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Materials with Improved Heat Resistance Characteristics

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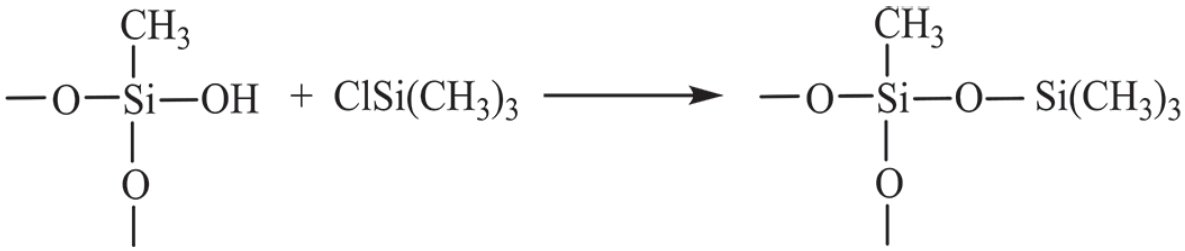
Annotation: A production process has been developed and a scheme of a pilot plant for the production of oligomethyl-silsesquioxanes used for the manufacture of highly filled thermo- and fire-resistant polymer composite materials has been presented.

Keywords: methyltrichlorosilane, heat resistance, polymer, matrices, thermoset.

Polymeric materials and products made from them are used everywhere in the modern world, and their production volumes, scales and applications are only increasing every year. One of the promising areas for the use of polymeric materials is their use as matrices or binders for the production of composite materials, which have recently become more widespread due to their improved technological properties, such as reduced shrinkage, due to mechanical strength combined with lightness, and also due to the presence of a complex of special properties in most of them-increased resistance to various factors, dielectric characteristics, etc. In the technology of obtaining polymer composite materials (PCM), a matrix is understood as a pure polymer, and a polymer binder is a composition based on a polymer with the addition of various additives. The properties and structure of the matrix largely determine the method of obtaining a composite material and its properties such as strength, chemical resistance, heat and moisture resistance. Therefore, the choice of matrix is one of the main tasks in the development of PCM compositions. In the technology of obtaining PCM, there is a general classification according to which thermosetting and thermoplastic matrices are distinguished. Organosilicon thermosetting oligomers are widely used in the production of heat-resistant polymer composite materials (PCM). The most promising among them are oligoorganosilsesquioxanes (osso) of the general formula (rsio1,5)n, where r are the same or different organic radicals. The main problem in the synthesis of organotrichlorosilanes or organotrialkoxysilanes by ossohydrolytic polycondensation (HPC) is the high tendency of the oligomers formed at the first stage to gel formation, both during synthesis and during storage, which is especially pronounced in the case of methyltrichlorosilane HPC. the latter is the most accessible and cheap, and the oligomethylsilsesquioxanes (omsso) formed from it during filling and curing form one of the most heat-resistant and fire-resistant PCMs. even with moderate heating, they quickly transform into polymers of a three-dimensional structure. Therefore, to study the structure of intermediate HPA products of highly active monomers, two approaches are usually used: stabilization of intermediate HPA products due to the interaction of their -SiOH groups with triorganochlorosilane (more often with trimethylchlorosilane - the trimethylsilylation reaction).



A multilateral study of binders based on epoxy and organosilicon polyfunctional oligomers has been carried out and it has been established that the properties of binders are determined to a large extent by the composition and

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structure of epoxy oligomers, as well as the nature of organic groups in organosilicon compounds, which ultimately determines the properties of composite materials based on the developed binders. , 2 - it has been established that the curing rate of organosilicon epoxy binders is determined by a combination of technological parameters and conditions for the formation of network structures, as well as the nature of organic substituents at the silicon atom. It is shown that the use of the developed technology for obtaining binders contributes to the creation of composite materials based on them with increased heat resistance and deformation-strength characteristics.

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