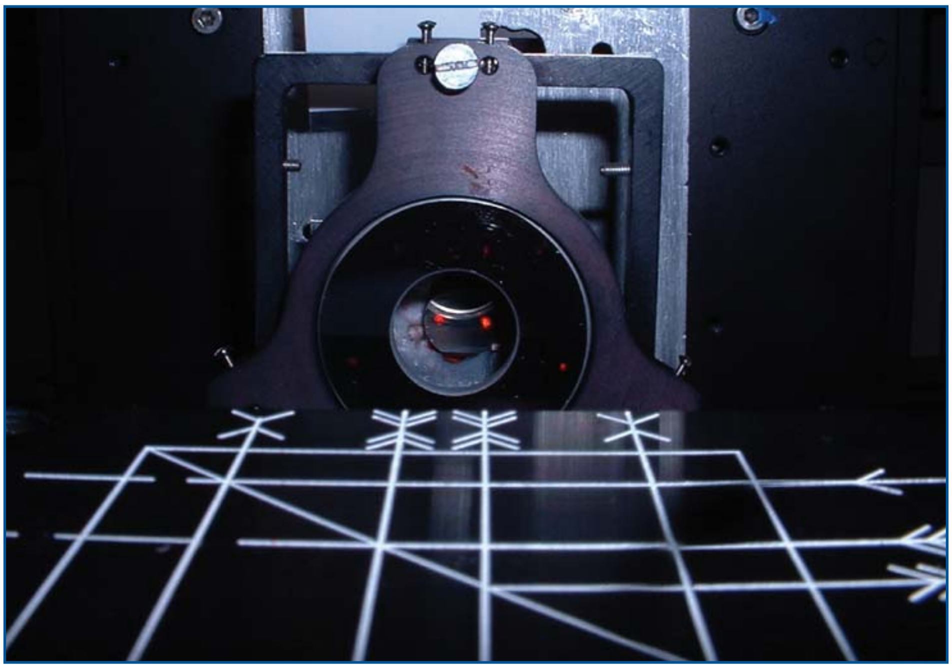
NPL National Physical Laboratory

Engineering *Precisely*

A National Measurement Newsletter

Spring 2006 | Issue 3



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Testing nano-structured materials

There is a rapidly expanding market for academic and industrial nano-scale testing for materials research and development. The only UK manufactured nano-indentation equipment is Micro Materials Ltd's (MML) "NanoTest", which is able to characterise the elastic and plastic properties of small volumes of materials such as nano-structured materials, thin films, polymers and biomaterials.

As part of the National Measurement Secondment Scheme, an NPL scientist spent a week on secondment at MML to help create a calibration package for their equipment to fully conform to ISO 14577, the international standard covering nano-indentation. This entailed high-specification measurements of displacement and force as well as calibrations of indenter shape and instrument compliance using artefacts directly traceable to the UK national standards.

The secondment gave an ideal opportunity for an industrial trial of NPL's newly developed certified reference materials, DataSure-IIT, and was successful in demonstrating that the modifications and procedures MML proposed would result in a product which was compliant to ISO 14577.

"Having a highly trained NPL staff member on secondment has proved invaluable in our instrument development"

Dr B Beake, Senior Research Scientist, MML

As a result of this secondment MML are now specifying an ISO 14577 conformity upgrade of the Nano Test, and plan to distribute the NPL DataSure-IIT certified reference materials and NPL calibrated indenters as an essential part of their ISO 14577 conformity package.

Measurement for Innovators is a DTI funded programme that is designed to promote innovation by linking industry with the world-class expertise and facilities contained within the UK's National Measurement Institutes.

To find out more visit www.npl.co.uk/measurement_for_innovators

For further information on nano-indentation please contact Nigel Jennett on 020 8943 6641

dti
National Measurement System

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Measurement of heat transfer properties for polymer processing

A comprehensive knowledge of how a polymer behaves during the moulding process is vital in saving time, materials and money.

Ensuring efficient processing and optimal properties of plastics requires good control over heat transfer during the preparation of the material charge (i.e. plastication) and the cooling of the formed product, for example to avoid phenomena such as hot and cold spots and to minimise cycle times.

A new instrument has been developed at NPL to study heat transfer through polymer specimens mounted between metal plates, thereby mimicking polymer processing - in particular injection moulding. This will enable investigation of the thermal conductivity of polymers at elevated temperatures and pressures, and the effect of different mould finishes or mould materials on moulding cooling rates.

Using this instrument the thermal resistance of an air gap between the polymer and mould wall was found to be equivalent to that of a polymer layer approximately ten times thicker. The results clearly indicate the importance of maintaining good contact of the polymer with the mould surface in order to obtain efficient heat transfer and thus shorter cooling times. The implications of the results for process modelling are significant as shrinkage of the polymer away from the mould surface will result in inaccurate predictions.

An NPL report, "Measurement of heat transfer properties for polymer processing" is now available electronically by contacting *engineering@npl.co.uk*.

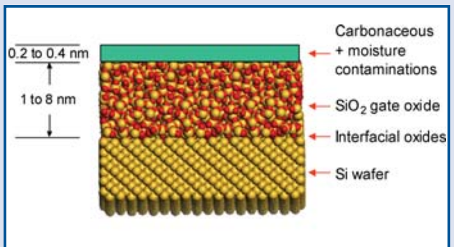
For further information please contact Martin Rides on 020 8943 6777 or martin.rides@npl.co.uk

NPL apparatus for measuring thermal conductivity and heat transfer co-efficients under conditions relevant to polymer processing

Measuring ultra-thin film thicknesses at the atomic level

A generic method, based on X-ray photoelectron spectroscopy, has been developed and tested to accurately measure the thickness of films less than 10 nm thick.

In today's world, as thin films become ultra-thin, accurately measuring just how thin they are can be something of a problem. Ultra-thin films can be anything from or protective films up to 10 nm down to molecular films, just one monolayer thick. For measuring thicknesses greater than 20 nm there are several options based on optical methods, such as ellipsometry or wave interference, that are popular and effective.



Structure of amorphous SiO_2 on a silicon crystal wafer with a surface layer of carbonaceous contamination and water.

