

MFP-3D Infinity

Endless Applications. Unlimited Potential.



Performance / Versatility / Support



The Business of Science®



MFP-3D Infinity

Endless applications. Unlimited potential.

The Asylum Research **MFP-3D Infinity™** is the latest, most advanced AFM in the MFP-3D family. It combines the renowned versatility of its predecessor with new higher performance, powerful new capabilities, and a new system architecture designed for future expansion. The MFP-3D Infinity will make your routine imaging tasks even easier and faster to complete while also supporting your most ambitious research projects.

The MFP-3D Infinity Is Everything That A Great Research AFM Should Be

- The flagship of the MFP-3D AFM family
- Stunning high performance for a large sample AFM
- Options and flexibility to turn your ideas into results
- Simple to use without sacrificing capability
- Support that our users routinely cite as best in the AFM industry



Highly Evolved

Exciting new capabilities and stunning performance

The MFP-3D Infinity has evolved extensively from the MFP-3D Classic design, featuring major improvements to both hardware and software.

Software

GetStarted™

- Automatically determine optimal imaging parameters for rapid, simple tapping mode imaging

Fast Force Mapping

- Accurate, reliable force mapping from the force spectroscopy leader

Electronics

Infinity Controller

- High-speed, low-noise electronics first designed for our Cypher™ AFMs
- Flexible signal switching and programmable logic enable future expansion options
- Performance is optimized by keeping the most critical electronics close to the AFM

AFM

Head

- Sub-atomic Z sensor noise for accurate topography at any scale, <35pm noise
- Higher Z bandwidth for improved force control and faster imaging
- Higher deflection bandwidth enables bimodal techniques at resonances up to 7MHz
- Lightweight aluminum design is easy to handle

Scanner

- Lower X&Y sensor noise for higher resolution closed-loop imaging, <150pm noise

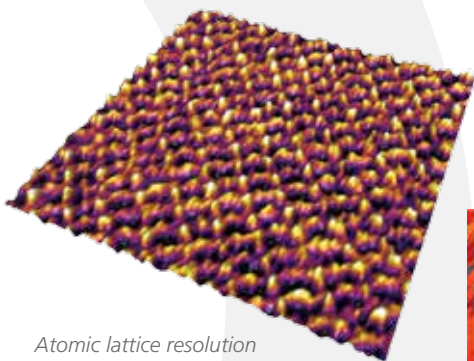
Base

- Redesigned optics provide higher resolution in both top and bottom-view options

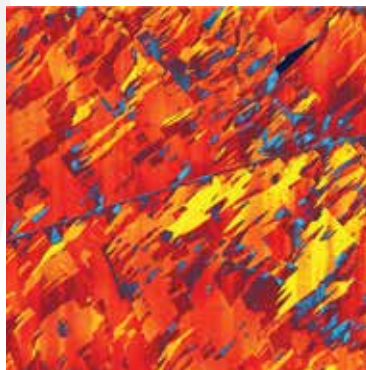
System Integration

Acoustic Enclosure

- Engineered for performance and superior ergonomics
- Integrated accessory expansion module bay reduces clutter and costs



Atomic lattice resolution on calcite, imaged with AC mode in water, 8nm scan.



Atomic steps imaged on gypsum. Surface reconstruction was imaged using AC mode in air after brief exposure to water. Z Sensor topography data is shown, 45µm scan.

GET RESULTS

Simple. Capable. Flexible.

The MFP-3D Infinity adapts to the various needs of a busy lab

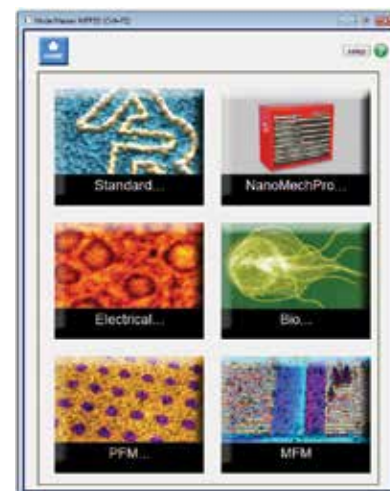
Not all AFM users are AFM experts and even the experts appreciate keeping operation as simple as possible. At Asylum Research we strive to develop ease of use improvements that offer genuine advantages to both groups without compromising capability or flexibility.

