Micro Materials
Excellence in Nanomechanics

Platform 5 – the future of the NanoTest

New capabilities only on Platform 5

You can now upgrade to **Platform 5, the latest software operating system** for NanoTest Vantage, Alpha and Xtreme instruments. It includes the following new developments:

- Rapid indentation mapping
- Fine-scale mapping
- Fast indents
- New scratch and tribological capabilities
- Soft contact capability for very soft/low stiffness samples

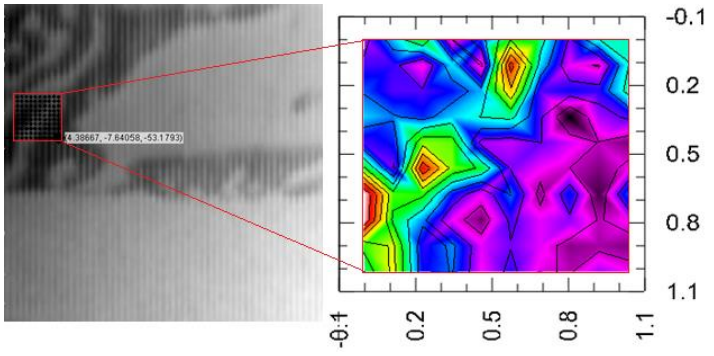
Contact us now for pricing information.

Fine-scale Mapping

Platform 5 (P5) systems equipped with the SPM-nanopositioning stage now have the ability to perform indentation grids within micron- scale areas.

This works by firstly performing a 3D scan of the sample using the SPM-nanopositioner. The indentation grid size and number of indentations are then selected from the resulting image. The precision of the SPM-nanopositioning stage allows for very small arrays with sub-micron indentation spacing.

The figure below shows a hardness map on a Zn alloy coating obtained from a 1 x 1 µm array of 100 indentations (10 x 10). The spacing between the indentations is just 100 nm. The indentations were performed with a sharp cube-corner indenter at very low depths to ensure the indents were small enough to avoid influencing adjacent indents. Fine-scale mapping is able to differentiate between different phases across very small areas

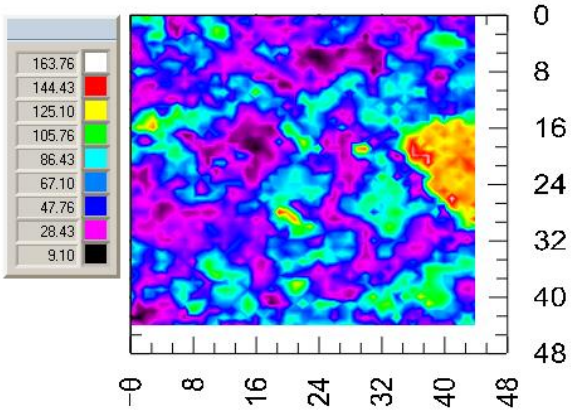


Left – 8 x 8 µm SPM nanopositioner scan. A 100-indent grid is selected over a 1 µm² area. Right – Hardness map over the 1 µm² area. The red regions indicate a hardness of 1.8 GPa, whilst the purple areas are < 0.8 GPa.

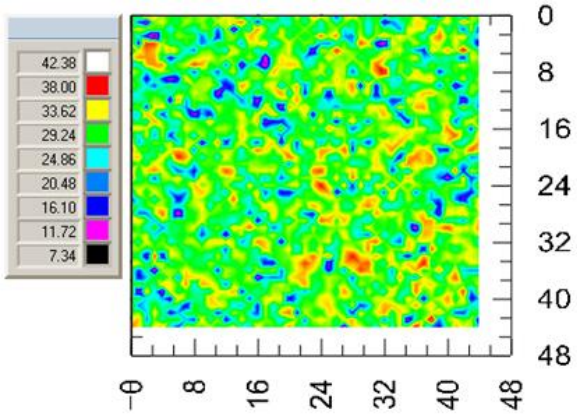
Rapid Indentation Mapping

The Platform 5 upgrade enables systems equipped with the SPM-nanopositioning stage to rapidly speed up the time taken to perform indentation experiments. When enabled, the SPM-nanopositioner performs the inter-indentation movement rather than the standard stages (up to 100 x 100 µm experiment area).

Thousands of indentations can be performed in just a few hours, allowing for high resolution mechanical property maps, a useful tool for studying the links between micro-structure and mechanical properties in highly heterogeneous and multi-phase materials. Full data curves are recorded for all indentations allowing for convenient review and analysis.



Modulus map obtained from a 2,025-indentation grid across a 45 µm x 45 µm area on a sedimentary shale sample - harder mineral phases are seen embedded in an organic clay matrix