Unfortunately, in the range below 10 nm, these methods are no longer accurate. At these scales, where the typical atom size is 0.25 nm, it is necessary to be very precise about measuring the correct thickness. This has been illustrated in a recent study involving an extensive pilot study under the Consultative Committee for Amount of Substance (CCQM), organised by NPL involving many expert laboratories world-wide.

This study, part of the Surface and Nano-Analysis activity within Valid Analytical Measurement programme, funded by the DTI, involved the well-known problem of measuring the thickness of thermal SiO_2 layers on Si wafers used for gate oxides in semiconductor manufacturing. Where the SiO_2 meets the silicon wafer there will be a region of around 0.5 nm of interfacial oxides that do not exist as stable compounds except at interfaces, Si_2O, SiO and Si_2O_3. Additionally, at the surface there is always some carbonaceous contamination, approximately 0.2 nm to 0.4 nm thick if good handling procedures are being used,

Formulation of the NMS Materials Programme 2007+

NPL has just started formulating the NMS Materials Programme 2007+ on behalf of the DTI.

This three-year programme, starting in April 2007, will benefit industry and academia by developing measurement methods and models for understanding the properties and characteristics of materials and materials systems. The outputs from the programme will benefit current and emerging materials end-users, producers, developers and modellers by enabling a better understanding of materials function, performance, lifetime, and fitness for purpose.

The programme gives organisations in the UK the opportunity to work in partnership with the DTI to develop measurement capability, methods and standards that improve business performance.

The formulation process has just started and will be used to define projects that meet industry needs in the short-term and also underpin long-term development.

Your input is vital to ensure that the work undertaken by the programme continues to meet the evolving materials measurement requirements of the UK.

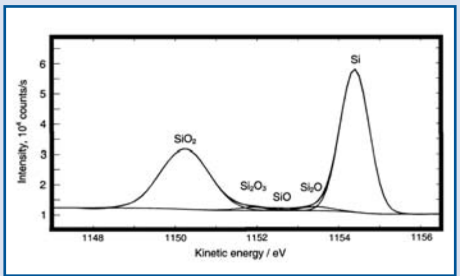
An orientation meeting was held in February 2006 to map out the future trends and drivers for the programme. A report on the outcomes of that meeting is available on the web site: www.npl.co.uk/formulation/materials/.

This web site also contains an enquiry page so you can register your interest in the Programme as well as highlighting your company's materials measurement issues.

Alternatively you are invited to contact the Programme Formulator direct with your materials measurement problems, or views as to the materials measurement requirements for the UK in the next few years.

The Materials Programme 2007+ forms part of a wider DTI activity in materials metrology within the NMS, and completes three materials lifecycle based programmes - Performance, Processing and Characterisation. Taken together these programmes address measurement issues related to the whole life cycle of materials including characterisation, design, production, performance and recycling.

For further information, or to contribute to the programme, please contact Bill Nimmo, Formulator of the Materials Programme 2007+ on 020 8943 7141 or MP2007@npl.co.uk



Detail of XPS data showing the 2p peak analysis of the SiO_2 and interfacial oxides for a <2 nm thick SiO_2 film.

and a similar quantity of adsorbed water if the analysis is at room temperature in ambient air.

Methods simply measuring the total film thickness may lead to thicknesses 0.4 nm to 0.8 nm, or more, greater than those measuring the required oxide thickness. There are few methods that can both measure the amount and the specific chemical state. The best of these is X-ray Photoelectron Spectroscopy (XPS). This allows the amount in different chemical states and for different elements to be measured.

Quantitative analysis of film thicknesses by XPS requires two constants, one being determined within the method and one usually taken from calculated data bases with standard uncertainties around 17%. This is inadequate for such applications as gate oxides where uncertainties of 1% are required. This accuracy has been achieved by calibration of the latter constant using X-ray reflectance (XRR), neutron reflectance (NR) or ellipsometry where films of different thicknesses can be used.

The required XPS constant has been calibrated so that all XPS users can, using an NPL reference procedure, measure SiO_2 thicknesses accurately in the sub-10 nm regime. When XPS indicates zero thickness, ellipsometry indicates an offset, here, of 0.57 nm. This offset arises from contaminations and other sources not fully identified. Such contaminants may vary from sample-to-sample and time-to-time. Similar, but smaller, offsets arise for many methods, which, if uncorrected, have now been shown to lead to errors in the range 10% to 100% for today's 1.5 nm thick oxides. A general procedure has thus been developed in which one of the methods; XRR, NR and ellipsometry, is used to calibrate the XPS constant. This can now be undertaken for any material, thus solving the general problem of valid and accurate thickness measurement in a wide range of ultra-thin films.

For more information, please contact Martin Seah on 020 8943 6634 or martin.seah@npl.co.uk. Visit www.npl.co.uk/nanoanalysis/ for additional information.

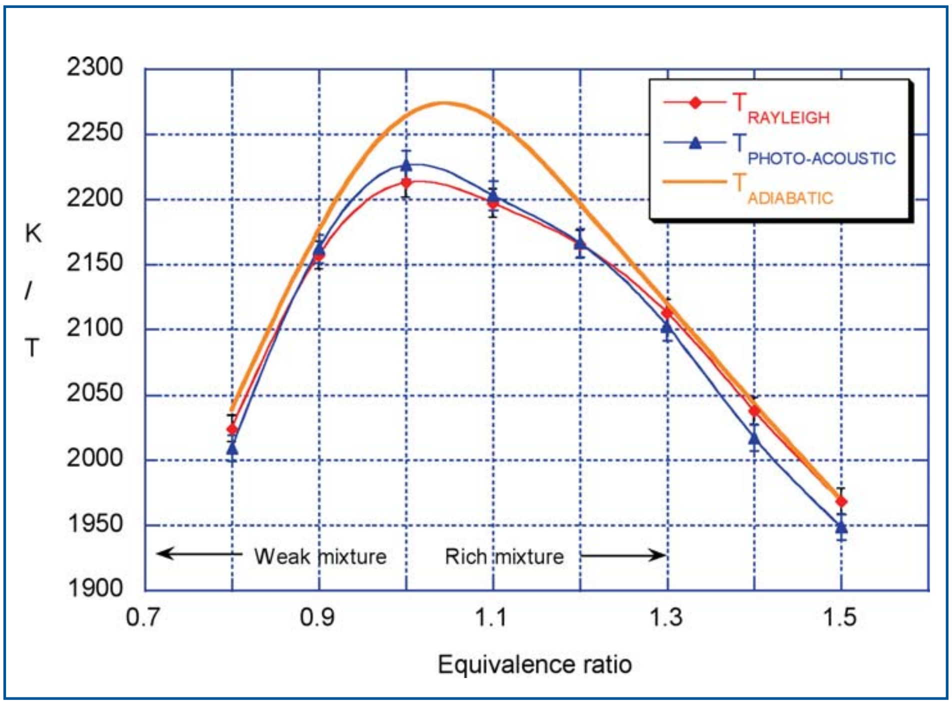
Temperature measurement of flames: The most accurate temperature measurements in the world!

