

10th International Conference on

EMERGING MATERIALS AND NANOTECHNOLOGY

July 27-29, 2017 Vancouver, Canada



Hamed Sadeghian

Netherlands Organization for Applied Scientific Research, TNO, The Netherlands

Probing the nano-scale with the use of Nano-Opto-Mechatronics Instruments (NOMI)

Understanding the interactions of matter at nano-scale has become the key for the success of several applications. In nanoelectronics or semiconductor industry, it helps for better manufacturing (higher resolution towards sub-10 nm structures, more complex structures) and reliable nanometrology and nano-inspection (for improving the yield of process). One of the NOMI to probe the interactions at nano-scale is scanning probe microscope. The ability to accurately measure critical dimensions in nano-meter scale has made it an important instrument in several industrial applications such as semiconductor, solar and data storage. Single SPM has never been able to compete with other inspection systems in throughput, thus has not fulfilled the industry needs in throughput and cost. Further increase of the speed of the single SPM helps, but it still is far from the required throughput and, therefore, insufficient for high-volume manufacturing. The first part of my talk presents the development of a concept for a multiple miniaturized SPM (MSPM) heads system (parallel SPM), which can inspect and measure many sites in parallel. The very high speed of miniaturized SPM heads allows the user to scan many areas, each with the size of tens of micrometers, in few seconds. Various nanoimaging such as subsurface probe microscopy will also be presented. The second part of my talk is about meta-instrument. Meta-instrument is a type of optical nano-instrument where the core is based on optical metamaterials to go beyond the diffraction limits for high resolution imaging. Advantages of optical techniques compared to SPM is that they provide direct capture imaging which is fast and allow large fields of views to be covered quickly. The development of first generation of meta-instrument will be discussed in detail.



Biography

Hamed Sadeghian has received his PhD (Cum Laude) in 2010 from Delft University of Technology. He has continued his career as a Research Associate and developed several nano-opto-mechanical instruments for nano-scale interaction measurement. He is currently working as a Principal Scientist at TNO. His research program NOMI focuses on development of instruments based on the interaction of electromagnetic or mechanical/quantum waves with matter, with a focus on industrial and societal applications. Examples are the parallel AFM as a sub-nm, high throughput metrology and inspection solution for semiconductor industry and the high resolution optical microscopy with meta-instrument and 3D nano-tomography to resolve invisible nano-structures below the surface. He is the Scientific Leader of the TNO Early Research Program 3D nanomanufacturing. In the last 5 years, he has participated in several EU-funded projects such as E450EDL, E450LMDAP, SeNaTe, Value4Nano, 3DAM and TakeMi5. In 2014, he has received his MBA degree from Leuven Vlerick Business School, Belgium. He was also a co-founder of Jahesh Poulad Co. (2002), which designs, manufactures and installs mechanical and electrical equipment for steel industries. He holds 40 patents, and has (co-) authored more than 60 technical papers and a book. He is a member of the Editorial Advisory Board of *Sensors & Transducers Journal* and a member of the technical committee of SENSORDEVICES conference. In 2012, he has received the "TNO Excellent Researcher" award.

hamed.sadeghianmarnani@tno.nl