ModeMaster™

- Automatically configures the software for the selected mode
- Supports both basic and advanced imaging techniques
- Makes getting started simpler and faster

GetReal™

- Calibrates the cantilever sensitivity and spring constant
- Automatic process is fast, simple, safe and accurate
- Helps make AFM results more consistent and more quantitative



One click starts the calibration

Measures thermal noise spectrum

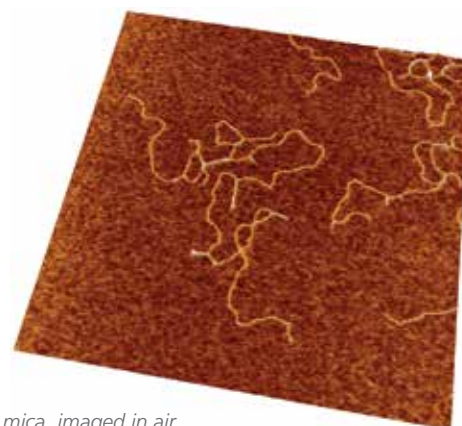
Calibrates the cantilever spring constant

Calibrates the cantilever sensitivity

Fully calibrated probe is ready to use!

GetStarted

- Automatically sets imaging parameters (setpoint, gain, scan rate)
- Uses normal tapping mode – not a new mode or gimmick
- Predictive algorithm is more robust than iterative optimization approaches that diverge to slow scan rates and high forces
- Produces high quality data from the very first scan line – no tip or sample damage while waiting for “scan optimization”



DNA on mica, imaged in air using tapping mode with GetStarted, 2µm scan.

BEYOND TOPOGRAPHY

Comprehensive Nanomechanics Toolkit

Measure viscoelastic properties including both storage and loss moduli

It is important to choose the best tool for the job and to compare results from more than one technique. These are a few examples from the Asylum NanomechPro Toolkit:

AM-FM Viscoelastic Mapping Mode

- Tapping mode technique that measures both storage modulus, E' , and loss modulus, E''
- Good for samples from 50kPa to 300GPa
- Fast – same speed as regular tapping mode

Contact Resonance Viscoelastic Mapping Mode

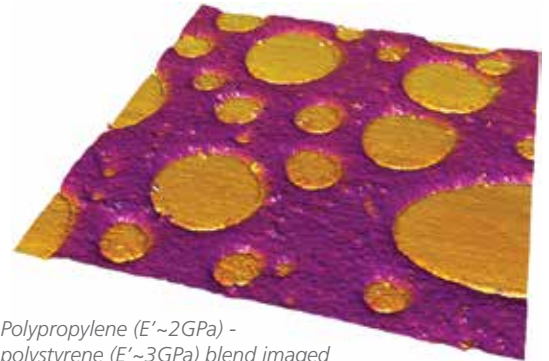
- Contact mode technique that measures both storage modulus, E' , and loss modulus, E''
- Good for samples from 1GPa to 300GPa
- Speed varies from 0.1 - 2Hz line scan rates

Fast Force Mapping Mode

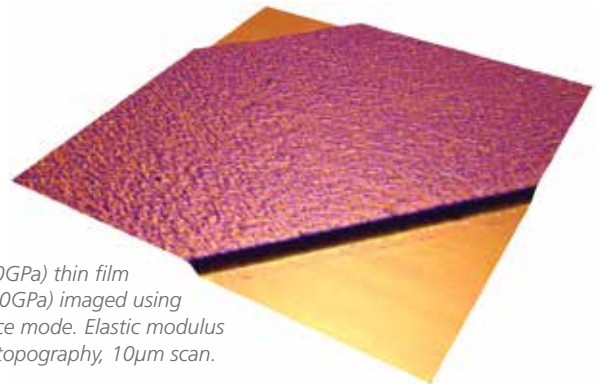
- Force-distance mapping mode that operates at up to 300Hz pixel rate
- Captures every force curve in the image – no missing curves or hidden data manipulation
- Realtime and offline analysis models can be applied to calculate modulus, adhesion and other properties. Models are fully user-accessible for modification.
- Good for samples from 10kPa to 100GPa

Learn more:

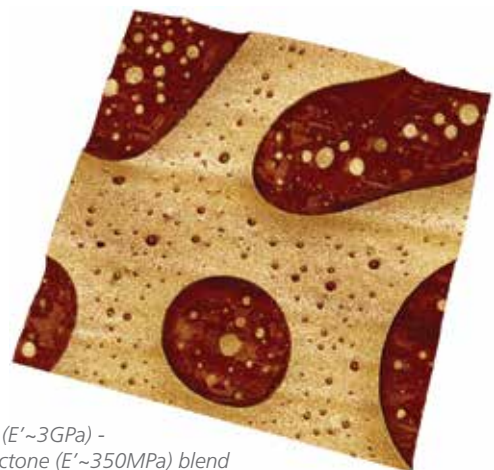
www.AsylumResearch.com/NanomechPro



Polypropylene ($E' \sim 2\text{GPa}$) - polystyrene ($E' \sim 3\text{GPa}$) blend imaged using AM-FM mode. Elastic modulus is shown on 3D topography, 8 μm scan.