Measuring the temperature of flames has always been a challenge – simply placing a thermometer into the hot gas rarely gives the correct answer! – but now NPL can provide unprecedented levels of accuracy with improved techniques.

Accurate flame temperature measurements have always been in demand. Better knowledge of temperature can lead to reductions in harmful pollutants and improvements in chemical and combustion efficiency, saving energy and money. To avoid the problems of perturbative thermometry, such as thermocouples which affect the temperature of the gas they are measuring, research over the past thirty to forty years has developed novel optical techniques. These techniques can measure the true flame /gas temperature non-intrusively, but still need to be calibrated. To do that NPL has developed the 'Standard Flame'.

The 'Standard Flame' has a highly reproducible temperature and gas composition. Using propane/air flames the temperature can be varied by adjusting the ratio of fuel to air from 1950 K (1677 °C) to 2215 K (1942 °C).

To find the true temperature of this flame, two existing optical techniques have been improved upon. Agreement to better than an outstanding 1% can be achieved using Rayleigh scattering and photo-acoustic beam deflection –



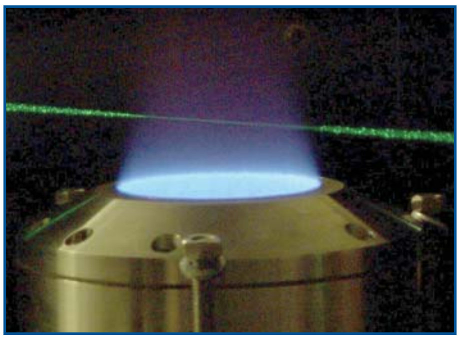
Comparison of standard flame temperature for Rayleigh and photo-acoustic thermometry. Error bars are ±0.5% of temperature. $T_{ADIABATIC}$ is the theoretical maximum flame temperature if there were no heat loses (never achieved in practice). The two independent methods agree to better than 1% of temperature.

despite being based on different physical phenomenon.

Rayleigh scattering thermometry measures the brightness of a scattered laser beam. This depends on the flame composition but more importantly on the flame temperature. If the composition is known, the temperature can be accurately measured.

Photo-acoustic beam deflection thermometry measures the speed of sound in the flame. Creating a spark formed by a focussed laser beam produces a sound, which is detected as it passes two fixed monitoring laser beams. Exploiting the simple relationship between the speed of sound in a gas and its temperature allows the flame temperature to be found.

"The project was conceived, designed and developed by NPL", Says Gavin Sutton, Project leader. "We're looking to build on what we've learned. We're already building a portable flame that can achieved the same accuracy and hope to perform industrial trials thereafter."



The Rayleigh scattering experiment in the Standard Flame – a green laser beam can be seen.

For further information contact Gavin Sutton on 020 8943 6712 or gavin.sutton@npl.co.uk

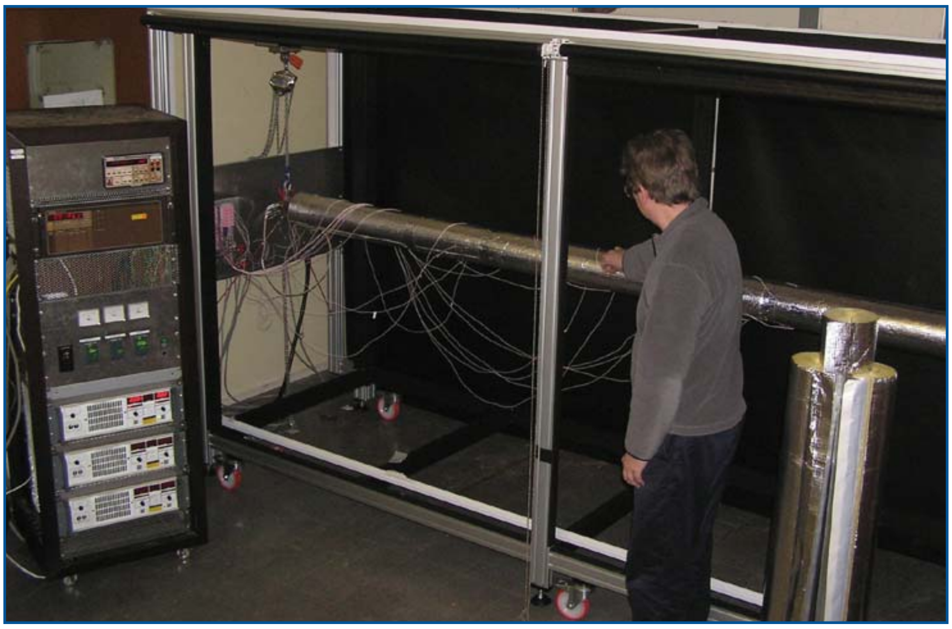
Energy efficiency no longer a pipe dream?

New apparatus at NPL can measure the thermal performance of pipe insulation, in order to help companies comply with European standards.

Since 1978, when the NPL Thermophysical Properties group was first established, their work has been responding to an ever changing background of political and commercial drivers relating to energy use in buildings. These have included the 1973 and 1979 Energy Crisis, EU Construction Products Directive with it's associated EU Product Standards, the Kyoto Protocol, Part L of the UK Building Regulations dealing with energy use in buildings, the Government's white paper "Our energy future - creating a low carbon economy" and finally the EU Energy Performance of Buildings Directive (2006). The latest addition to the group's facilities is an apparatus to measure the thermal performance of pipe insulation. It was built to meet an imminent requirement for UK industry to be able to certify the thermal performance of these types of products (to BS EN ISO 8497:1997) in order that they can be CE marked and show compliance to the appropriate EU Product Standard.

