
Editorial

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Biographical notes: Albert Weckenmann studied Electrical Engineering with the focus on Communications Engineering in Karlsruhe, Germany. In 1992, he set up the new chair for quality management and manufacturing metrology at the University Erlangen-Nuremberg and realised labs including a high precision measurement room. The foci of his research were in tactile coordinate metrology with measurement strategies and evaluation algorithms, in optical metrology and particularly in the area of function-oriented measurements in micro- and nanometrology. His works on uncertainty evaluation, economics of metrology, innovative training concepts as well as on quality management methods rounded off the picture of his scientific output.

Metrology is one of the key sciences of all centuries. Moreover, manufacturing metrology is the key of modern production. In manufacturing macro parts as well as micro- and nano-structures on surfaces, without metrology there would not be any capable and precise manufacturing process nor any surface fulfilling precisely functional requirements. Without metrology there would not be any innovative high quality product or process. But they are needed to save the exhaustible raw materials on earth, because of saving material by being able to produce and process smaller dimensions of work pieces with the help of adequate metrology systems, for e.g., nanostructures. Moreover, the saving of resources during lifetime of the manufactured goods, e.g., reducing friction by knowing exactly the topography of friction partners is another profit of metrology. Only when the state of the art is known sufficiently precisely, there is the chance to improve. Due to that situation and underlining the importance of metrology, a special issue of the *International Journal of Nanomanufacturing* dedicated to novel research results which are able to improve manufacturing processes in nanotechnology has been arranged.

The first paper from University Huddersfield (UK) is an excellent review on surface measurements in nanometer scale and on the importance of function-oriented measurement and evaluation.

The second and the third papers are dealing with scanning probe microscopy. The second from PTB (Germany) presents two kinds of AFM's for the manufacturing process nanoimprint lithography, the promising next generation lithography technique. The third one titled 'Towards fast AFM-based nanometrology and nanomanufacturing' from the University of Technology Vienna (Austria) is addressing the characteristics of AFM hampering the use in manufacturing shops. Improvements of the operational performance and comfort of AFM technology, particularly the scanning speed and bandwidth for controlling the interaction between tip to surface are demonstrated.

The fourth paper originating from the University of Tokyo is dedicated to the application of a novel height measurement method for single nanoparticles illuminated by an evanescent field. This method can be applied, e.g., in wafer inspection.

The next paper from KAIST (Korea) deals with the use of a frequency comb of a femtosecond laser as a wavelength ruler for real-time measurements of absolute distances. The comparison with laser interferometer demonstrates the performance of this new method: an average deviation of 32 nm in measuring a distance of some 2.3 m.

The next three papers deal with coordinate measurements and probing systems. The contribution of company Werth Messtechnik (Germany) focuses the importance of high precision probing systems and requirements on them for reliable measurement results with resolution in nanometer range. A novel fully 3D capable tactile-optical probing system and its unique performance are demonstrated by measurement results. The seventh contribution from the University Erlangen-Nuremberg (Germany) presents a novel dynamic sensor rotation for micro-measurement systems. The aim is to lower measurement deviation and to increase accessible surface angles. The contribution shows simulative results on different surfaces and discusses aspects of the principle's practical application. The eighth paper from University Erlangen-Nuremberg and Technical University Ilmenau (both Germany) gives an overview of properties of the nanomeasuring machine (NMM-1) and of probing systems applied there for most precise surface and coordinates measurements with a resolution of 0.1 nm.

A scatter light sensor for detecting and analysing chatter marks in nanometer scale is demonstrated in the following contribution from the University Kaiserslautern, Germany. With such a sensor the performance of machining processes can be controlled and improved.

In the tenth contribution of this issue, provided by an Austrian-Turkish team centred at the Vienna University of Technology (Austria), surface characteristics of coatings on cutting tools are investigated. The performance of coated and uncoated tools was evaluated and compared after using them in machining processes. The comparison turned out that coated cutting tools are of an extended tool life and lead to higher quality of machining and surface finish.

In the 11th and last contribution, prepared by a team from Osaka University, an evaluation system using parallel phase-shift digital holography is proposed which is aiming to enable a precise, but non-destructive evaluation of heterogeneity in optical glasses.

Altogether, this special issue unveils novel measurement procedures for application in nanomanufacturing and demonstrates their capability and their contribution to highly efficient and most precise nanomanufacturing processes. All in all a fine collection of scientific novelties in metrology for nanomanufacturing.

I thank all the distinguished authors who contributed to this fine collection of highly interesting special issue of *International Journal of Nanomanufacturing*. As well I thank the editors-in-chief, Prof. Fengzhou Fang and Prof. Jack Luo for their confidence in entrusting me with arranging this precision metrology dedicated special issue as guest editor. My particular thanks address my assistant Dr.-Ing. Teresa Werner, she did all the extensive organisational and manual formal work operating the complicated editorial system.