

# DOWNLOAD PDF CERAMIC COATINGS METROLOGY WORKSHOP REPORT

## Chapter 1 : Capabilities - Novellution Technologies, Inc.

*The Ceramic Coatings Metrology Workshop was held at NIST to identify the measurement needs of the various industries that manufacture and use ceramic coatings.*

It is open to all the areas connected to both theoretical and experimental aspects of metrology at the nanometer scale, from new methodologies for the quantitative characterization of nanomaterials, to new results in fields of characterization of nanomaterials and realization of nanometrological standards, which represent a key issue for making possible a successful technological transfer of nanotechnology. The aim of this event is to offer an opportunity to academicians, innovators and industrials to share, and divulge new methods, techniques and instrumentations, for metrology and characterization of nanomaterials, nanosystems, and nanodevices at the nanometer scale. The event topics include, but not limited to: Great progress has been made in energy science and technology innovation in our country, but the new energy material has become an important bottleneck to upgrade energy technology and energy industry structure. Currently, new energy technology is attributed to be one of the five most important technologies in world economic development: During the "First National New Energy Materials and Devices Conference" topics concerning energy conversion and storage of energy, materials and device design, etc. Research progress and analyzing the current state of development of the industry, from an academic and industrial perspective, will also be addressed. The conference offers a platform for exchange and cooperation for the outstanding scientists and entrepreneurs, to promote new energy materials, devices and applications. We look forward to welcoming you at this event. TACT will be the sixth one. The conference includes plenary lectures and invited talks by eminent personalities from around the world in addition to contributed papers both oral and poster presentations. It brings together leading scientists, researchers, engineers, practitioners, technology developers and policy makers in nanotechnology to exchange information on their latest research progress, innovation and business opportunities. With the development of the auto-mobile, electronics, communication, aerospace and aviation, marine shipbuilding, high-rise buildings construction and machine industries, there is an increasing demand for excellent and innovative surface treatment, plating and painting industries. Through the connection with the surface treatment industry, Surtech Middle East will promote industry exchange and development and seeks to become the foothold of the growth of the industry by arranging a place for cooperation for manufacturing companies, small and medium-sized companies and global companies. The ECNF aims to bring academics and industry thought-leaders to exchange and share their knowledge on the aspects of surface engineering, functionalization and smart materials. This conference will facilitate opportunities to network and discuss the practical challenges facing the industry sectors. It presents the products, services and achievements of companies and institutions in NRW which are active in the battery technology and application market. Visit our website often to get the latest updates on our Symposium. The event will attract more than featured exhibitors and an expected crowd of more than attendees, including business executives, venture capitalists, politicians, scientists and researchers from over 70 countries. Nanotech contains 38 symposiums and brings together specialists from a wide range of scientific fields, technology and business. Representatives of the following open access journals will attend:

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## Chapter 2 : Nanotechnology Now - High Performance Thin-Film Coatings Conference

*Note: Citations are based on reference standards. However, formatting rules can vary widely between applications and fields of interest or study. The specific requirements or preferences of your reviewing publisher, classroom teacher, institution or organization should be applied.*

