

INVESTIGATION OF THE FLAME RETARDANT PROPERTIES OF SOME GLYCOLURIL DERIVATIVES

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Rubber products have been implemented in almost all spheres of human life. The range of rubber products manufactured is incredibly high and varied. Increasing the fire resistance of rubber is facilitated by the introduction of flame retardants into the rubber mixture. Nitrogen-containing compounds are not as useful as halogen- and phosphorus-containing flame retardants, but they also represent an independent group of flame retardants and used individually. Nitrogen-containing compounds are often used in combination with halogen, phosphorus or antimony compounds as well. Amides, in particular urea derivatives, are the most widely used among various classes of nitrogen-containing compounds capable of reducing the combustibility of polymers. The presence of four nitrogen atoms in the structure of glycoluril related to bicyclic bisureas as well as two carbonyl oxygen atoms allows testing it as a flame retardant.

In this study, the well-known 2,4,6,8-tetraazabicyclo[3.3.0]octane-3,7-dione (glycoluril) and 2,6,4,8-tetrahydroxy-2,4,6,8-tetraazobicyclo[3.3.0]octane-3,7-dione (tetramethylglycoluril) as well as the halogen- and phosphorus-containing tetramethylglycoluril derivatives synthesized by us were chosen as the objects of the study. The expediency of the investigation of 2,6-di(chloromethyl)-4,8-dihydroxy-2,4,6,8-tetraazobicyclo[3.3.0]octane-3,7-dione as a fire-retardant additive is based on the known flame retardant characteristics of halogen-containing flame retardants. Rubbers based on synthetic isoprene rubber and synthetic divinyl rubber were used as test samples for fire resistance.

During the tests, tetramethylglycoluril was introduced into the rubber composition in 10 parts by weight. The total duration of residual burning of six test samples was 9 seconds. 2,6-Di(chloromethyl)-4,8-dihydroxy-2,4,6,8-tetraazobicyclo[3.3.0]octane-3,7-dione was introduced into the rubber composition in 1 part by weight. The total duration of residual burning of six test samples was 13.8 seconds. Tetramethylglycoluril functionalized with dimethylphosphonomethyl groups also showed pronounced flame retardant properties for rubber specimens based on isoprene synthetic rubber and divinyl synthetic rubber.