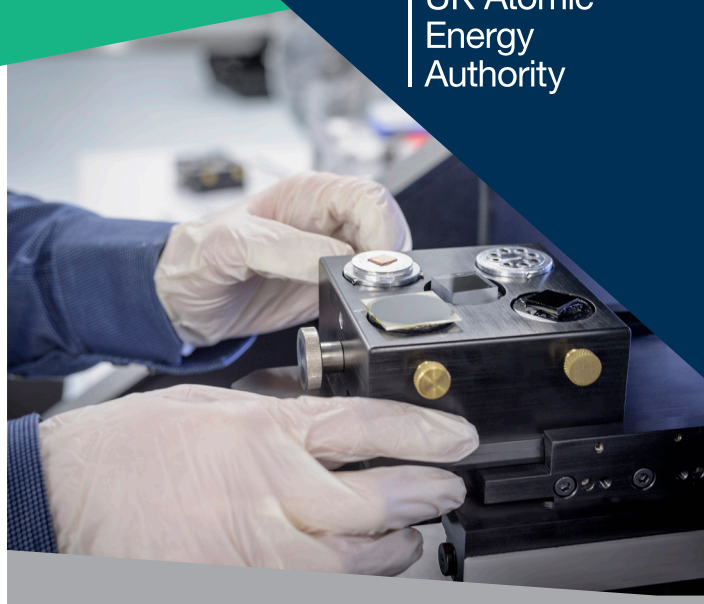
MATERIALS RESEARCH FACILITY

UK Atomic Energy Authority

Agilent Nanoindenter G200



The nanoindenter analyses the mechanical behaviour of a material by pressing a microscopically small tip into a sample and measuring the required load versus the displacement of the tip into the surface. Precise forces are created by electromagnets and the displacement is measured with an accuracy of 0.01 nm – roughly 3 helium atoms! Online data analysis allows for the evaluation of the elastic and plastic mechanical properties of materials on the nano-scale.

Micro-cantilever machined using the focused ion beam allows the strength and toughness of tungsten to be measured. Stress modelled using a finite element method to improve the accuracy of the interpretation of the measurement.

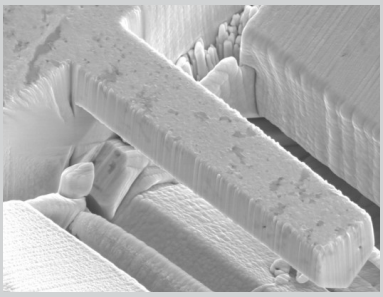
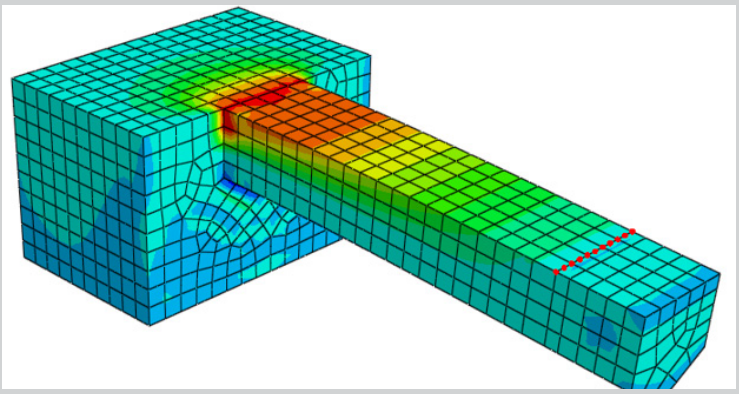
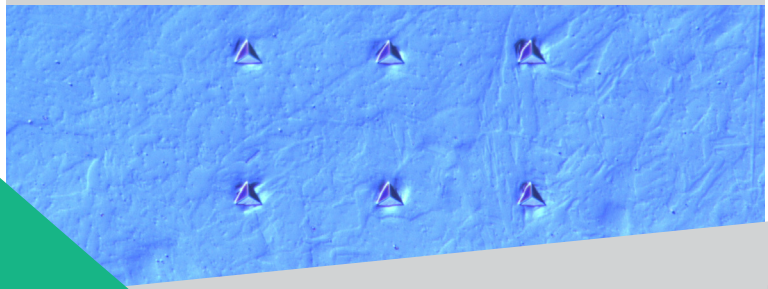


Image courtesy of M. Lessmann



Array of indents in an ion-irradiated T91 steel viewed by optical microscopy. Indent spacing is 50 micrometres. Image by A.J. London.



TECHNICAL SPECIFICATIONS

- Accurate, repeatable results compliant with ISO 14577 standard
- Electromagnetic actuation allows for unparalleled dynamic range in force and displacement
- Maximum force 10 N, with 1 mN load resolution, < 1.0 µN contact force and ~5MN/m load frame stiffness
- 500 µm maximum indentation depth and displacement resolution of 0.01nm
- Continuous Stiffness Measurement (CSM) provides an accurate measurement of the location of initial surface contact and continuous measurement of contact stiffness as a function of depth or frequency, thus eliminating the need for unloading cycles
- Standard indenter stage, 100mm x 100mm with 1 µm position accuracy
- NanoVision stage for atomic force microscopy, 100 µm x 100 µm with sub-nm positioning
- Optical microscope with 10x and 40x objective combined with 25x video screen magnification
- Configurable for routine testing or new applications

MRF is part of the National Nuclear Users Facility (NNUF) and the Henry Royce Institute for Advanced Materials.

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