

Heat Resistant Polymers Based on Polyphosphazenes and Cyclotriphosphazenes

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Cyclotriphosphazenes with skeletal nitrogen and phosphorous atoms exhibit unusual thermal properties such as flame retardancy and self-extinguishability. Their polymeric species, polyphosphazenes are generally prepared by ring opening polymerization of hexachlorocyclotriphosphazene and subsequent substitution reactions with various nucleophiles. In addition to the thermal properties imparted by phosphorous and nitrogen elements on backbones, they have the wide range of physical properties generated by variation in side groups.

Cyclophosphazenes and polyphosphazenes have been used for improving thermal properties of organic polymers. For example, cyclotriphosphazenes have incorporated into polymeric systems as pendants, cross-linking agents, and additives. Several grafted copolymers between polyphosphazenes and industrially important organic polymers were also reported. Another method for incorporating the phosphazene moiety in organic polymers is thermal polymerization of curable organic compound-substituted cyclotriphosphazenes and polyphosphazenes.

In the present work, we prepared several heat resistant polymers based on polyphosphazenes and cyclotriphosphazenes such as thermally curable polyphosphazenes, star-branched polymers with cyclotriphosphazene cores, and polyphosphazene-graft-polyoxazoline copolymers.