The apparatus has a 3.4 m long heater pipe and uses the van Rinsum method to correct for end losses. It measures thermal conductivity and thermal transference of pipe insulations in the temperature range of 40 °C to 250 °C. This apparatus is designed for insulation with an internal bore of 48 mm and with any thickness (subject to a limit of 1000 Watts power dissipation). It is currently being validated prior to being offered as a measurement service. The long term aim is to extend the apparatus to allow measurements on pipe insulation with different bore sizes and possibly at higher temperatures.

Contact Neil Lockmuller on 020 8943 6578) or neil.lockmuller@npl.co.uk or Ray Williams on 020 8943 6510 or ray.williams@npl.co.uk



Validation of surface texture software – new web site now live!

Where accuracy is vital, the software analysing the data is an important link in the measurement chain.

As in many other areas of metrology, instruments that measure surface texture generally interface to a computer that collects, filters and analyses data. As part of the data analysis, parameters are calculated and used to provide quantitative information concerning a manufacturing process or the functionality of a surface. Though it is commonplace to use artefacts to calibrate surface measuring instruments, such artefacts do not allow validation of the software components of the instrument in isolation.

ISO 5436-2 (2000) introduced into international standardisation the concept of the software measurement standard in the context of the measurement of surface texture. The standard defines Type F1 (*softgauges*) and Type F2 (*reference software*) software measurement standards for testing the numerical correctness of software used in surface texture measurement.

The DTI recently supported a project to design, implement and disseminate software measurement standards for testing software that calculates surface texture parameters. The project was led by Prof Liam Blunt of the Centre for Precision Technologies at the University of Huddersfield and involved Taylor Hobson Ltd (Prof Paul Scott) and NPL.

ISO 4287 (2000) provides definitions of surface texture parameters in terms of a continuous representation of a profile. In practice, however, the profile is known only in terms of discretely measured points, and developers of software for the calculation of the parameters are required to interpret the definitions in terms of the available knowledge. A key aspect of the DTI-funded project was to provide definitions of the parameters that are unambiguous and consistent with international standards. Additionally, definitions are provided that are robust and stable, a requirement if they are to be used to describe genuine properties of a surface. The definitions are based on applying an interpolant function to using a function that interpolates the discretely measured points to provide a continuous representation of the profile. Calculations are then undertaken in terms of the new function using, for example, established algorithms for numerical integration, root-finding, etc.

Type F1 softgauges are reference data files which depict a digital representation of a profile. The softgauges are used as input to the software under test, and the results obtained are compared with reference results provided with the softgauges.

Three types of Type F1 softgauges have been developed, relating to:

- Mathematically defined profiles, including sine waves, square waves, random profiles, steps, etc.
- Simulated profiles to represent a machining process, for example, turning and milling
- Measurements of master workpieces relating to typical manufacturing processes such as electro-discharge machining (EDM), and ground and honed surfaces.

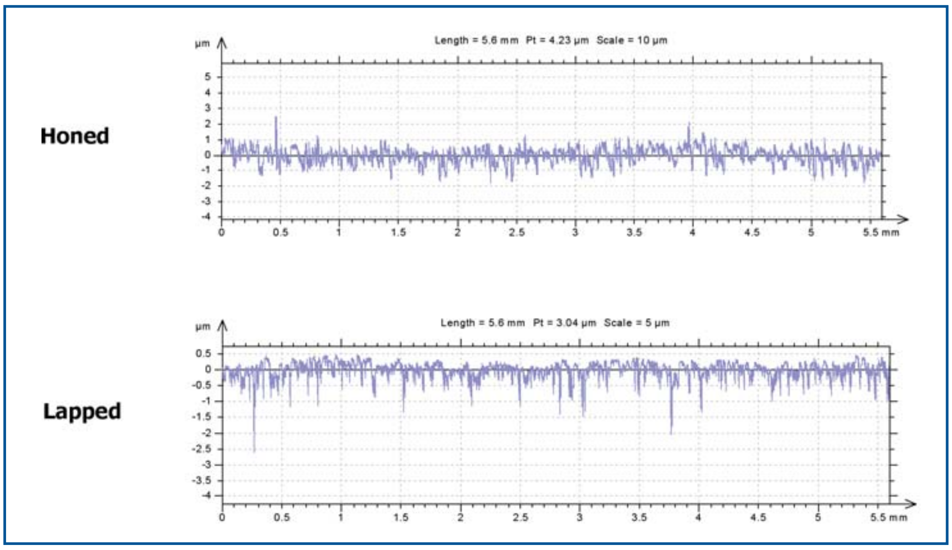
Type F2 measurement standards are reference software, consisting of traceable computer software against which software in a measuring instrument can be compared. A common data set is used as input to both the software under test and the reference software, and the results delivered by the software under test are compared with those provided by the reference software.

The most important consideration in the design and implementation of reference software is its numerical correctness. This is in contrast to the considerations for production software, for which the requirements on numerical correctness are generally more modest, but issues of efficiency (computing time and memory) as well as usability are of concern.

The reference software has been implemented in the Java programming language, which ensures that it is portable across operating systems. A risk-based approach has been used in the development of the software with a number of software engineering techniques applied to support its testing and validation, including static analysis, defensive programming, code review, statement testing, and back-to-back testing.

The outputs of the project are available through the web site http://www.npl.co.uk/length/services/softgauges.html. It is expected that the web site will be used by a wide spectrum of the surface texture community including instrument users, and software and instrument developers. The outputs comprise Type F1 and Type F2 software measurement standards together with specifications of the calculations of the surface texture parameters on which the softgauges are based. Additionally, in order to promote the use of the softgauges, a facility is provided for converting between common data file formats encountered in surface texture measurement.

For further information please contact Richard Leach on 020 8943 6303 or Peter Harris on 020 8943 6961 or richard.leach@npl.co.uk or peter.harris@npl.co.uk



Examples of reference data (Type F1 softgauges) based on the measurement of master workpieces.

NPL develops integrated multi-axis loading and strain mapping facility

Recent work at NPL has demonstrated the applicability, capability and use of an integrated multi-axial loading and strain mapping facility for the development of a biaxial test method for polymer composites, and the validation of strain output from finite element analyses.

