

Polymers for High Resolution Imaging Applications

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During the past several decades, there has been a continuing and nearly frantic effort on the part of the microelectronics manufacturers to make ever smaller devices. The rate of device scaling is described by the famous “Moore’s Law”. Companies that cannot keep pace with Moore’s Law quickly disappear from the market place and sadly many with famous names like Siemens, Motorola and Sony have fallen by the wayside. Photolithography, the process that has enabled the production of all of today’s microelectronic devices has now reached physical limits. Efforts to push that technology to provide still higher resolution by the historical paths of exposure wave length reduction, increasing the numerical aperture of the projection lens and reduction in the Rayleigh constant have been abandoned. Is this the end? Can device scaling continue??

A progress report will be presented on our effort to enable continued scaling of these devices through application of chemical engineering principles. Recent work has demonstrated a means to increase the resolution of photolithography by over four fold. We have now demonstrated well resolved 50 Angstrom wide lines and spaces using a “bottom up” imaging process enabled by new block copolymers and have successfully transferred these very small patterns into useful substrate materials. These results bode well for continued scaling at the pace described by Moore’s Law.