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Characterization of Materials for Nanoscale Lithography

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Current state-of-the-art semiconductor devices are fabricated at dimensions below 100 nm and industry planning anticipates that devices at the 20 nm scale will be in production a decade from now. The sizes of the component molecules of typical polymeric photoresists are of this same magnitude, and due to this convergence of scales and intrinsic materials limitations, the formation of high fidelity relief images at these dimensions will be a significant challenge. We summarize here the materials issues that must be addressed to enable the practical application of nanoscale photolithography, and describe instrumentation and methods we have developed that allow their suitability for such use to be assessed by characterizing basic materials properties.