The vast majority of composite components experience multi-axial loading during service life. Existing composite material test standards for generating mechanical design data are predominantly uniaxial in scope, and although several European laboratories are proposing standard methods for multi-axial characterisation, there is currently no standard protocol in place.

There are several methods of creating multi-axial loads, including the use of axial forces and pressure (internal/external) using tube specimens, biaxial plate or cruciform type biaxial configurations and full rig systems applying combinations of axial, bending and/or twisting loads. To further increase the confidence of designers, manufacturers and end-users in the use of composite materials for safety critical applications, it is important to be able to apply realistic "service-loading" to components and structures as opposed to just testing simple coupons.

NPL has recently acquired and commissioned a multi-axial test facility, that is being used for test method development plus loading of components. The multi-axial strong floor facility set-up consists of a tee-slotted cast iron strong floor, upon which can be mounted up to four hydraulic actuators (axes 1-4), each with a static load capacity of ±100 kN, or a dynamic rating of ±50 kN. Each of the hydraulic rams has a stroke of ±50 mm and can be positioned on the strong floor independently, providing, for example, the flexibility to configure the facility from four single-axis test rigs, to a biaxial loading arrangement for cruciform test components.

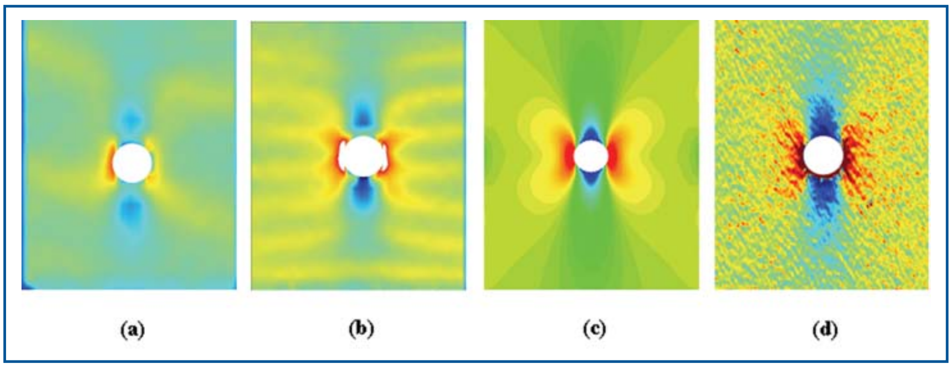


Figure 2 - ε_x strain distribution around a hole in an open-hole tensile coupon by: (a) DIC low resolution, (b) DIC high resolution, (c) FEA (LUSAS) and (d) ESPI (uniaxial)

In conjunction with a number of full-field, non-contact strain mapping techniques including electronic speckle pattern interferometry (ESPI) and digital image correlation (DIC), the aim is to use the facility to validate predicted strain distributions obtained using finite element analyses and to check for strain uniformity in coupon specimens.

An NPL Measurement Note has recently been produced detailing two case studies that have been undertaken to demonstrate the capability and use of the NPL multi-axial test facility. The case studies detailed are; (i) an open-hole tension (OHT) specimen loaded transversely via a pin fitted into the hole and (ii) an aluminium bolted T-joint loaded at 45°. For both case studies measured strain data were compared to strain maps predicted using finite element modelling and theoretical analyses. The strain mapping techniques used were; (i) strain gauges, (ii) ESPI and (iii) DIC. Copies of the Measurement Note can be obtained from NPL (see contact details below).

NPL is now seeking to undertake further cases studies and is looking for industrial partners who would be interested in validating their Finite Element Analysis (FEA) generated strain output through use of the multi-axis loading/strain mapping facility.

For further information, and details on the measurement note please contact: Michael Gower on 020 8943 8625, or michael.gower@npl.co.uk