Titanium ($E' \sim 110\text{GPa}$) thin film on silicon ($E' \sim 160\text{GPa}$) imaged using contact resonance mode. Elastic modulus is shown on 3D topography, 10 μm scan.



Polystyrene ($E' \sim 3\text{GPa}$) - polycaprolactone ($E' \sim 350\text{MPa}$) blend imaged with fast force mapping. Elastic modulus is shown on 3D topography, 4 μm scan.

BEYOND TOPOGRAPHY

Nanoelectrical and Electromechanical Tools

Measure current, permittivity, conductivity, surface potential, piezoelectric response, electrochemical strain, and more

Electric Force Microscopy (EFM)

- Maps the electrostatic force gradient between tip and sample

Kelvin Probe Force Microscopy (KPFM)

- Measures sample surface potential

Conductive AFM

- Measure DC current from 1pA to >10 μ A
- Dual Gain version spans the entire range

Current Mapping with Fast Force Mapping Mode

- Measure current with Fast Force Maps to reduce lateral forces
- Collect the entire current vs. Z curves

Scanning Microwave Impedance Microscopy (sMIM)

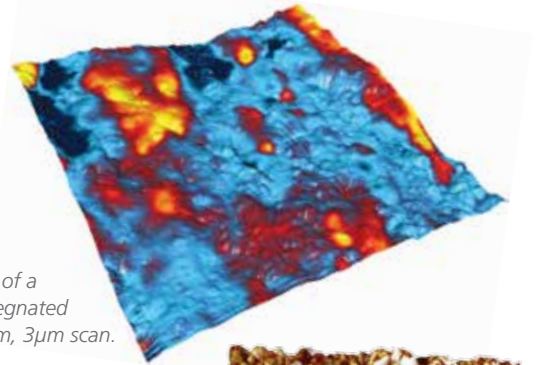
- Measure both permittivity and conductivity simultaneously
- Operate on insulating, semiconductor and conductive materials

Electrochemical Strain Microscopy

- Exclusive capability to probe electrochemical reactivity and ionic flows in energy storage and energy generation materials
- Directly measures effect of ionic currents on mechanical strain

Piezoresponse Force Microscopy (PFM)

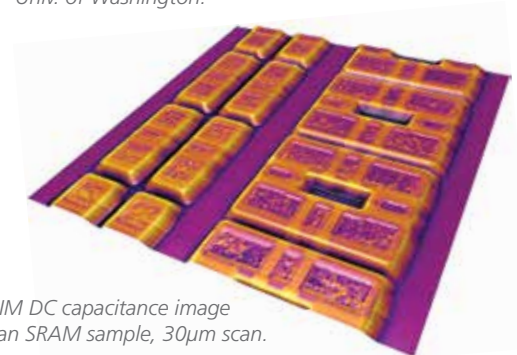
- High sensitivity and crosstalk-free measurements
- Higher sensitivity is enabled by operating at high voltages (up to 150V) and at the tip-sample resonance (DART mode)



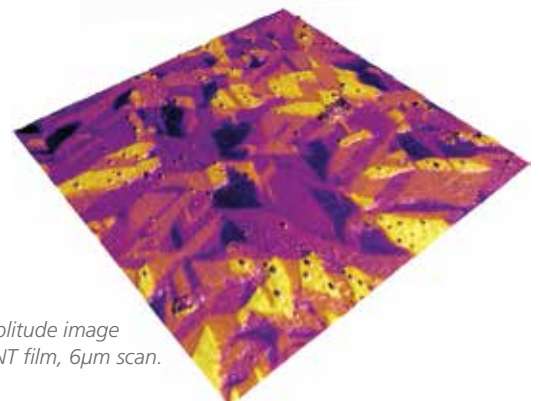
KPFM image of a carbon-impregnated polyolefin film, 3 μ m scan.



CAFM image of Europium-doped ZnO sample, 2 μ m scan. Sample courtesy of the Krishnan Lab, Univ. of Washington.



sMIM DC capacitance image of an SRAM sample, 30 μ m scan.



PFM amplitude image of a PMNT film, 6 μ m scan.

SPECIFICATIONS

Unrivaled Capability, Power, Performance

Asylum Research is the technology leader in atomic force microscopy

Precise, Ultra-low Noise Closed-loop Scanner

X&Y range 90µm

X&Y sensors <150pm noise

Z range >15µm (>40µm option)

Z sensor <35pm noise

Low-noise, High Bandwidth Optical Lever

Cantilever deflection sensing uses an inverted configuration (incident beam off-vertical) to dramatically reduce interference from light reflected by the sample.

