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Self-Assembling Block Copolymer Resist Mixtures towards Lithographic Resists for Sub-10 nm Features CURRAN CHANDLER, VIKRAM DAGA, JAMES WATKINS, University of Massachusetts Amherst — Significant improvements in 193 nm photolithography have enabled the extension of device feature sizes beyond the 45 nm and 32 nm nodes, yet uncertainty lies beyond 22 nm features as no single replacement has emerged. Here we show that low molecular weight, nonionic block copolymer surfactant blends are capable of self-assembling into highly ordered domains with feature sizes on the order of 5 nm. These surfactants, most of which lack the required χN for microphase separation on their own, exhibit strong segregation and long-range order upon addition of a component capable of multi-point hydrogen bonding that is specific for one of the blocks in the copolymer. This has been demonstrated by our SAXS data for several Pluronic (PEO-*b*-PPO-*b*-PEO) and Brij (PEO-*b*-$[CH_2]_nCH_3$) surfactants of various molecular weights and PEO volume fractions. Furthermore, we employ these highly-ordered systems as thin film, nanolithographic etch masks for the transfer of sub-10 nm patterns into silicon-based substrates. Small molecule, hydrogen bonding additives containing aromatic or silsesquioxane structure are also used to tune etch contrast between the blocks which is important for reducing line edge roughness (LER) of such small features.

Curran Chandler
University of Massachusetts Amherst

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