

Mechanical characteristics analysis

Nano-scale verification solution for softer materials and semiconductor thin films

ISO-14577 Part1,2,3 fully compliant nano-indentation **Industry-first**



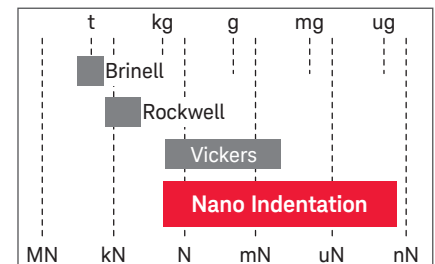
G200 Nano Indenter base thin film mechanical characteristics evaluation system

- “ Want to verify mechanical characteristics of thin film like PN layer of power device semiconductor ? ”
- “ Want to evaluate surface hardness of resin or coating materials ? ”
- “ Want to evaluate adhesion of solder land on SMT board ? ”

Yes, we can support for you !

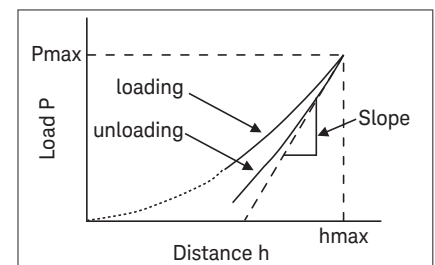
Load control to nN level

Nano-scale materials mechanical evaluation is available. Unique-to-Keysight electromagnetic actuator realizes load control from N level to nN level. Rigid film and thin film like resin or semiconductor that require shallow depth indentation are all supported by one test system. Various materials are covered and it brings a high return on investment.



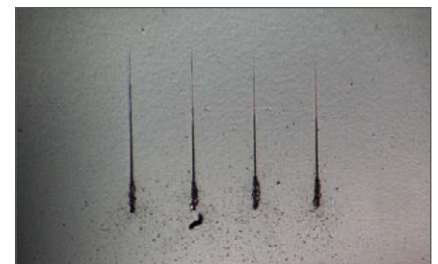
Various mechanical tests of materials available

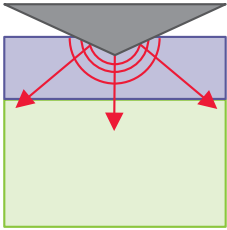
Rather than measuring the contact area directly once the indenter is withdrawn from the material, continuous acquisition of force and displacement allows calculation of contact area, which facilitates small-scale testing. For this reason, a wide range of measurements (not limited to hardness and Young's modulus) are available that cannot be acquired in traditional indentation tests.



Many applications

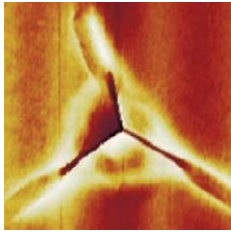
Take the scratching test for example. To form a scratch, move the XY table carrying the sample in a horizontal direction and simultaneously control the load in the vertical direction. Users can evaluate the friction, adhesion strength, and the percentage of elastic and plastic deformations of coating materials or semiconductor thin films.





Substrate independent film properties

Want to get characteristics of thin film only? Unique to Keysight, the CSM (*1) method separates Young's modulus and hardness of the thin film and substrate.



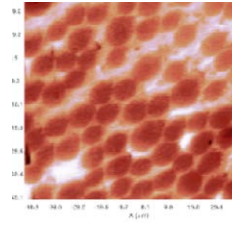
Fracture toughness

The CSM technology provides stiffness mapping that topography image does not give. Fracture toughness can be calculated by measuring cracks length around indentation.



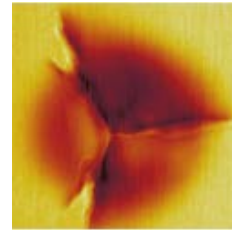
Indentation under high-temperature heating

Many materials require mechanical characterization at a high temperature. Heating stage (optional) enables measurement at max 350 degrees Celsius.



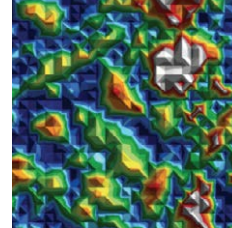
In-situ imaging enables indentation with high precision positioning

Tip imaging with either a high precision stage or piezo scanner enables the visualization of a sample surface with up to 1nm resolution.



Film delamination

Stiffness mapping provides stiffness change information of sample surface. Users can evaluate correlation between indentation and stiffness degradation.



Express test

Yields fast, accurate maps of hardness and modulus, thousands of indentation can be completed within minutes.

Application examples

Market	Application
Semiconductor / MEMS devices	Mechanical stability of thin film
	DRAM package
	Stability of solder
Automotive parts	Meal materials
	Paint coating, glass coating
	Braking pad
General materials	Polymer, gum, resin, etc.

(*1) CSM (Continuous Stiffness Measurement)

Keysight's patented dynamic indentation test method - where a small oscillating force is superimposed on the primary loading signal. By continuously recording the load, displacement and time history it obtains a continuous measure of stiffness. This is useful for measuring mechanical properties as a function of depth and also for measuring the complex modulus of time dependent materials.

Pictures or figures sources: Some of them refers to TOYO corporation's G200 product pamphlet.

Major users (A to Z order)

- | | |
|-------------------------|----------------------------------|
| Abbott Vascular | Indian Institute of Technology |
| Applied Materials | Kharagpur |
| Bosch | Nanyang Technological University |
| Cheron | National Cheng Kung University |
| CNRS | Stanford University |
| Colgate-Palmolive | Tsinghua University |
| Corning | University of Cambridge |
| Dow | |
| Epson | |
| Freescale | |
| Henkel | |
| Imec | |
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 Published in Japan, July 26, 2016
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