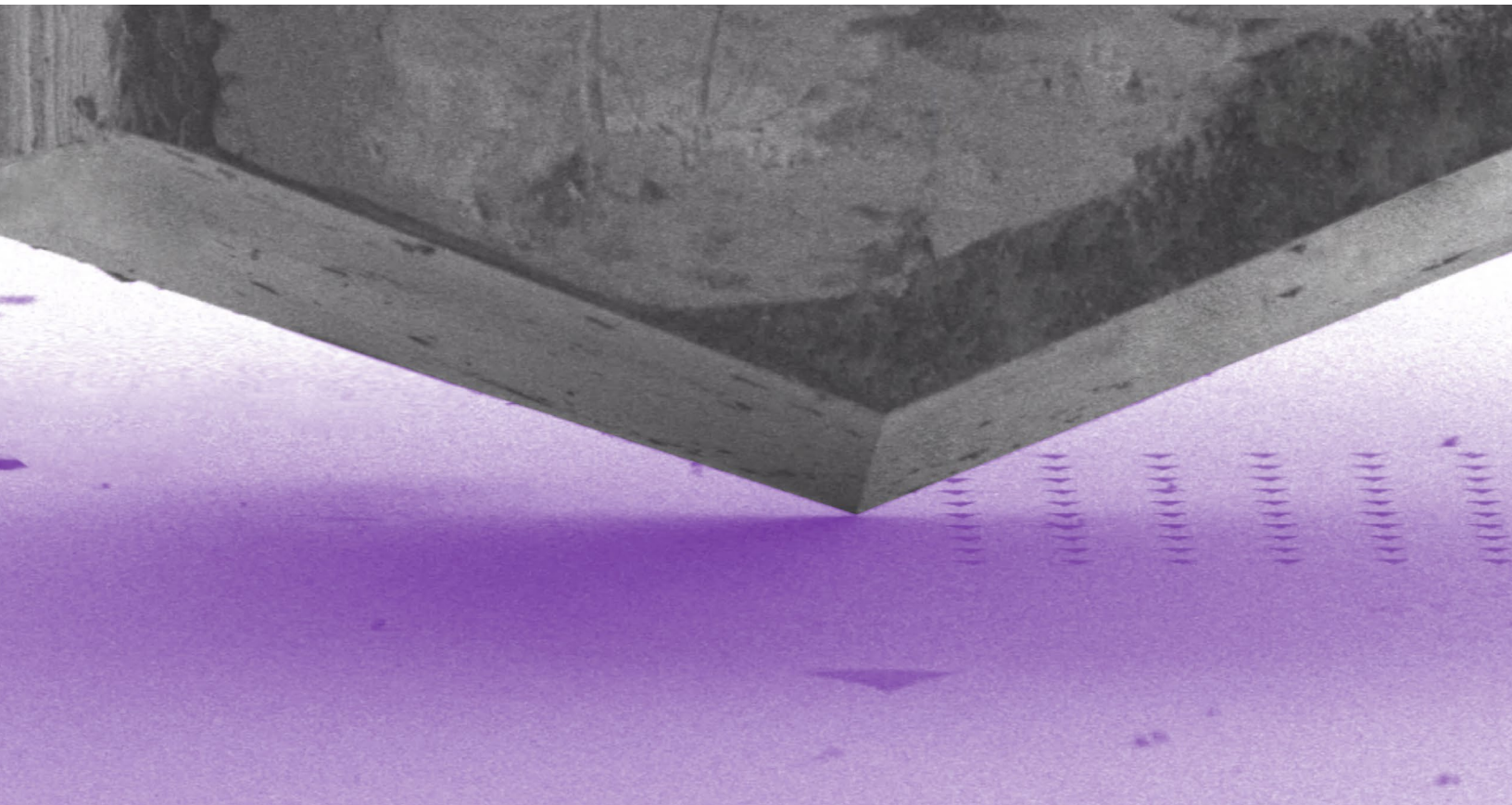


iMicro

Nanomechanical Tester



Features

- Upgradeable, extendible platform for automated nanoindentation, hardness, scratch testing and universal testing, complete with statistical data analysis package
- Large suite of pre-programmed nanomechanical test methods for improved ease-of-use
- Standard InForce 1000 actuator for capacitance displacement measurements and electromagnetic force actuation up to 1N, with interchangeable tips. Also available are an additional load actuator for thin films and soft materials, and a two-axis force actuator for tribology and lateral force measurements
- Fast, accurate tip calibration for high measurement accuracy
- High-speed controller electronics with 100kHz data acquisition rate and 20 μ s time constant for capturing nanoscale changes in mechanical properties during contact
- High-stiffness gantry with integrated vibration isolation for noise floor, ensuring accurate measurements of a wide range of materials
- Integrated microscope with digital zoom for precise positioning of nanoindentation sites
- Proprietary online nanoindentation courses taught by nanoindenter experts, and mobile apps for live updates to test methods

