

The Nanometrology Bottleneck: Challenges and Recent Advances

Metrology is fundamental to nanomanufacturing: detailed measurements enable the development of new materials and devices, while on-line measurements enable process control to be maintained. While many sophisticated tools are available for in-depth material and device characterization, they are typically severely limited in throughput and unsuitable for on-line metrology. There is thus a need for techniques that can reliably report on nanoscale structure and properties at high speed. In addition, these techniques must be affordable. One way of meeting this challenge is to take the comprehensive process-structure-properties relationships derived from careful measurements and abstract the key features of those relationships into a model of the system. That model is then used to interpret the results from measurements that typically only need to reflect changes in the devices or materials being produced over a narrow range of process parameters. The measurements needed can therefore be made significantly simpler, faster and cheaper. In this talk I will illustrate this approach by considering the disparate cases of carbon-based nanocomposites, roll-to-roll nanoimprinted surfaces and DNA-templated nanostructures.

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Received his B.A. and D. Phil. degrees in Materials Science from the University of Oxford. He worked for 12 years at Bell Laboratories on new electron-beam lithography techniques and optical MEMS. Subsequently he spent four years as the head of the LBNL nanofabrication group in the Center for X-ray optics, and then lead scientist of the Molecular Foundry nanofabrication user facility before moving to NIST. He is now leader of the Nanofabrication and Nanomanufacturing Research Group in the Center for Nanoscale Science and Technology. His current focus is on novel metrology methods for nanofabrication and nanomanufacturing.