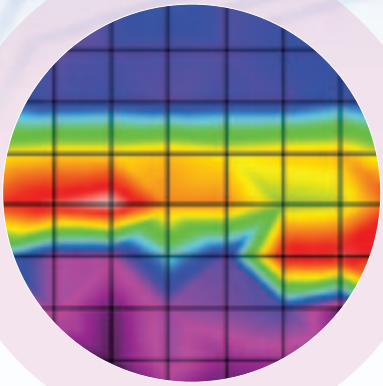
Micro Materials
Excellence in Nanomechanics

NanoTest™ Vantage

THE NANOTEST VANTAGE: NEXT GENERATION NANOMECHANICAL TESTING AND MATERIALS DEVELOPMENT FOR THE **MICROELECTRONICS** SECTOR



- Lead-free solder - high temperature nano-indentation
- SiO_2 surface wear
- Scratch testing of ta-C films
- Bending of micro-beams and cantilevers
- Fatigue of micro-beams and cantilevers (using patented nano-impact technology)
- Bond pads

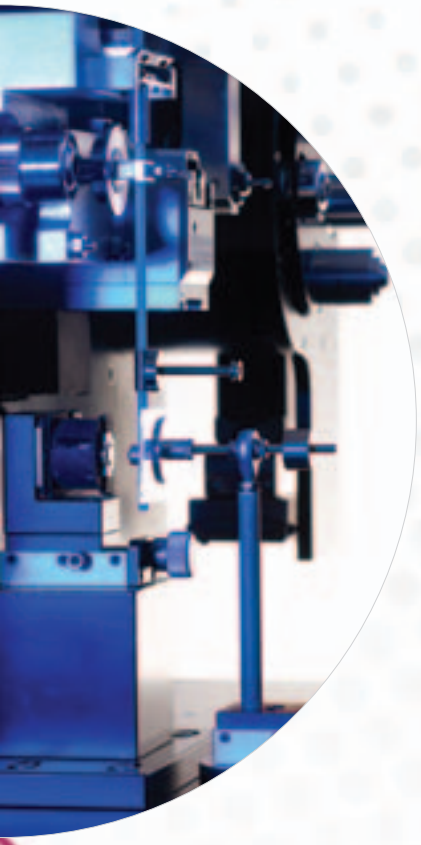
Nanomechanical testing for microelectronics applications

Improving performance in microelectronics

The microelectronics sector moves quickly: gaining a technical lead can be critical to gaining a market advantage. And key to that is having testing processes in place that can determine future performance of potential new materials and coatings offering enhanced performance – quickly, reliably and cost effectively.

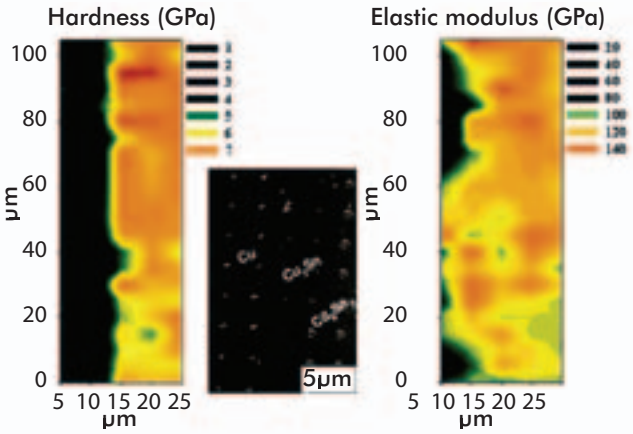
Nano-scale tests to optimise reliability

Lead-containing (Sn-Pb) solder joints have been used extensively in the micro-electronics industry for decades. Whilst promising lead-free solders such as SAC (Sn-Ag-Cu) have been developed for domestic use, concerns remain over their reliability, as they are much less well characterised, particularly under working environments as experienced in micro-electronics applications where industrial studies have shown that failure rates are too high and degradation mechanisms differ from those in domestic uses.

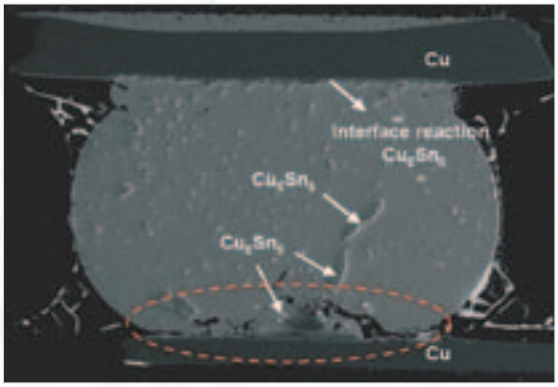


The NanoTest Vantage can be configured with nanoindentation, nano-scratch , nano-impact and nano-fretting.

NanoTest: producing valuable data



Mapping across solder joint interface after metallographic polishing, courtesy of Begbroke Nano, University of Oxford. At Oxford, nanoindentation as a function of temperature is used for its potential to characterise the lead free solders used in real microelectronic joints/interconnects, rather than studying the constituent materials in bulk form. Hardness, elastic modulus, yield strength and creep behaviour of micro-phases formed in a Sn-Ag-Cu solder joint have been characterised at temperatures from 25 - 175°C.

