Crosslinkable Polynorbornene with Phenylethynyl Groups for the Trilayer Photoresist System

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Norbornene copolymers with phenylethynyl groups were synthesized for the buffer layer in trilayer photoresist system. The trilayer photoresist system is the novel photolithography method to fabricate dip trench patterns. It is composed of organic buffer layer (1st layer), silicon based hard mask (2nd layer) and organic resolution layer (3rd layer). The buffer layer acts as the etching barrier to plasma RIE. Norbornene copolymers are good candidate materials for the buffer layer. Norbornene maleic anhydride alternating copolymers were polymerized by radical polymerization. Phenylethynyl groups with -OH end functional groups were introduced as the crosslinking moiety to the copolymers. The crosslinking reactions among the phenylethynyl groups enhanced mechanical strength, thermal resistance and etching selectivity. The synthesized polymers were analyzed by FT-IR and 1H-NMR.