Thin films and coatings technologies are helping to bring new performance advantages to existing products. The nanoscale manufacture, finishing and patterning of surfaces is also of interest to many sectors including the biotechnology industry so in late the NanoKTN, in conjunction with CEMMNT, organised a seminar in London to highlight the very best technologies that are currently available in the UK. Many products now require the use of performance and functional films to improve cost reduction and increase service lifetimes, whilst reducing the environmental burden. The integrity of such thin films and coatings is absolutely crucial to ensure the best possible performance characteristics and business sustainability. By reducing manufacturing defects and investigating the mechanics and structures at the most fundamental level in the micro and nano regimes, it ensures that an enhanced level of engineering control be achieved and hence the value added of products can be increased substantially. This is primarily due to the high usage of coatings in the electronics industry but also the increasing usage of coatings within the engineering and healthcare sectors. The main aim of the one-day seminar and workshop, entitled High Performance Thin-Film Coatings - Ensuring Nanoscale Manufacturing Integrity was to bring together innovators in both advanced thin-film manufacture and measurement in order to share knowledge and encourage collaborations. These solutions include materials which are engineered using biological, chemical or physical methods. Some applications require a bulk solution such as structural composites or plastics. Kean looked at the increasing requirement to add to the functionality of surfaces by working with materials that enhance the performance systems. Thin Film Photovoltaics Prof. Mike Walls, Loughborough University Walls presentation introduced the thin-film deposition techniques available and the metrology tools used to characterise optical performance, as well as uniformity and roughness. Walls provided an overview of the photovoltaic sector and how much it is rapidly expanding globally due to the renewed interest in green energy technologies. He went on to give an overview of what his research group is doing in this area with the development of a new large area magnetron sputter unit which is capable of producing well defined thin films of material onto glass windows. ANSIN was established through the support of founding partner Seagate Technology Ireland with a mission to undertake collaborative research between the University and Seagate and to also act as a hub to engage in new collaborative and precompetitive research in advanced materials and coatings. The presentation looked at some examples of how the ANSIN facility can provide value and how we can now provide a bridge between the capabilities of a well found University research environment and the needs of advanced coatings manufacturing. The focus of the presentation was on the characterisation of nano-diamond like films on macro sized components and how the use of analysis can show how films can be improved by the production of smaller nano-diamond domains. An example could be found in gear wheels for wrist watch applications. Gee outlined a selection of old and new techniques for evaluating mechanical properties, including nano-indentation, Surface Acoustic Wave Spectroscopy, Scanned Probe Microscopy and scratch testing. Many of these techniques are now enhanced with modulated temporal methodologies e. The Structure and Integrity of Ceramic Coatings using X-ray Tomography and Mechanical Testing Ian Shapiro, Mosley Imaging Centre, Manchester University The goal of mapping a 3D dimensional object without cutting or cross sectioning is very appealing to the manufacturing community so the development of new x-ray tomography techniques is of special interest. The presentation from Ian Shapiro outlined moves to improve the resolution into the nanoscale of 3D tomographic analyses. With such improvements, the large datasets generated need to be managed and computed. This is now starting to be a reality and so very fine 3D structure is starting to be revealed on a many different types of materials samples not just coatings but bulk objects as well. This

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technique can be used to image surfaces in parallel rather than in raster fashion for interferometric methods which takes longer to acquire the data. This advance coupled multi wavelength laser system acquisition can mean that step heights or normal samples can be measured properly without metrological artefacts dominating images which can lead to false height estimations. Discussions between delegates suggested that the step before manufacturing is important when developing new products - the challenge is to reproduce the expectations of the customer - i. It is important to marry the testing of a component to application development i. The measurement needs are different for each application. Overall, UK SMEs were disappointed by the lack of suitable measurement turnaround times by Universities who sometimes have different priorities for their equipment. The question of how manufacturers identify who can do what measurements was central to discussions. Some suggested by going through brokers who can signpost options for manufacturers. The MNT facilities tried to tackle this issue through the MNT Capital programme however with decreasing resources there is a need to carry on an active network rather than a list of facilities. This may be an action for instrument providers and knowledge networks like the NanoKTN to generate and disseminate. Of course, the lack of professional skills and training are still issues due to the high expertise level required to operate and get the best out of the more advanced analytical equipment that is around on the market today. Nanoscale metrology is particularly fraught with problems with measurement error. Conclusions In its review Advanced Materials -Key Technology Areas , the Technology Strategy Board identified three challenge areas, where high value-added products and processes strongly underpinned by, advanced materials technology can be exploited in strong UK markets. The conclusions from discussions are that more effort needs to be paid to identifying and making available measurement case studies to the community and to help in assisting those who are in completely different business sectors gaining cross over knowledge in measurement. There was also a need to be able to train equipment and instrument operators to be able to drive analytical equipment to utilise capital spending. As well as covering a large number of crucial issues within the industry, the conference provided an area for industry professionals and academic institutions to network, creating links in the supply chain and generating new discussions surrounding nanotechnology for engineering. By bringing together people at events like these, the NanoKTN aims to find solutions to issues faced by the market, in order to forge a competitive industry in the UK. This article gives only a snapshot of the developments in this market and only a summary of the issues discussed at the event. To stay up-to-date with group developments and events in this area and to read presentations in full, please visit [www](http://www.nano-ktn.org).

