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Abstract

TECHNOLOGY FOR PRODUCING HARD-COMBUSTIBLE EPOXY-AMINE COMPOSITES MODIFIED WITH COPPER(II) HEXAFLUOROSILICATE

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Composite materials based on epoxy resins are a unique type of polymer materials with an extremely wide range of applications in various industries and construction. Therefore, the requirements for combustibility, flammability of epoxy resins and their smoke-forming ability under burning, as well as toxicity of combustion products of epoxy polymer materials constantly increase. In this regard, it is extremely important to find new ways to reduce the combustibility of epoxy-amine polymers and use them to develop a new type of fire-resistant materials. The most promising way to solve this problem is the chemical modification of epoxy polymers, involving the use of reactive fire retardants. Here, special attention is paid to the application of transition metal complexes [1–4]. In particular, we have developed a unique fire retardant-hardener for epoxy resins to be as a chelate complex, composed of polyethylenepolyamine and copper (II) hexafluorosilicate. The curing process of epoxy-amine composites in the presence of a developed flame retardant-hardener has one distinguishing feature, which consists in the exceptional ability of the chelate complex to incorporate into the polymer framework of the composite producing chemical bonds with nitrogen-containing components, forming a polymer monolith thereby.

By incorporating a flame-retardant hardener into the epoxy polymer, the heat resistance of samples of the epoxy-amine composites is enhanced, and the amount of a coke residue increases. The application of the given fire retardant-hardener results in an increase in the ignition point and self-ignition point for the polymer composites obtained, a decrease in the maximum temperature of gaseous products of combustion and mass loss in burning of these epoxy-amine composites. The epoxy-amine composites modified with copper (II) hexafluorosilicate are the hard-combustible materials with moderate smoke-forming ability; these do not spread the flame which itself is able to go out [5, 6].

The optimization of the formulation and technology for producing epoxy-amine composite materials with lowered fire risk has been carried out. It is provided that such composites in practice can be used as glues for the manufacture of chipboards, as flame-retardant coats for wood, and as pouring polymer floors for industrial and administrative buildings. That approach allows reducing the fire load of various objects and the probability of the fires origination there.

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