# Synthesis of PDMAEMA-*b*-PTHPMA copolymers and investigation of their lithographic performance

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A constant need for smaller, faster and more energy efficient electronic devices has increased demands for higher component density in integrated circuits, and hence smaller component sizes. In addition new device technologies are being proposed in emerging fields including photonic crystals, microsystems and the broad area of bioapplications. Block copolymer lithography is widely considered as a promising patterning technology for miniturized device fabrication, but also for the development of nanofabrication routes facilitating the development of novel devices.

In this work, we present a novel block copolymer system used in top-down lithography for the generation of bottom-up nanoscale patterns. Amphiphilic poly(2-dimethylamino ethyl methacrylate)-*b*-poly(tetrahydropyranyl methacrylate), PDMAEMA-*b*-PTHPMA, copolymers were synthesized by group transfer polymerization and were characterized with $^{1}$H NMR and GPC. Chloromethyl naphthalene was used for the quaternization of the tertiary amine groups of PDMAEMA in order to increase the hydrophilicity and the plasma etch resistance of this block. (Figure 1) The chemical amplified lithographic ability depends on the acid catalysed deprotection of the THPMA blocks. Furthermore, the direct block copolymer lithographic ability depends on the difference in the hydrophilicity of the two blocks following the quaternization of the PDMAEMA block to form the quaternary ammonium salt. Finally, the polymers have been evaluated as components of chemically amplified resist formulations in combination with photoacid generators. Upon exposure to 248 nm, contact printing and 500 nm structures were created.

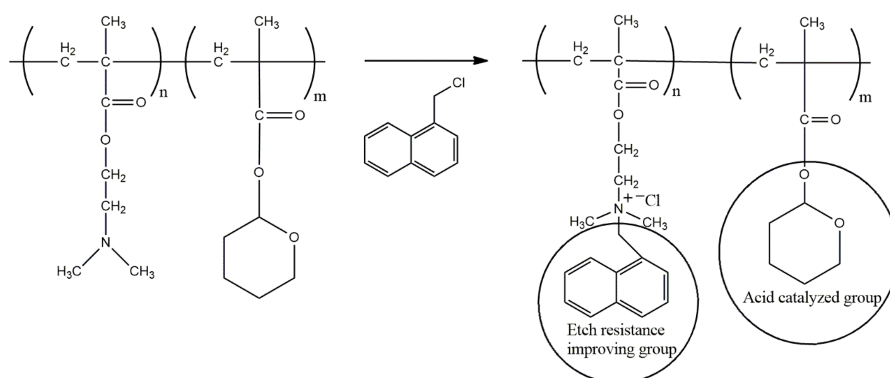


Figure 1: Quaternization reaction of the PDMAEMA-*b*-PTHPMA block copolymer

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