Light source Low-coherence infrared (860nm) superluminescent diode, FDA/IEC Class 1M (Non-hazardous)

DC detector noise <10pm

Detector bandwidth 7MHz

High Resolution System Performance

DC height noise <20pm

AC height noise <20pm

Optics

Top-view optics (included)

Resolution 3µm

Field of view 2200×1600µm with digital pan & zoom

Camera Color, 5 megapixel

Bottom-view optics (optional)

Resolution 1.5µm

Field of view 2000×1500µm with digital pan & zoom

Camera Color, 10 megapixel

Illumination (top included, bottom optional)

Type Köhler with aperture and field diaphragms

Source White LED fiber-coupled with SMA connector

Intensity Software controlled

Sample Stage

Sample size Up to 80mm diameter

Sample thickness Up to 10mm (up to 27mm option)

(Noise measurements are quoted as the average deviation measured with a 1kHz bandwidth over a full 10 second period. Specifications assume required vibration and acoustic isolation in an appropriate laboratory environment.)

Acoustic and Vibration Isolation Enclosure

A custom enclosure fully integrates both acoustic and vibration isolation, part of the Infinity controller electronics, and the accessory expansion module bay.

Vibration isolation Active vibration isolation provides superior damping without the instability and compressed air requirements of passive isolation tables.

Acoustic isolation Rigid, highly damped design provides effective isolation of acoustic noise in typical laboratories.

Ergonomics The door of the enclosure effortlessly swings to the side to open and is reversible to accommodate different laboratory floor plans. A smaller access window allows users to reach into the enclosure to make adjustments.

Included Operating Modes

Contact mode; lateral force mode; tapping mode (AC mode); phase imaging; loss tangent imaging; AC mode with Q control; Dual AC™, Dual AC Resonance Tracking (DART); MicroAngelo (nanolithography / nanomanipulation); electric force microscopy (EFM); Kelvin probe force microscopy (KPFM); magnetic force microscopy (MFM); piezoresponse force microscopy (PFM); DART PFM; vector PFM; switching spectroscopy PFM; force curve mode; ramp mode; force mapping mode (force volume)

Optional Operating Modes

AM-FM Viscoelastic Mapping Mode; Contact Resonance Viscoelastic Mapping Mode; Fast Force Mapping Mode; instrumented nanoindentation; force modulation; Scanning Thermal Microscopy (SThM); Ztherm™ Modulated Thermal Analysis; Conductive AFM (CAFM) with ORCA™ and Eclipse™ mode; current mapping with Fast Force Mapping; Nanoscale Time Dependent Dielectric Breakdown (nanoTDDB); high voltage PFM; Band Excitation; Electrochemical Strain Microscopy (ESM); iDrive™ (magnetically actuated AC mode in liquid); Scanning Tunneling Microscopy (STM)

Service and Support

Warranty Full two-year comprehensive warranty

Support No-charge technical support and expert applications support for the lifetime of the AFM

VERSATILE

Drive Your Research To the Next Level

Asylum Research offers the widest range of innovative accessories

The MFP-3D Infinity accessories are carefully designed to provide unique capabilities while maintaining AFM performance and ease of use. Many have been designed in partnership with our customers to ensure that they meet the practical needs of real research applications.

Temperature and Environmental Control

- **PolyHeater** – heating up to 400°C
- **CoolerHeater** – heat or cool -30° to 120°C
- **Humidity Sensing Cell** – sealed humidity chamber

External Driving Forces

- **Variable Field Module 2** – magnetic fields up to 0.8T
- **NanoRack** – tensile or compressive stress up to 80N
- **High Voltage Field** – apply up to $\pm 150V$
- **Probe Station** – apply your own electric signals to samples

Controlled Gas or Liquid Environments

- **Closed Fluid Cell** – perfuse gases or liquids
- **Fluid Cell Lite** – operate in liquid without perfusion
- **Electrical Closed Cell** – controlled gas environment
- **BioHeater** – coverslip-based heater for liquids
- **Petri Dish Holder** – minimizes evaporation from dish
- **Petri Dish Heater** – also heats dish up to 80°C
- **MicroFlow Cell** – small volume fluid exchange
- **Electrochemistry Cell** – also available with heating



Asylum Research also sells a complete range of AFM probes

www.AsylumResearch.com/ProbeStore

Learn more about these accessories and the full range of capabilities:

www.AsylumResearch.com/MFP3D-accessories

Visit www.AsylumResearch.com/Infinity to learn more about Infinity and get a quote

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