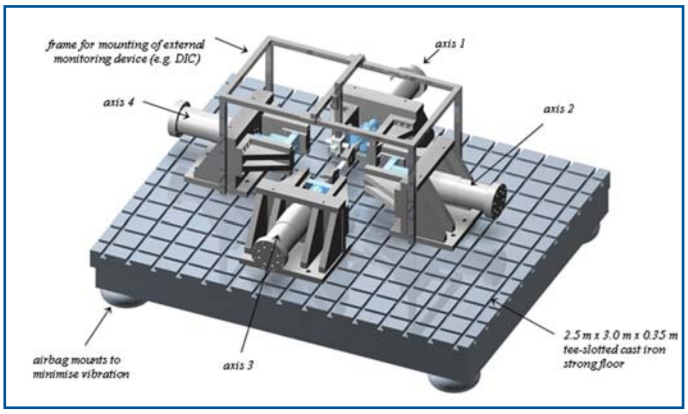


Figure 1 - schematic of NPL's multi-axial strong floor test facility

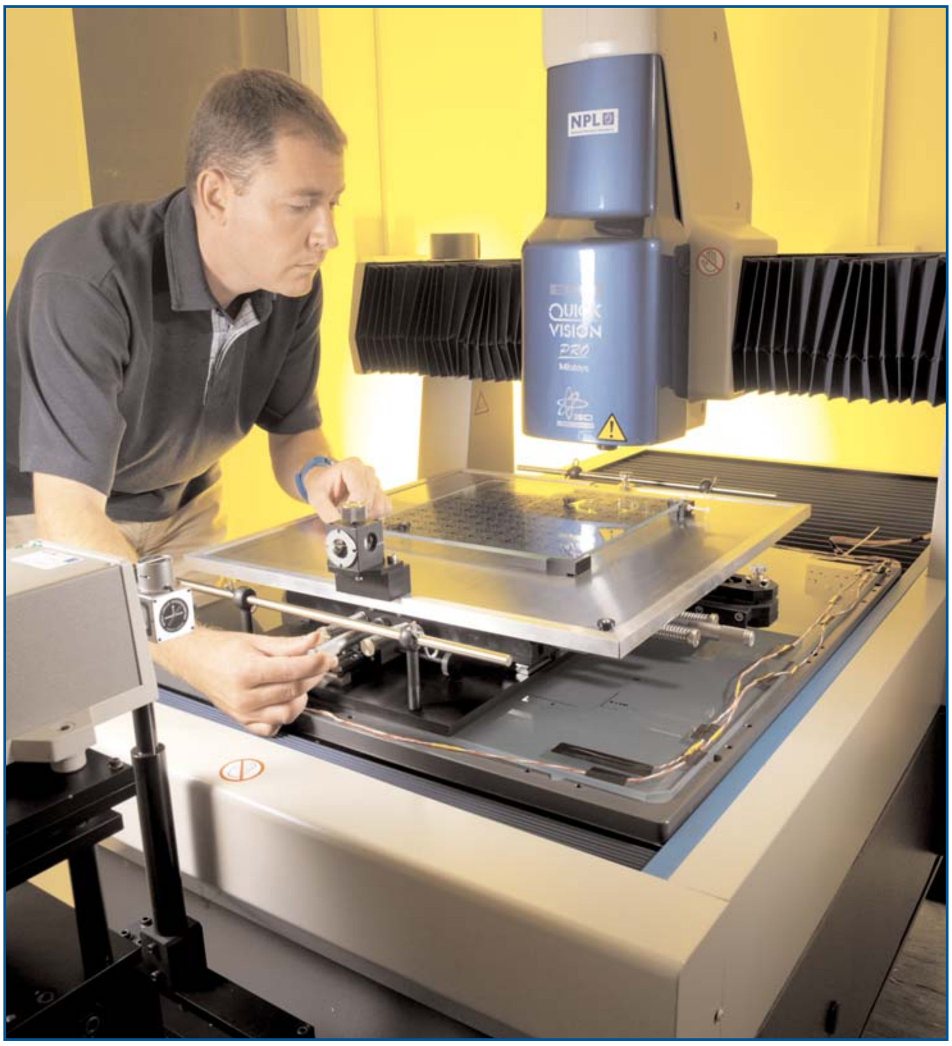
A sharp eye for quality

The National Physical Laboratory develops calibration standards with sub-micron accuracies for vision inspection machines

Vision inspection machines make it possible to measure complex, precisely fabricated items and materials such as automotive and aerospace components, printed circuit boards, microelectronic circuits and features that cannot be accessed by conventional contact type machines and gauges. The measurement technique is neither invasive nor destructive, allowing measurements to be obtained from thin or soft workpieces; and brittle, elastic or moving parts can be measured accurately and quickly. This has advantages in a production environment, allowing quality control and real time feedback to be readily integrated into the manufacturing process.

NPL has developed a new range of non-contact dimensional standards designed primarily to benefit industrial imaging systems and vision inspection machines. These non-contact standards provide traceability to the SI unit of length, the Metre and can be measured with sub-micrometre accuracy. They can aid customers seeking formal accreditation, for example, to UKAS or ISO requirements.

As the United Kingdom's national standards laboratory NPL has much experience in designing, producing and calibrating high accuracy optical standards. Artefacts produced include an X-Y grid plate, and an optical linewidth standard, both supplied with sub-micrometre measurement uncertainties. These standards were co-developed with European partners as part of an EU contract. Subsequent research and development at NPL has seen the production of a family of standards ideally suited for the verification and calibration of industrial imaging systems and vision machines.



NPL Interferometric Vision Inspection Calibration Facility

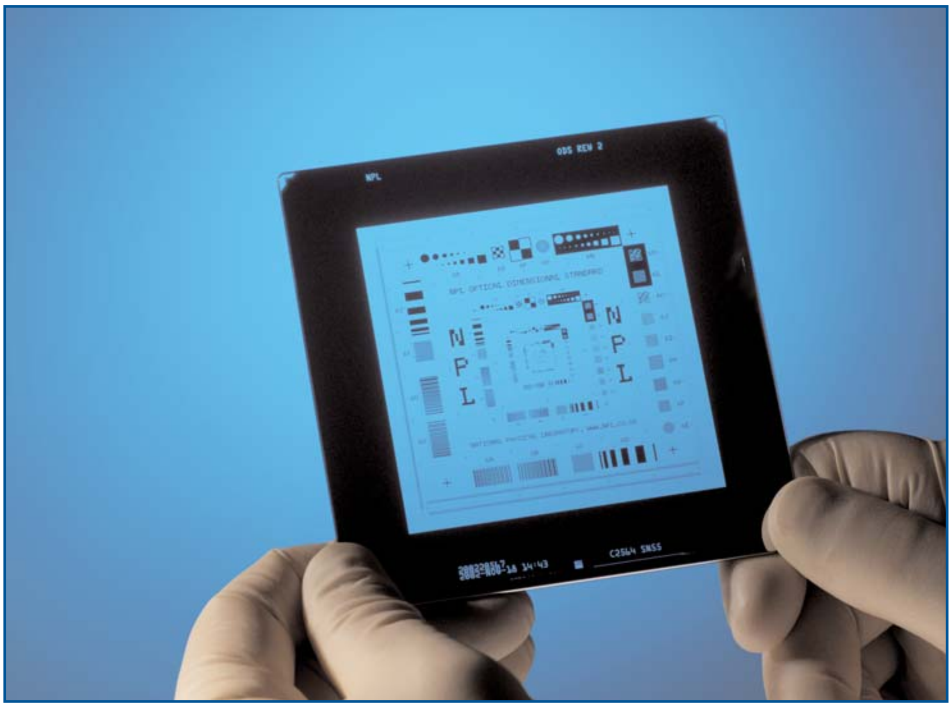
NPL now has a range of X-Y Grid Plates designed to calibrate the co-planar axes of vision machines. The standards are chrome on glass and have working areas from 250 mm x 250 mm to 500 mm x 500 mm. The chrome layer bears metrology structures composed of target dies, set on a square grid that has a nominal pitch of 25 mm. Each die is made up of chrome and clear circles, crosses and squares. The nominal external dimensions of these features start from 30 μm, with each successive feature being twice the size of the previous, up to 1 mm. This enables the co-ordinates of the features to be measured using different optical magnifications. Each artefact has supplementary patterns including linear scales, grids and optical linewidths, designed for the linear calibration of a vision system's optical viewing head.

Where high precision calibration and verification of the imaging system is required, a new multi-functional Optical Dimensional Standard is available, consisting of a single high-precision calibration plate bearing a vast range of different scales, designed to meet virtually all optical dimensional calibration needs. The NPL Optical Dimensional Standard is a 100 mm square plate bearing many thousands of bright chrome structures ranging in sizes between 1 μm and 60 mm. There are twenty 100 mm square plate bearing many thousands of bright chrome structures ranging in sizes between 1 μm and 60 mm. There are twenty-two patterns, scaled and repeated six times, enabling it to be used at different optical magnifications. In addition, there are six 60 mm long linear scales and an X-Y grid pattern, covering an area of 60 mm x 60 mm.

