies that demand constant buffer concentration and an oxygen-free environment are important for research in electrochemistry.

Additionally, the Agilent EIC is excellent for dry gas environments that remove moisture, prevent contamination, and reduce adhesion from capillary effects (as in force measurement studies of proteins). In temperature-dependent studies, the EIC is crucial for condensation control. With the Agilent EIC, users are able to control vapor saturation and eliminate evaporation from solvents such as non-aqueous buffer.

Environmental control also provides benefits for imaging under less extreme conditions. The enclosed environment provides an isolated chamber immune from disturbance caused by changes in airflow and acoustic noise that may impair the quality of image results. For example, minor variations in air currents, humidity levels, gas concentrations, and temperature can greatly influence tip-to-sample interactions. Since so many environmental factors influence interactions at the tip-sample interface, CSAFM (conductivity mapping), LFM (lateral force microscopy), and even contact AFM can all benefit from environmental control.

Environmental Isolation Chamber



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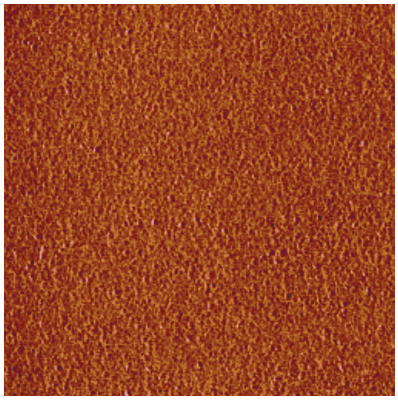

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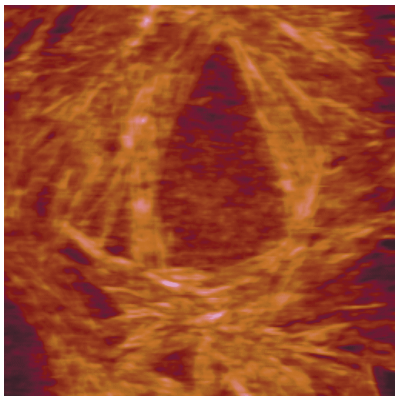

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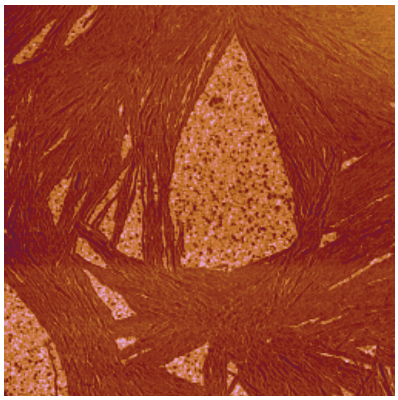


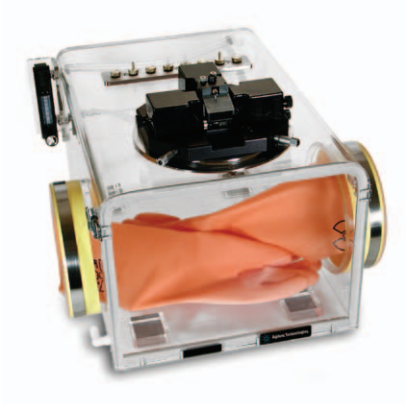
(d)

Figure 4. AFM images of polyvinyl alcohol (a) topography and (b) lateral force at 85% RH, and (c) topography and (d) lateral force at 10% RH. 5µm x 5µm.

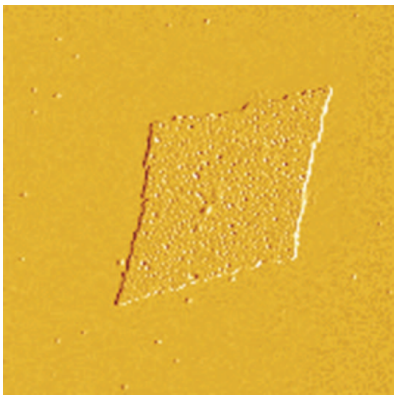
Complete Environmental Solution

A miniature glove box can be attached directly to the microscope body, offering even greater environmental control. The clear acrylic box with a stainless steel adapter ring has eight threaded ports for gas inlet/outlet. Air- or moisture-sensitive samples can be precisely loaded on the microscope without ever exposing them to the external atmosphere and the ante-chamber allows the introduction of samples into the inert environment. Since the sample, piezo, and electronic parts are totally isolated from the imaging environment, it is possible to perform experiments under very reactive conditions without damaging the system or the sample.

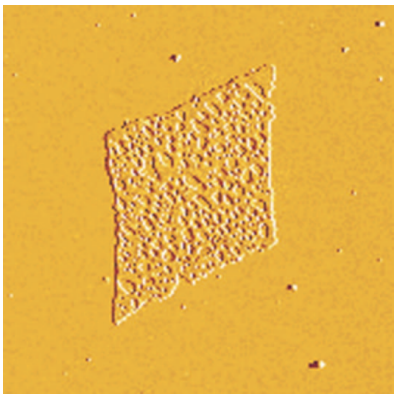
Agilent's glove box works with the Agilent 5500 and 5100 AFM/SPM microscopes to offer the only systems in the industry that deliver high-resolution imaging with precise control of environmental conditions. Using these technologies in concert, SPM scientists have the ability to explore new fields of research with unrivaled ease.



Miniature Glove Box



(a)



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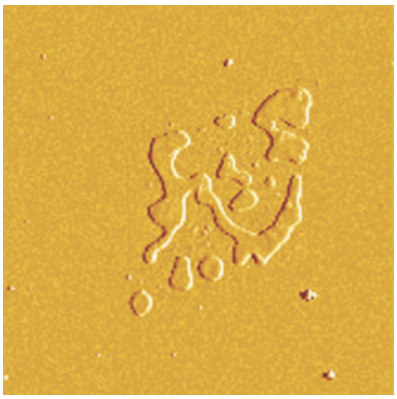

(c)

Figure 1. MAC Mode AFM images of a polyethylene single crystal at (a) 85°C, (b) 110°C, and (c) 130°C. 2µm x 2µm.

AFM Instrumentation from Agilent Technologies

Agilent Technologies offers high-precision, 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 and easy-to-use AFM technologies.

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