



NASCENT SHORT COURSE

Optical Nanometrology and Inspection Techniques

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University of New Mexico, Center for High Technology Materials

Thursday, July 21, 2016
12:00 pm - 3:00 pm

CHTM, 1313 Goddard SE Albuquerque, NM 87106
Room 103

<https://zoom.us/j/209236627>

Metrology is an essential aspect of manufacturing. Ideally, a manufacturing metrology should be: real-time - so as not to limit throughput; non-destructive, and preferably non-contact - so as not to interfere with the processing; with sufficient resolution to monitor manufacturing drifts; and flexible in sampling to allow both large area monitoring of trends and local monitoring of defects and manufacturing variability. Optical metrology satisfies many of these constraints, but the issue for nanomanufacturing becomes the resolution when the optical wavelength is much larger than the feature sizes (critical dimensions); the periodicity of fabricated structures; and the scale of “killer” defects. Fortunately, optical measurements, and in particular techniques based on coherent light and wave interference, allow resolutions to small fractions of a wavelength. Two techniques being explored in the NASCENT ERC: scatterometry and imaging interferometric microscopy (IIM) will be discussed in some detail. Scatterometry is an optical metrology based on diffraction from periodic structures that is well suited to the demands of the nano manufacturing of photonic and electronic components which often include regions of periodic structures. IIM pushes the resolution limits of optical microscopy to fundamental limits of $\sim\lambda/4n$ where λ is the optical wavelength and n the refractive index of a sub/superstrate that can be as high as 5 for a silicon thin film in the visible. Finally, metrology measurements, e.g. the polarization selectivity for a wire grid polarizer or the contact angle of a fluid drop on a patterned surface can provide nanoscale information from macroscopic measurements.

S. R. J. Brueck is a Distinguished Professor Emeritus of Electrical and Computer Engineering and of Physics and Astronomy at the University of New Mexico. He has long been active in various aspects of optical metrology, optical lithography and nonlinear optics. He is a fellow of IEEE, OSA and AAAS and was inducted as a fellow of the National Academy of Inventors in 2015. He was awarded the inaugural UNM Presidential Medal of Honor for his many contributions to the University of New Mexico where he was a long-term Director of the Center for High Technology Materials.