**Principles and Promise of Multicolor, Visible-Light Nanolithography**

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The Abbe criterion has long been used to guide the development of new approaches for improving the resolution of optical projection lithography. An important component of this strategy has been to develop methods that rely upon ever shorter wavelengths of light. Each new decrease in the actinic wavelength brings with it a new set of challenges in the generation and manipulation, as well as the materials that are patterned.

In optical microscopy, it is often not feasible to use a shorter wavelength of light to improve upon resolution. This constraint has let to the development of an entirely new class of approaches to resolution enhancement in far-field optical fluorescence microscopy.[1-5] These new strategies go beyond using one color of light to excited fluorescent molecules by adding a second color that can modulate the fluorescence. In favorable cases, such approaches can provide imaging resolution that is a small fraction of the wavelengths of light employed.

Over the past half decade, similar strategies have begun to be developed for projection lithography.[6] A number of two-color, visible-light approaches have already demonstrated resolution that is well below that predicted by the Abbe criterion. A nascent generation of three-color lithographic techniques has the potential to push the resolution to the 10-nm level using visible light.

In this presentation we will discuss the underlying principles of and approaches to multicolor, visible-light nanolithography. Although these techniques have so far been applied predominantly to point-by-point lithographic techniques, with continued materials and hardware development, rapid, large-area patterning with resolution on the 10-nm scale promises to be feasible.

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