iMicro



Flexible, easy-to-use mechanical testing for a wide range of applications and materials

The iMicro is designed for nanoscale mechanical testing, such as indentation, hardness, scratch testing and universal nanoscale testing. The interchangeable actuators on the iMicro system provide a large dynamic range of force and displacement measurements. This powers the iMicro to perform tests on a wide range of materials, from soft polymers to hard coatings and thin films. The iMicro can also perform nanomechanical measurements on small volumes of materials. Modular options can accommodate a variety of applications, such as material property maps, frequency-specific dynamic tests, and high-temperature mechanical characterization.

Apart from its capability to advance research in universities, the iMicro can perform nanoindentation testing, and creep resistance measurement for the following materials and **industries:**

- | | |
|------------------------|--------------------------------|
| ▪ Hard coatings | ▪ Pharmaceuticals |
| ▪ Ceramics and glasses | ▪ Semiconductors |
| ▪ Metals and alloys | ▪ Batteries and energy storage |
| ▪ Composites | ▪ Automotive and aerospace |
| ▪ Coatings and paints | |

Features and Options Overview



KLA Core Technology

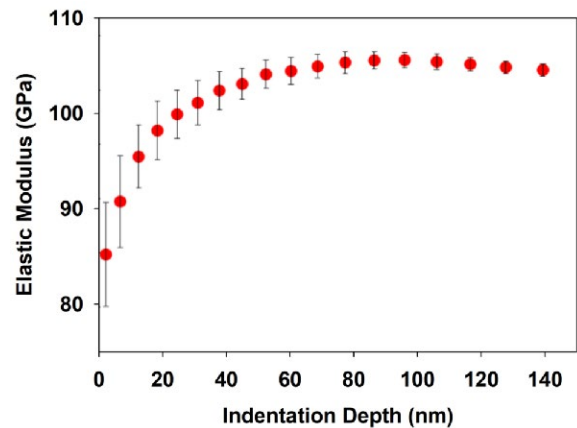
The iMicro system is powered by electromagnetic transducers to deliver precise measurements and to avoid artifacts in the x and y axes. The system is designed to provide accurate sample positioning, easy sample viewing, and simple sample height adjustment. In its standard configuration, the iMicro utilizes the InForce 1000 actuator, and a modular controller that allows users to add capabilities as needed. In addition, the iMicro gives users the ability to program each transducer for specific measurements, and switch between them at any time. The system has a small footprint to conserve lab space and conforms to ISO 14577 to ensure data integrity.

The iMicro proprietary InView software suite includes RunTest with on-screen controls for simplified test setup, ReviewData for data analysis during or after testing, and InFocus for generating graphs and reports for presentations and documentation.

Continuous Stiffness Measurement (CSM)

- Measures stiffness and other material properties during the indentation cycle

The CSM option involves oscillating the probe during indentation to measure properties as a function of depth, force, time, or frequency. The option comes with a constant strain rate experiment that measures hardness and modulus as a function of depth or load, which is the most common test method used across academia and industry.

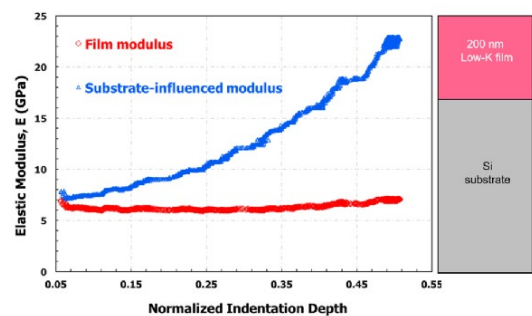


Measurement of elastic modulus as a function of indentation depth using the CSM option

AccuFilm™ Thin Film Method

- Allows for characterization of ultra-thin films by correcting for substrate influence on the measurement

The AccuFilm Thin Film Method option is a test method package with a specialized indenter tip for measuring substrate-independent material properties with the CSM module. AccuFilm uses the Hay-Crawford model to correct for substrate influence, for measuring hard films on soft substrates, or soft films on hard substrates.

