Effect of Crosslinking Moiety on Nanopore Generation in Polynorbornene Thin Films

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High performance polymers, such as polyimide, polyester and polynorbornene, have found a number of uses in a variety of electronic devices and components. Especially polynorbornene (PNB), which is synthesized through vinyl addition polymerization, exhibits good properties such as a very high glass transition temperature, good optical transparency and low dielectric constant. PNB is thus a good candidate material for low dielectric multi chip module packaging. In order to decrease the dielectric constant, a thermally labile group was added to the PNB backbone as a nanopore. However the decomposition of thermally labile group in PNB films induced a pore collapse and a further decrease in the film thickness. To control the pore structure, we synthesized PNB with epoxy functional group to vitrify the matrix. Epoxy crosslinking mechanism and cationic polymerization process were investigated. The crosslinking mechanism was monitored with FT-IR. Then, this material was used for thin film preparation. Nanoporous thin films were characterized by ellipsometry, FE-SEM.