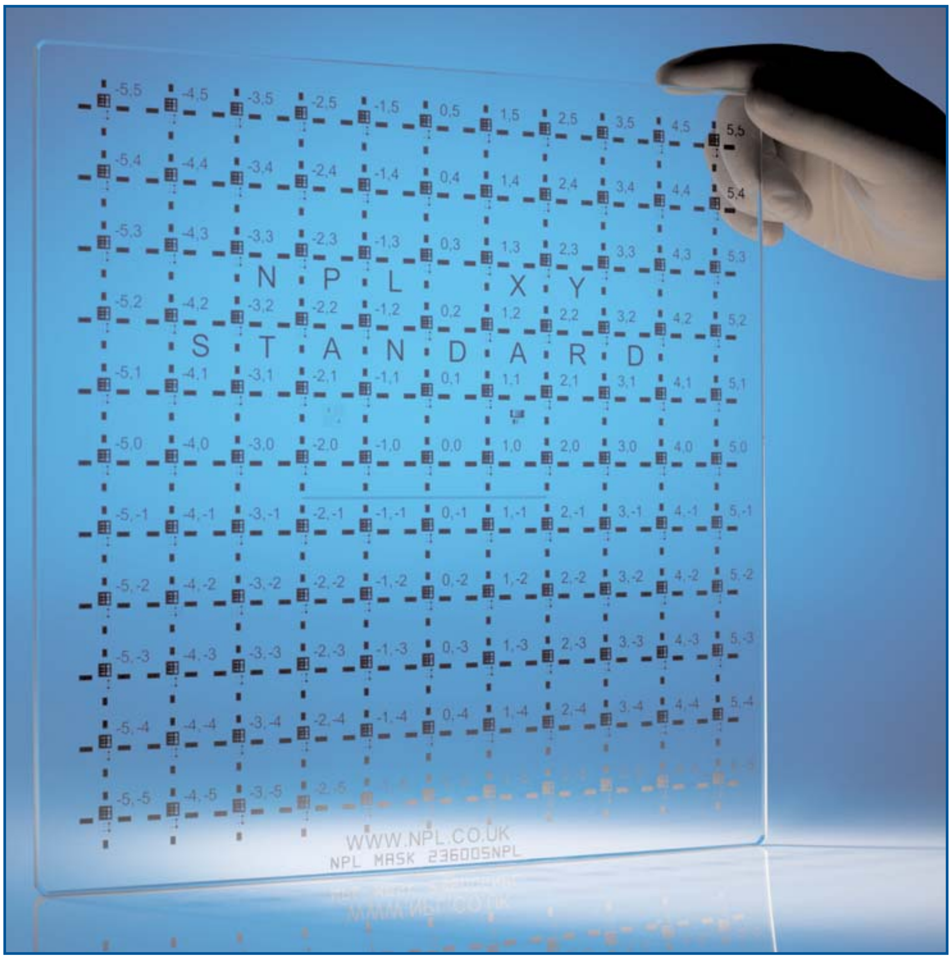
Optical instrumentation companies, vision machine and image analysis developers, system integrators and end-users can all benefit from using the NPL Optical Dimensional Standard. NPL has an unparalleled capability to certify the artefact features, including UKAS accredited measurements. Sub-micrometre measurement uncertainties can be provided and the mutuality agreement that exists between international National Measurement Institutes (NMI's) means that the excellence of the traceability using the artefacts is globally recognised.

For organisations that do not have their own vision machines, or who require particularly high accuracy, the laboratory provides a contract measurement service and consultancy. Artefact sizes up to 1200 mm x 1000 mm x 500 mm can be accommodated, and the capabilities of the machines at NPL have been enhanced by laser interferometry and advanced mathematical algorithms designed in-house, to optimise the measurement uncertainty.

For more information on these standards, visit www.npl.co.uk/length/dmet/index.html or contact Michael McCarthy or Gordon Rodger on 020 8943 6655 or michael.mccarthy@npl.co.uk or gordon.rodger@npl.co.uk



NPL Optical Dimensional Standard



NPL X-Y Grid Plate

Eye in the sky: NPL aids TopSat vision

NPL expertise has contributed to the successful development of the remote sensing, imaging camera used in the TopSat micro-satellite. The camera first transmitted high-resolution images of the Earth last December, following the satellite's launch from the Plesetsk cosmodrome in northern Russia in late October 2005.

Courtesy of the Topsat Consortium

Designed, constructed and tested at Rutherford Appleton Laboratory (RAL), the camera is a compact low cost imager with a 2.5 metre panchromatic resolution on the ground, from a distance of 600 km above the earth's surface. The camera has been designed to be lightweight, compact and stable so that it can be flown on low cost mini-satellites. It will return high quality images very quickly to both fixed and mobile ground stations. Uses of the camera include natural disaster monitoring, environmental damage assessment, pollution and habitat mapping.

Previous high-resolution cameras have been bulky, and required large satellites, which are expensive to operate. TopSat gets round this by using a folded optical system with an off-axis mirror. This design necessitates an extremely stable and accurately aligned optical system. NPL was able to help in the following ways:

- The selection of the materials that formed the camera body optical system to check the viability of the alignment and mirror characterisation.
- Measurement of the individual mirror forms, their alignment within the camera body and their stability when subjected to vibration.

The camera body was to be made from carbon fibre composite to minimise its mass. However, the composite could not absorb too much moisture as this would make it dimensionally unstable, and it needed to have a low expansion coefficient. Thermal expansion and moisture stability measurements made by the materials group at NPL aided the choice of composite for this application.

The mathematical modelling, carried out at NPL, involved the:

- Simulation of the measurement of the optical system to estimate the likely uncertainty in the measurements associated with the geometry of the mirrors.
- Developing software to convert measurements of the mirror system into settings for the five degrees of freedom mirror adjusters to bring about optimal alignment.
- Analysis of mirror geometry and positioning geometry.

The modelling required complicated mathematics because of the large number of solutions to the mirror placement, not all of which are optimum, and the complexity of the shape of the mirrors.