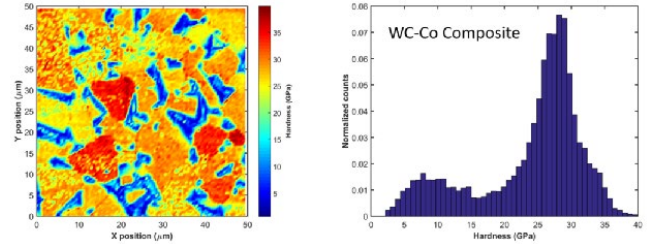


Substrate-influenced modulus and film-only modulus as a function of normalized indentation depth using AccuFilm thin film method

NanoBlitz 3D Rapid Mechanical Property Mapping

- Quickly and quantitatively maps surface mechanical properties
- Gives statistically significant results due to increased number of observations
- Measures rough surfaces and/or heterogeneous materials

The NanoBlitz 3D option measures elastic modulus and hardness as a function of x-y position, generating thousands of data points in a short period of time. The quantitative data is combined with powerful visualization techniques to assess differences in microstructure and gradients in mechanical properties.

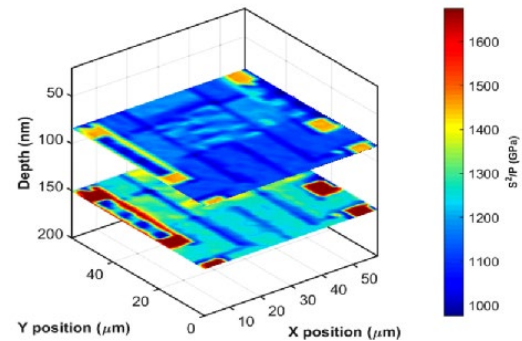


Hardness mapping and statistical histogram of hardness on WC-CO composite materials using NanoBlitz 3D option

NanoBlitz 4D Mechanical Property Tomography

- Extends the Continuous Stiffness Measurement (CSM) technique to include mechanical property tomography

To assess elastic modulus and hardness as a function of lateral position and depth, NanoBlitz 4D option rapidly creates a user-defined array of constant strain rate indents using the CSM module. Because each indent is performed in about 7 seconds, the system can generate a statistically significant amount of data, to accurately characterize complex microstructures and components.

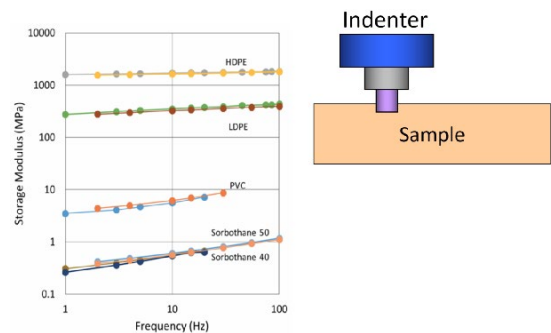


Elastic and plastic property mappings at two different indentation depths, on multiple layers of thin film using NanoBlitz 4D option

ProbeDMA™ Local Dynamic Mechanical Analysis

- Enables dynamic mechanical analyses (DMA) on soft polymers and other materials with sample geometries and/or material volumes that are not suitable for standard DMA tests

The ProbeDMA option turns the nanoindenter into a localized Dynamic Mechanical Analysis instrument by enabling measurement of storage modulus, loss modulus, and loss factor as a function of frequency. ProbeDMA utilizes the CSM module and the precision of the iMicro actuators to provide quantitative results that match traditional DMA testing. It is fully compatible with the 300°C sample heating option, described below.



Storage modulus of a series of standard polymer samples, tested using flat punch tip

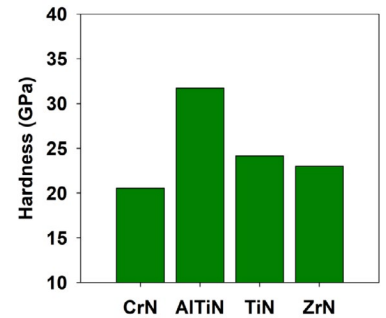
300°C Sample Heating

- Allows the sample to be placed inside a chamber for uniform heating while simultaneously undergoing tests.