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## Chapter 3 : SUPER THERM - Project Pictures -SUPERTHERM Ceramic - SUPER THERM

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Many products now require the use of performance and functional films to improve cost reduction and increase service lifetimes, whilst reducing the environmental burden. The integrity of such thin films and coatings is absolutely crucial to ensure the best possible performance characteristics and business sustainability. November 9th, High Performance Thin-Film Coatings Conference The one-day seminar and workshop will evaluate the issues faced by the nanotechnology supply chain that manufacture high performance thin-film coatings. Through discussions and case study presentations, delegates at the event will be given the opportunity to network and discuss the advantages and disadvantages of potential applications. By discussing challenges and opportunities, the NanoKTN aims to identify gaps in the market where UK companies could invest and become involved. The event will conclude with an open discussion which will provide an unique opportunity to discuss and air views on the issues that are relevant to the thin film manufacturing community as a whole. There will be a 50 minute breakout session when delegates will be able to hear and discuss the issues first hand. These have recently published reports into surface engineering and thin film metrology respectively and outline what technical and development priorities need to be implements to provide innovation in this field. If you would like to read the reports before the workshop the please visit the Materials KTN website and the Co-Nanomet website. Once for armed with this state of art information, there will be series of round table discussions about how the thin film manufacturing community can move forward and outline the challenges ahead. There will then be an opportunity to put these views to an expert panel including the presenters of the report and also the Technology Strategy Board. This gives UK companies a platform in which to express their views. Finally following this presentation their will be a presentation from Christian Inglis of the Technology Strategy Board who will outline the funding initiatives in this area and how the UK Government is stimulating innovation in a very important field. Presentations at the meeting include: ANSIN was established through the support of founding partner Seagate Technology Ireland with a mission to undertake collaborative research between the University and Seagate, acting as a hub to engage in new collaborative and pre-competitive research in advanced materials and coatings. Bowman will present some recent examples of how the ANSIN facility can provide value and how it can provide a bridge between the capabilities of a University research environment and the needs of advanced coatings manufacturing. As well as covering more complex techniques such as nano-indentation and micro-tribology testing, the talk will emphasise test techniques that can be applied simply and provide highly useful information on aspects such as residual stresses, adhesion and coating stiffness. Production of Nanoparticle Coatings for High Performance Structural Applications Alistair Kean, Technical Director, Mantis Deposition Market areas such as energy and medicine are becoming increasingly dependent on solutions provided at the nano-scale. These solutions include materials which are engineered using biological, chemical or physical methods. Some applications require a bulk solution such as structural composites or plastics. However there is an ever increasing requirement to add to the functionality of surfaces by adding a material which enhances the performance of the device or system that depends upon that surface. Examples include catalysis, plasmonics, thermodynamics and tribology. For instance, thermal barrier coatings must reliably adhere to the metallic components that they protect within gas turbine engines and chemical vapour deposited SiC coatings must also have perfect integrity if they are to contain radioactive material within nuclear fuel particles. Ian Shapiro will look at the Henry Moseley X-ray imaging facility at the University of Manchester that allows the structure within materials to be probed at scales from nanometres up to many centimetres. For more information about this event and details of how to register, please visit [www.](http://www.)

## Chapter 4 : Coatings | Events

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*The NIST Metallurgy Division has initiated a research program to investigate coatings produced by thermal spray techniques. The focus of this research is the development of measurement tools that will aid in the understanding and/or control of the plasma spray process.*

## Chapter 5 : Nanotechnology Now - Thin-film coatings - CEMMNT and NanoKTN event review

*The one-day seminar and workshop will evaluate the issues faced by the nanotechnology supply chain that manufacture high performance thin-film coatings. Through discussions and case study presentations, delegates at the event will be given the opportunity to network and discuss the advantages and disadvantages of potential applications.*

## Chapter 6 : Paint Standards and Related Coating Standards

*This report is intended as a record of the presentations and discussions which took place at a NIST the current MSEL Ceramics Coating Program. Workshop Presentations.*