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A Comparison of Photoresist Resolution Metrics using 193 nm and EUV Lithography

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Image blur due to chemical amplification represents a fundamental limit to photoresist performance and manifests itself in many aspects of lithographic performance.[1-5] Substantial progress has been made in linking image blur with simple resolution metrics using EUV lithography.[6-8]

In this presentation, we examine performance of 193nm resist and EUV resist systems using modulation transfer function, corner rounding, and other resolution metrics. In particular, we will focus on cross-comparisons in which selected EUV and 193 nm resists are evaluated using both EUV and 193nm lithography. Simulation methods linking 193nm and EUV performance will be described as well.

Results from simulation indicate that image blur in current generation 193nm photoresists is comparable to that of many EUV resists, but that ultra-low diffusion materials designs used in very high resolution EUV resists can result in substantially lower blur. In addition to detailing correlations between EUV and 193nm experimental methods, we will discuss their utility in assessing performance needs of future generation photoresists.

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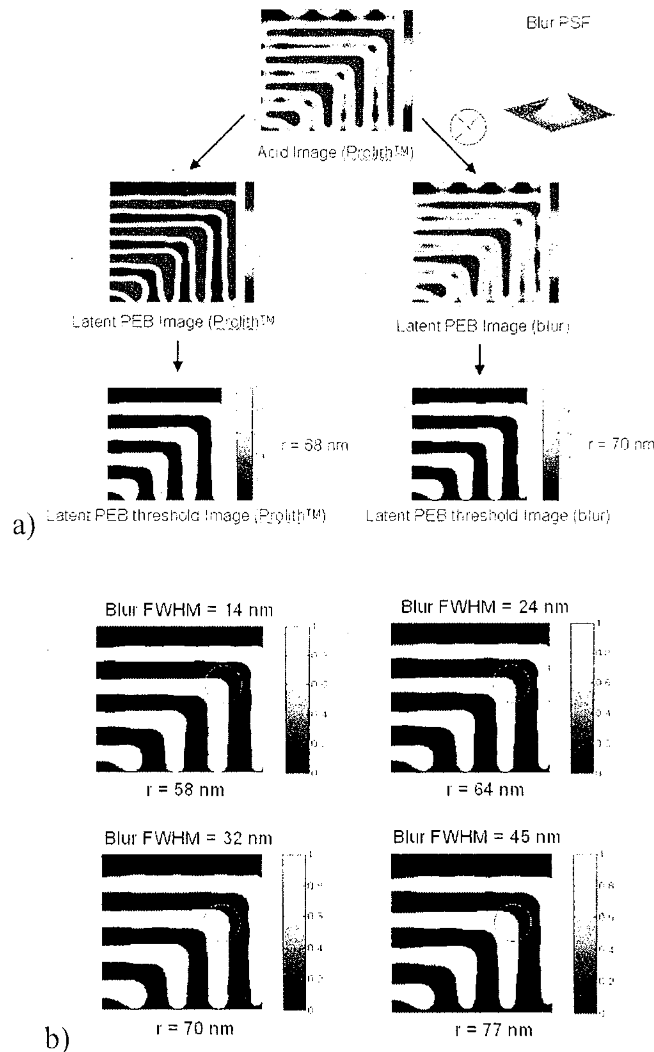

Figure 1. a) Corner rounding simulations using commercial 193nm photoresist. Left path: corner rounding analysis using Prolith resist model. Right path: corner rounding analysis using a blur point spread function (PSF) matched to Prolith resist model. b) Simulated 193nm corner rounding using blur PSFs derived from analysis of EUV resists.