Photodeactivatable photoresists for visbile-light nanolithography

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In the conventional picture of photolithography, attaining the finest possible resolution entails using the shortest wavelength of radiation or particle that is feasible. However, a new approach to enhancing resolution has recently been developed in which two different beams of light are employed, one to activate a negative-tone photoresist and another to inhibit the exposure. By appropriate spatial shaping of the activation and deactivation beams, feature sizes as small as 40 nm have been demonstrated using 800 nm light. This technique is known as resolution augmentation through photoinduced deactivation (RAPID) photolithography.[1-3]

In this presentation we will discuss the fundamentals of RAPID lithography as well as the current state of the art including the optics, chemistry, kinetics and performance of this technique. We will also consider future prospects for the technique and the challenges that must be addressed to maximize its potential.

(1) **"Achieving lambda/20 Resolution by One-Color Initiation and Deactivation of Polymerization,"** Linjie Li, Rafael R. Gattass, Erez Gershgoren, Hana Hwang and John T. Fourkas, Science 324, 910-913 (2009).

(2) **"Nanoscale Photolithography with Visible Light,"** John T. Fourkas, *J. Phys. Chem. Lett* 1, 1221-1227 (2010).

(3) **"Multiphoton Photoresists Giving Nanoscale Resolution that is Inversely Dependent on Exposure Time,"** Michael P. Stocker, Linjie Li, Rafael R. Gattass and John T. Fourkas, *Nature Chem.* 3, 223-227 (2011).