



Interferometric micro- & and nanoscale patterning and its industrial applications

Murukeshan Vadakke Matham
Centre for Optical & Laser Engineering
Nanyang Technological University, Singapore
Email: MMurukeshan@ntu.edu.sg

ABSTRACT

Optics technology that focuses on semiconductor, biomedical, and energy sectors in the recent past has seen the impact of nanoscale patterning, a challenging trend to achieve smaller features or devices with micro- or nano-scale features. This demanded automatically the need for achieving much smaller features beyond the forecasted sub-30nm fabrication methodologies. Hence, there is significant push for smaller dimension recently that has posed many challenges. In this context, a new branch of conventional and nearfield optical concepts, such as evanescent wave and plasmonics, for improving patterning resolution has started developing. These approaches have been receiving considerable attention for its ability to produce high-density sub-wavelength features at the micro- and nano-scale levels. This plenary talk will be covering the above mentioned aspects focussing on the in house developed concepts and technologies in the related areas by the author's group.

The talk will initially details the need for using visible or near UV wavelengths for patterning and explore how interferometric concepts can enable such approaches. It will then details the development and instrumentation details of a multi-beam laser interferometric lithography system for conventional and near field optics assisted patterning at the micro- and nanoscale. These patterned structures are then demonstrated for semiconductor applications detailing the challenges faced in meeting the forecasted technology nodes of sub-30nm features by 2020. A configuration of layered plasmonic and gap mode assisted structures for improved broadband absorption in thin film Si solar cells will then be discussed followed by novel nanoscale patterning approaches using random optics such as the recently proposed and innovative speckle lithography. This has proven to make reliable hydrophobic, hydrophilic surfaces, and black or white silicon structures for potential industrial applications. The talk will conclude by highlighting the current and future research challenges using periodic and aperiodic patterns obtained by interferometric approaches for high resolution imaging.

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