Hysitron PI 80 SEM PicoIndenter

Core Instrument for In-Situ Nanomechanical Testing

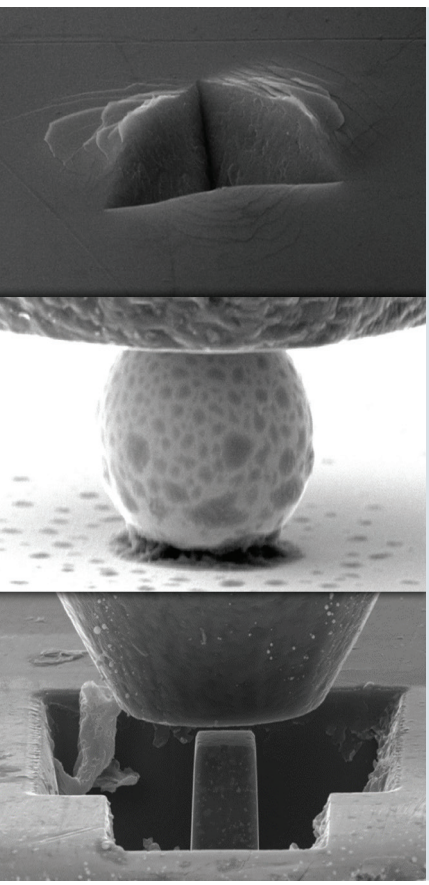
Bruker's PI 80 SEM PicoIndenter is a depth-sensing nanomechanical test instrument specifically designed to augment the imaging capabilities of scanning electron microscopes (SEM, FIB/SEM, PFIB). With this base nanoindentation tool, it is possible to perform quantitative in-situ nanomechanical testing while simultaneously imaging with the SEM. Featuring Bruker's industry-leading capacitive transducer, PI 80 provides exceptional performance and superior stability at the nanoscale. Its compact, low-profile design makes the instrument ideally suited for small-chamber SEMs, as well as standalone Raman and optical microscopes, beamlines, and more. With its combination of features, testing modes, and optional accessories, the PI 80 SEM PicoIndenter offers an excellent introduction to advanced nanomechanical property testing inside your SEM.

Hysitron PI 80 Features

- Quantitative nanomechanical property measurements—hardness, elastic modulus, yield strength, fracture toughness, creep exponent, and stress relaxation
- Range of mechanical testing modes, including indentation, compression, bending, tension, and fatigue
- Max load of 10 mN; displacement up to 5 µm with industry-leading noise floors
- Multiple control modes, including closed-loop displacement, closed-loop load, and open-loop load
- Proprietary transducer technology featuring electrostatic actuation and capacitive displacement sensing
- Interchangeable probes in a variety of geometries

Designed to Augment Your SEM

With the compact form of Bruker's capacitive transducer, Hysitron PI 80 can be mounted directly onto the SEM stage without being a permanent fixture in the microscope. The sample positioning stages accommodate samples up to 20 mm thick while providing precise sample positioning across more than 3 mm in all three directions (XYZ). In addition, the mechanical coupling of the sample stage and the transducer provides a stable, rigid platform for nanomechanical testing. Overall, this in-situ instrument enables stage tilt and working distance optimized for complementary SEM imaging and standard nanomechanical testing.



Core Capabilities with Hysitron PI 80 Modes

Nanoindentation: Precise lateral positioning and nanoscale load and depth control allow quantitative determination of fundamental mechanical properties (e.g., hardness and elastic modulus) for a wide variety of materials.

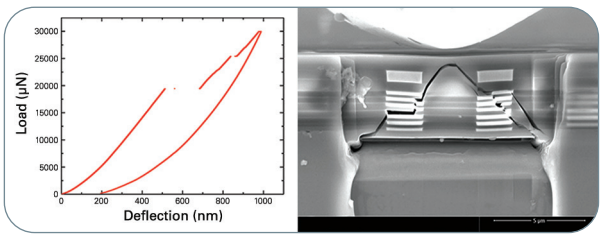
Tension: Direct-pull and push-to-pull (PTP) testing of dog-bone specimens, thin films, or nanowires provides in-situ measurements of stress-strain behavior in low dimensional materials not easily tested by traditional means.

Bending: Stiffness and fracture toughness measurements for single-phase, composite, or layered materials are a straighforward process, captializing on the SEM's precise imaging of loading alignment and specimen size.

Compression: Pillars, particles, and other small-scale structures can be compressed to measure stress-strain behavior and yield properties while observing deformation mechanisms in real-time. Proper tip alignment is verified using SEM imaging.

Fatigue/nanoDynamic: Powerful electronics and control algorithms obtain a truly continuous measurement of mechanical properties as a function of depth, frequency, and time. nanoDynamic is ideally suited for in-situ depth profiling, creep, and fatigue testing.

Electrical Contact Measurement: Electrical property changes of a sample under applied load can be characterized, which allows for in-situ testing of piezoelectrical materials, phase change memory, bulk metallic glasses, CNT composites, silicon, batteries, and energy storage materials.



Discontinuities in the load-displacement data are correlated to the onset of fracture observed in a FIB-milled beam containing copper interconnects and brittle dielectric material.

Mechanical Property Insights at the Nanoscale

Simultaneous mechanical measurements and SEM imaging enables a complete understanding of material deformation behavior. The in-situ mechanical data acquired with the Hysitron PI 80 instrument is perfectly synchronized with SEM data and displayed in side-by-side video format for real-time analysis.

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