Measurement of the mirror profiles, the placement within the camera body and the effect of vibration was carried out at NPL using two high-accuracy co-ordinate measuring machines (CMMs). A small CMM was used to characterise the mirror shapes using a special error separation measurement strategy. A larger CMM was used to determine their placement within the structure, both before and after vibration testing. Three small tooling balls were attached to each of the mirrors providing a datum for the coordinate system used for the measurements. Once the mirror shapes had been characterised, the alignment of the mirrors could be determined from the position of the balls.

After the system had been aligned at NPL, the system showed three optical fringes across the field of view. This enabled RAL to reduce this to a final value of approximately half a fringe using an interferometeric system. The accurate alignment from the CMM measurements reduced the time required for the interferometric alignment from months to a few days.

TopSat was designed and built by a consortium of British companies led by QinetiQ. The programme has been jointly funded by the British National Space Centre (BNSC) and the UK Ministry of Defence.

For further details on NPL's involvement contact Nigel Cross on 020 8943 6731 or nigel.cross@npl.co.uk; or Alistair Forbes on 020 8943 6348 or alistair.forbes@npl.co.uk

NPL helps Guys and St Thomas' to improve blood pressure measurement

Blood pressure measurement is one of the key parameters used to determine patient health in both primary health care and hospitals, but how do we know the results are correct?

Historically the most common instrument used to measure blood pressure has been the mercury sphygmomanometer, but increasing concerns over the toxicity of mercury is causing these to be phased out across the NHS. Other types of instrument are taking their place with many of these being impressive in their initial performance. However, as with any measurement instrument they need regular re-calibration against traceable measurement standards to ensure that they are still fit for purpose. Owing to a lack of awareness of traceability issues most sphygmomanometers are never calibrated against reliable pressure standards. The effect of this is illustrated by a recent survey that found 49 out of 279 instruments, in use in 45 general practices, produced errors in excess of the allowable tolerance. Such errors can have serious consequences for the treatment of patients with some being given unnecessary medication and harmful symptoms in others not being observed.

NPL has helped Guys and St Thomas' to set up the first UKAS accredited laboratory for the calibration of the sphygmomanometers. This will allow sphygmomanometers to be periodically calibrated against a pressure standard traceable to national standards, eliminating discrepancies and reducing incorrect diagnosis based on blood pressure measurement.

For further information on pressure measurement and calibration please contact Ian Severn on 020 8943 6862 or ian.severn@npl.co.uk

Digital Image Correlation Workshop Meeting NPL, Tuesday 28th March 2006

NPL in conjunction with BSSM is organising a one-day workshop meeting on the development and application of digital image correlation techniques in engineering and materials testing.

Digital Image Correlation (DIC) is a relatively recent development and is receiving considerable interest as a tool for full field, non-contact strain measurement with a large and diverse range of potential applications.

DIC works by comparing changes in images to build up deformation vector fields and full field 2D and 3D strain maps. The technique can be applied over a wide range of length scales from measurements on large structures to analysing images from microscopes and the SEM, and provides a powerful and effective tool for validating 3D FE models of complex geometry component deformation and behaviour.

The meeting is aimed at engineers and scientists with an interest in strain and deformation measurement, looking to develop a better understanding of the capabilities of DIC for their own applications. There will be a series of presentations from internationally recognised researchers and experts, covering various aspects of DIC technique development, validation and application, together with a hands on demonstration session where delegates will be able to examine and compare systems by LaVision, Ettermeyer, Correlated Solutions and GOM.

For more details and registration information contact Dr Jerry Lord on 020 8943 6340 or jerry.lord@npl.co.uk

If you would like further information on any aspect of
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Engineering Measurement Awareness Network, 28 March 2006 – RAF Museum Cosford

DMAC Annual meeting - Measurement for global applications

Accurate measurement is essential to competing on the world stage. DMAC's annual meeting will give insights to diverse and innovative measurement solutions that can or are having worldwide impact. These will include: the use of CMMs to ensure camera alignment on theTopsat micro satellite, Implementing GPS (geometrical product specification) into industrial working practices and calibrating a non-contact device for the measurement of chronic wounds.

An exciting addition to this year's meeting is an hour-long commercial session sponsored by Quality Today. This will give 10 to12 delegates the opportunity to give rapid five-minute presentations on a measurement related subject of their choice e.g. a new product; a new project; a new capability; a recent case study. The session is open to all but places will be allocated on a first–come-first-served basis for registering delegates.

For more details on the meeting and to register visit: www.npl.co.uk/eman/meetings or contact Odette Valentine on 020 8943 6836 or odette.valentine@npl.co.uk

Forthcoming events

28 March 2006, NPL, Teddington
Digital Image Correlation Workshop Meeting
jerry.lord@npl.co.uk

28 March 2006, RAF Museum, Cosford
Engineering Measurement Awareness Network
DMAC Annual meeting: Measurement for global applications
www.npl.co.uk/eman/meetings
odette.valentine@npl.co.uk

5 April, NPL, Teddington
Metrology or Meteorology?
www.rmets.org/event/calendar.php

25 – 26 April, NPL, Teddington
Rapra: Joining plastics 2006
www.rapra.net/conferences/JoiningPlastics06/index.asp
sgarrington@rapra.net

26 April 2006, IEE, Savoy Place, London
15th meeting of the Intelligent Sensing Programme (ISP) Sensors Knowledge Transfer Network
www.sensorsktn.com
robert.angus@npl.co.uk

8 - 10 May 2006, Manchester International Convention Centre
Location and Timing Knowledge Transfer Network will host a Pavilion space at ENC 06
www.rin.org.uk
gill.roe@npl.co.uk

22 May 2006, ImechE, London
Small Specimen Testing – Methods and Analysis
www.imeche.org.uk/events/SST
z_thomas@imeche.org.uk

6 – 7 June 2006, French National Metrology and Testing Laboratory, Paris
High Temperature Fixed Points, Research and Industry Solutions Workshop
www.lne.fr/en/news_events/workshop-htfp-2006/high-temperature-fixed-points-workshop-2006.html

17 – 18 July 2006, NPL, Teddington
Humidity Measurement & Calibration Course 06
www.npl.co.uk/thermal/courses/humidity_course.html

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