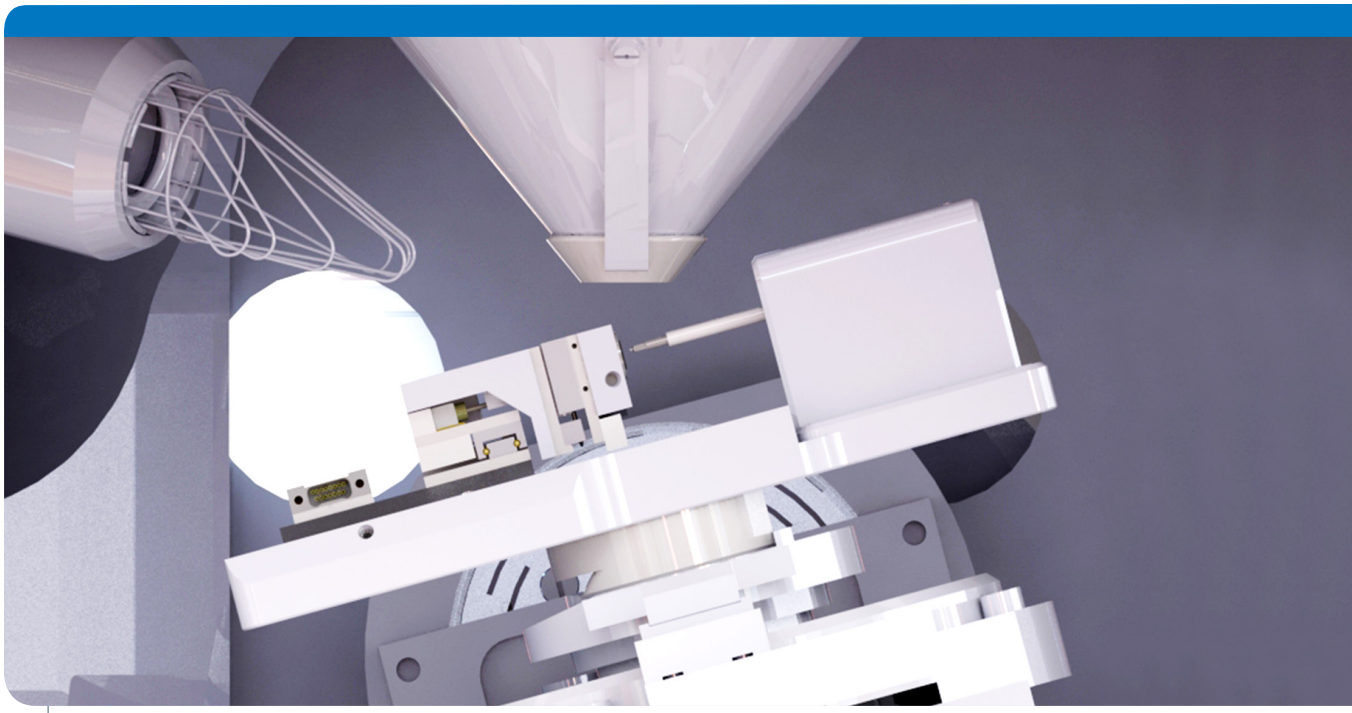


Hysitron PI 85L SEM PicoIndenter

● Versatile In-Situ Mechanical Testing Platform

Bruker's SEM PicoIndenter® instruments are depth-sensing nanomechanical test systems that are specifically designed to leverage the advanced imaging capabilities of scanning electron microscopes (SEM, FIB/SEM). With these systems, it is possible to perform quantitative nanomechanical testing while simultaneously imaging with the SEM. The Hysitron® PI 85L is a next-generation dedicated in-situ nanomechanical test instrument that is designed for use in SEM but also is suitable for a variety of platforms and environments. Featuring Bruker's capacitive transducer working in conjunction with an extremely fast 78 kHz control system, the system provides exceptional performance and superior stability at nanoscale. The compact, low-profile design makes the system ideally suited for small-chamber SEMs, Raman and optical microscopes, beamlines, and more.

Hysitron PI 85L Features

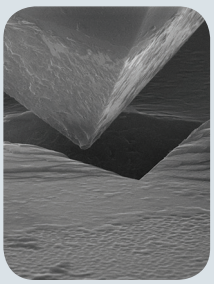
- Quantitative measurement of nanomechanical properties—hardness, elastic modulus, yield strength, fracture toughness, creep, and stress relaxation
- Low-profile design ideal for SEMs, Raman and optical microscopes, beamlines, and more
- Unique transducer technology featuring electrostatic actuation and capacitive displacement sensing
- Range of mechanical testing modes, including indentation, compression, bend, tensile, and fatigue
- Interchangeable probes in a variety of geometries to meet the demands of different testing modes
- Multiple control modes, including closed-loop displacement control, closed-loop load control, and open-loop load control
- Proprietary Q-Control software for active dampening of vibrations and greater stability at nanoscales

Designed for Performance

With the compact form of Bruker's capacitive transducer, the Hysitron PI 85L can be mounted directly onto the SEM stage without being a permanent fixture in the microscope. The sample positioning stages of the system are designed to accommodate samples up to 10 mm thick while providing precise sample positioning with >3 mm range 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 low-profile instrument allows for maximum stage tilt and minimum working distance for optimal imaging during testing.

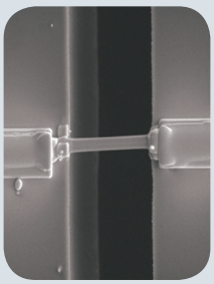
Hysitron PI 85L is driven by Bruker's dedicated, Performech® Advanced Control Module, which boasts an ultra-low noise floor and a 78 kHz digital feedback routine to capture even the most transient deformation phenomena.

The Hysitron PI 85L Testing Modes



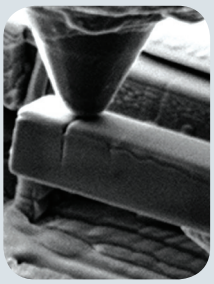
Nanoindentation

Precise lateral positioning and nanoscale load and depth control allow for quantitative determination of such fundamental mechanical properties as hardness and elastic modulus for a wide variety of materials.



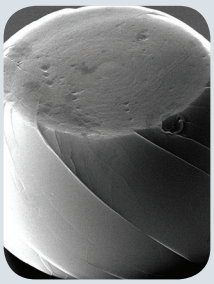
Tensile

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



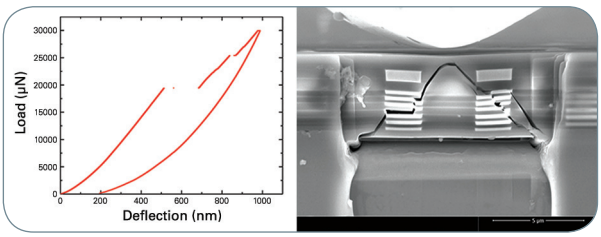
Bending

Accurate loading alignment and specimen size measurement using SEM imaging enables straightforward bending stiffness and fracture toughness measurements for single-phase, composite, or layered materials.



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.



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.

Vanstreels, et. al., *Appl. Phys. Lett.* 105, 213102 (2014)

Gain Insights Into Mechanical Properties at the Nanoscale

In-situ mechanical data acquired with the Hysitron PI 85L instrument is synchronized with SEM imaging and displayed in side-by-side format. Simultaneous mechanical measurements and SEM imaging enables a complete understanding of material deformation behavior.

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