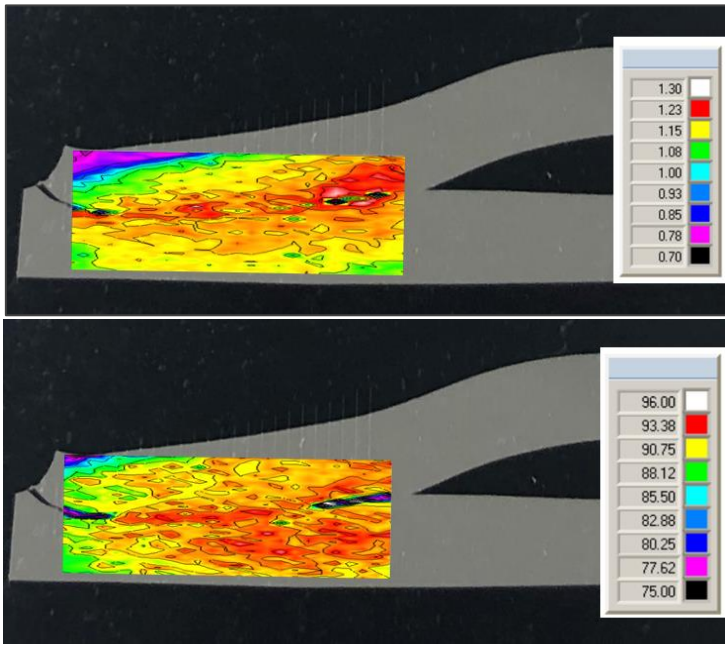
Hardness map obtained from a 2,025-indentation grid across a 45 µm x 45 µm area on a WC-Co sample

Fast Indents for mapping over larger areas

The Platform 5 upgrade includes the **fast indent** capability, which enables indentation experiments to be performed up to 5x faster than normal. This uses the standard NanoTest stages, so all Platform 5 users can benefit (SPM-nanopositioner not required).

The fast indent capability combined with the large travel range of the NanoTest sample stages enables mechanical property maps to quickly be obtained over very large areas.

In the example below, a grid of 850 indentations was performed on a welded aluminium alloy covering an area of 9.6 mm x 3.3 mm. The indentation load used was 500 mN. The hardness map shows clear changes in hardness around the welded region.



Hardness map (top) and reduced modulus map (bottom) obtained over a 9.6 mm x 3.3 mm area of a welded Al alloy

Soft contact mode for polymers and biomaterials

New 'Soft Contact' mode allows for more sensitive and accurate sample surface detection for very soft and low stiffness materials:

- The soft contact mode enables various post experiment set-up options for modifying the indentation contact procedure.
- The modified contact procedure takes advantage of the very low spring stiffness of the NanoTest low load head, and results in more precise determination of the sample surface (reduced 'pre-indent' effect)

How to Upgrade

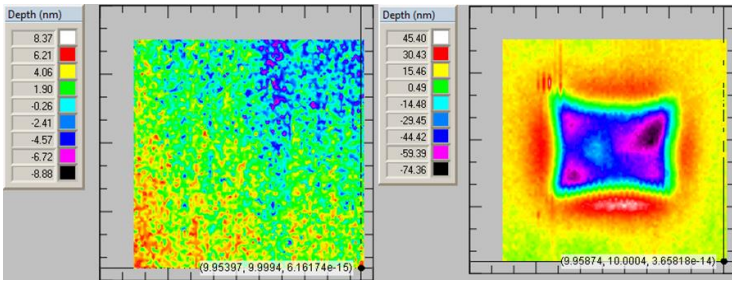
All NanoTest systems can be upgraded to benefit from these new developments. For all **Platform 4** systems, the Platform 5 upgrade is a straightforward addition completed on-site.

For older systems operating on Platform 3 or earlier, contact Micro Materials for a customised upgrade quote for your system.

Nanowear boxes

P5 NanoTest systems equipped with the SPM-nanopositioning stage can now perform nanowear boxes. The wear-box technique works by scanning a defined area of the sample surface with the indenter under a user-selected normal load. Tests may be configured to have one or many wear cycles over the same area.

Topographic images of the sample surface are normally performed before the first wear cycle and after the final cycle. Topographic images may also be performed between wear cycles at intervals specified by the user. Topographic image data may be exported for quantitative analysis of wear volume.

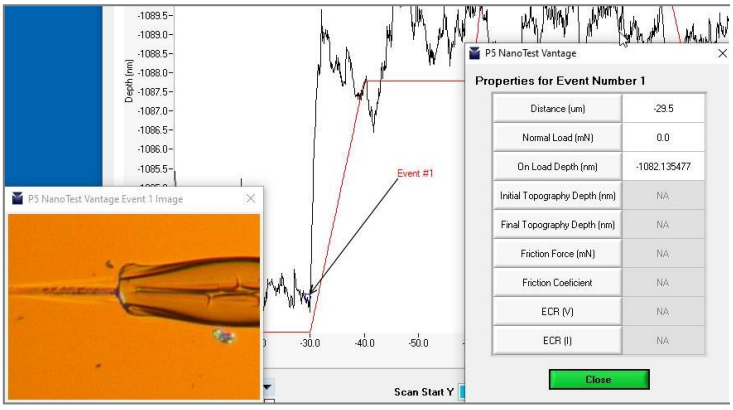


SPM-nanopositioner images (20 x 20 µm) of the initial surface of a 0.75 µm carbon coating (left) and nano-wear box (right) after four wear cycles at 50 mN using a 4.2 µm end radius spheroconical diamond probe

New Scratch Analysis Software

The scratch & friction software package has been improved to greatly expand its capabilities, including:

- Multi-axes signal display
- Microscope image integration
- Stepped load profiles
- Multi-event logs for easy analysis



Contact us:-

Micro Materials Ltd
Willow House, Yale Business Village,
Ellice Way, Wrexham, LL13 7YL, UK
Tel: +44(0) 1978 261615
E-mail: info@micromaterials.co.uk
www.micromaterials.co.uk