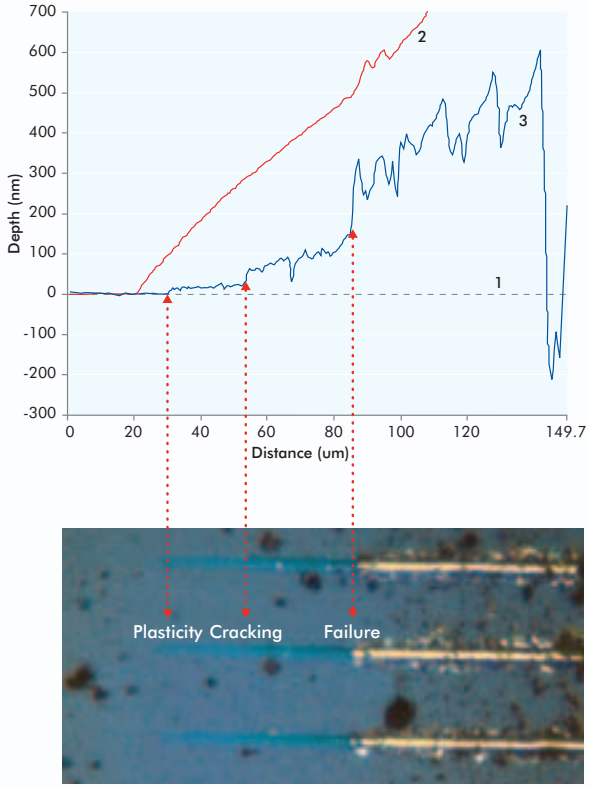


Solder bond failure due to IMC formation, courtesy of Begbroke Nano, University of Oxford

Rapid, flexible testing to advance coating technology

Improving MEMS fabrication

In particular, the control of friction and wear of moving parts is a key issue for the reliability of Microelectromechanical (MEMS) Devices. A common problem is that they are fabricated from Si wafers using techniques originally developed by the microelectronics industry. Unlubricated $Si0_2$ surfaces (Si with its native oxide) are very hydrophilic and therefore suffer from high friction and wear, and unwanted adhesion.



Experimental conditions: Three-scan scratch test with 3 µm radius probe scanning over a 150 µm track a scan speed of 2 µm/s. In scan 2 after 20 µm the load is ramped at 2.5 mN/s. 3 repeat tests were performed to test the reproducibility of scratch behaviour. The replot shown was from the second of these.

DLC and ta-C overcoat formulations

Solid lubrication approaches are being developed to combat this – and low friction, hard coatings that are resistant to abrasive wear are being developed which lower the surface energy. The NanoTest Vantage is playing a major role in the development of next generation coatings, by assessing potential overcoat formulations, such as DLC, ta-C and other more novel materials.Tetrahedral amorphous carbon (ta-C) films have a high sp^3 fraction of carbon atoms resulting in high hardness; these films can be highly stressed and their suitability for tribological applications needs to be evaluated.

In particular, the optimum deposition conditions necessary for improved scratch resistance of ta-C films produced by FCVA plasma technology can be accurately, rapidly and cost-effectively determined by nano-scratch testing using the NanoTest Vantage.

The NanoTest is an ideal tool for investigating the structure and homogeneity of multi-layer bond pads for integrated circuit reliability.

NanoTest™ Vantage

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NanoTest Vantage: the user benefits

High temperature measurements

Allows the testing of samples at temperatures up to 750°C, allowing evaluation of true 'in-service' mechanical properties.

User friendly software

A simplified interface, while allowing full flexibility, makes the software easier to navigate and more intuitive - making it ideal for both new and inexperienced users.

Industry-leading stability

The system has a dedicated environmental enclosure and a high thermal mass frame, ensuring ultimate instrument stability.

High automatic throughput

The automatic scheduling facility allows maximum throughput without the need for user intervention, enabling the equipment to be used 24/7.

Unrivalled flexibility

The NanoTest Vantage software offers a wide range of selectable parameters, allowing the user optimum flexibility of experiment design.

Purpose-designed for experiments

A large working area between the motor stage and the indenter allows you to set up custom experiments.

Application/material	NanoTest advantages - microelectronics
Lead free solder	High precision mapping, stability for creep testing, high temperature testing
Multilayer thin film systems	Multi-pass scratch and wear testing
Bond pads	Nano-impact

Modular design to grow your research options

The NanoTest Vantage is a fully modular system that allows the user to configure the system to meet their individual needs and can be expanded at a later date to include further modules.

Comprehensive after sales service & care

Our strong customer after sale care includes direct access to our expert engineering team who can help with your experiment design and custom software setup.

Peer-collaboration and knowledge exchange

Many of our testing modules have been developed in response to the needs of our customers. You too can opt to be part of this collaborative approach.

Cutting edge technology for enhanced research

We apply the very latest and most accurate technology in our NanoTest Systems which allows you to break through into new and pioneering research.

Patented nano-impact and fatigue testing

This technique helps you design better materials or coatings for erosive protection, cutting tool, engine and other applications.

Liquid cell facility

Allows the testing of a sample fully immersed in a fluid without indenter buoyancy problems associated with vertical loaded indentation.

Load / partial-unload technique

This enables users to rapidly build up a complete profile of the variation of hardness and modulus with depth.

Wide load range 10 μN - 20N

With our micro and nano load heads you have a wide range of loads to choose from which adds to the flexibility of use for the system.

FIND OUT THE FULL STORY

This has been a brief appraisal of the NanoTest Vantage's operating capabilities. To find out how one of the new generation models could transform your testing capabilities, get in touch and we can provide a detailed analysis of how it could benefit your operation.

To see the NanoTest Vantage in action (either at our UK headquarters, through one of our worldwide distributors or through a videolink) running test experiments that have relevance to you, again, just get in touch and we will do the rest.

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