The 300°C sample heating option can be used with the 1N and 50mN actuators.

Internationally Standardized Nanoindentation Testing

The iMicro is compliant with internationally recognized mechanical testing ISO 14577 standards for nanoindentation.



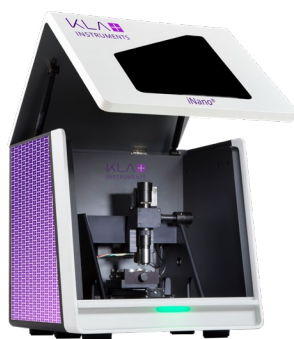
Hardness values of a series of standard samples, tested in compliance with ISO 14577 standards

Additional iMicro Options

Scratch and Wear Test Method	The Scratch and Wear test applies a constant or ramped load to an indenter while moving across the sample surface. It can be used for characterizing thin films, brittle ceramics and polymers.
Biomaterials Method	The Biomaterials Method Pack provides the ability to measure the complex modulus of biomaterials with shear moduli on the order of 1kPa. Utilizing the CSM module, the pack includes a flat-punch tip and a test method for evaluation of viscoelastic properties.
DataBurst Mode	DataBurst mode enables systems to record displacement data at rates > 1kHz, for measuring high strain step loads, pop-in and other high-speed events.
InView Experiment Scripting	InView offers a powerful and intuitive experiment-scripting platform for designing novel or complex experiments.
True Test I-V Measurements	The True Test I-V option allows the user to apply specific voltages to a sample and measure the current at the tip, to characterize local changes in electrical properties during nanomechanical measurements.
Active Vibration Isolation with Modular Rack	Adding active vibration isolation to the built-in passive vibration isolation of the iMicro provides superior stability and precision for difficult nanomechanical measurements on ultra-thin films. The active vibration isolation system reduces vibration for all six degrees of freedom, with no tuning required.
Linear Optical Encoders	The Linear Optical Encoder (LOE) option is integrated into the x and y motion stages and increases the positional accuracy and throughput of the testing process.
Gemini 2D Multi-Axis Transducer	The Gemini transducer operates the CSM module along two axes simultaneously, allowing lateral force and tribology measurements, including Poisson's ratio, coefficient of friction, scratch, wear, shear and topology.
Indenter Tips and Calibration Samples	Interchangeable tips for the InForce 50, InForce 1000, and Gemini actuators include Berkovich, cube corner, Vickers, and flat and sphere punches.

The Nanoindenter Family of Products

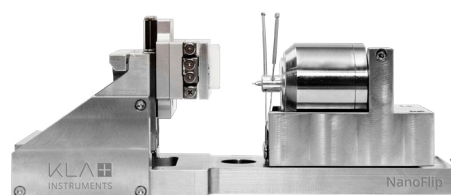
KLA offers a full range of ambient and in situ nanoindenter solutions, including the Nano Indenter® G200X, iNano®, NanoFlip, and InSEM® HT.



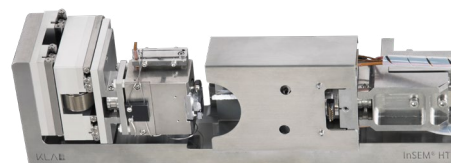
iNano®



Nano Indenter® G200X



NanoFlip



InSEM® HT

A Better Level of Understanding

The total customer experience delivered by the iMicro is more than a list of specifications. From easy-to-use software and reliable hardware to industry-leading customer service and uptime, the iMicro offers a powerful, straightforward, worry-free solution.

Applications Support

KLA application scientists are available to assist with test design and planning. With experience in both materials science and mechanics, our scientists have developed best practice testing techniques and have contributed to many of the key papers in the industry.

Customer Service

KLA nanoindenters are known for problem-free operation. If you do have a question or need help, our customer service personnel can log in to your equipment to resolve your issue within 24 hours. Most repairs do not require an onsite service visit. The iMicro is designed for the customer to easily replace a component. The tool is also backed by local service and support around the world, for onsite service or installation.



KLA SUPPORT

Maintaining system productivity is an integral part of KLA's yield optimization solution. Efforts in this area include system maintenance, global supply chain management, cost reduction and obsolescence mitigation, system relocation, performance and productivity enhancements, and certified tool resale.

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