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INFLUENCE OF PHOSPHORUS-RETARDANT ON FLAMMABILITY AND ON PHYSICAL AND MECHANICAL PROPERTIES OF EPOXY COMPOUND

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Abstract. *Presents the influence of flame retardant on the flammability of polymeric materials. The influence of phosphorus compounds on flammability and physical and mechanical properties of epoxy polymers. Experimentally shows the possible methods of reducing their combustibility without changing the physical and mechanical characteristics.*

Keywords: antipirens, combustibility, epoxy polymers, physical and mechanical properties.

Introduction

By binding to polymer composites by different and complex requirements largely determine the area of their use. Widespread fiberglass coating, the traditional material for which use binders based on epoxy resins are usually operated at temperatures 120 ... 150^0C and above. Therefore, a challenge is heat resistant, low combustibility epoxy binder is relevant and important.

Analysis of research and publications

The use of advanced protective materials are an integral part of scientific progress. One such protective materials is monolithic coating of epoxy. These coatings are used in chemical, petrochemical, electronic industry, as well as in engineering, construction and nuclear power. None of the areas industrial past is the problem of fire safety. Statistics shows, fireplace fire is of use in polymer materials, fire, which occur more frequently than low-calorie sources (sparks, overheating wiring, put outed cigarette, etc.). The consequences of these fires show that the problem of reducing flammability of polymer materials, reducing their smoke-forming properties and toxicity of combustion and pyrolysis products that undergo environmental pressures on the environment, are not fully resolved. Flammability of epoxy compositions can be reduced by various methods [1; 2].

Problem

The aim of this work is to develop a formulation of epoxy compounds with low combustibility input phosphorus flame retardants (AP) as the most effective inhibitors of combustion processes and decay [1].

This was injected phosphorus AP-aliphatic: diethyl ether N, N-dyhidroksyetylaminometaphosforic acid, tryhlorpropilphosfat, tryhloretylphosfat and aromatic: dyfenilkrezylfosfat and trykrezylfosfat in overflowing epoxy compound of the following composition: epoxy resin ED-20 Dianova, polietylenpoliamin (Pepa), powdered quartz and plasticizer - dibutylphtalate (DBF). Introduction AP is performed by partial and complete replacement of plasticizer, given that almost all the AP are plasticizers. Partial replacement was carried out at 30, 50 and 70% of the mass of DBF.

Assessment of flammability is performed in thick samples (3 ± 1) mm from the fixation of free time burning, with flames spreading horizontally on the frozen sample did not reach its working parts. Combustion took place with a large release of grimy soot, foam froth burning parts and its carbonization. When testing the original composition, it was observed dripping, which leads to inflammation in the wool sample.

With increasing number of AP in the compound in all cases a gradual exclusion of such shoothing drops (fig. 1).

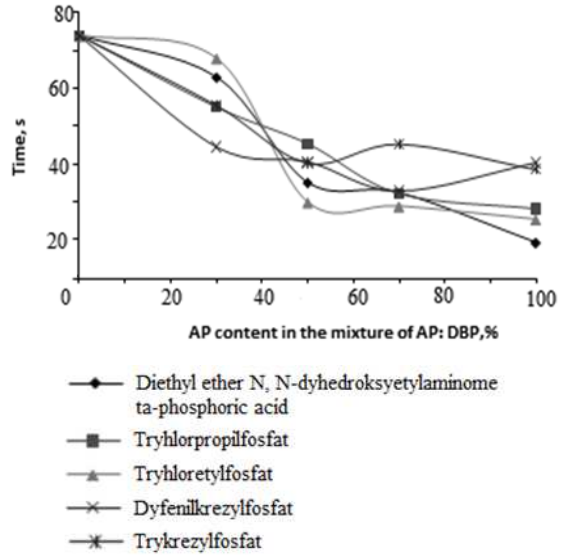

Fig. 1. Measurement of burning time available for the replacement of DBF AP

Substitution of aromatic plasticizer AP leads to a decrease in free time the burning of an average of two times, and aliphatic − three times that, most likely due to the effect synerhytychnym content in their composition of chlorine atoms [3-6] (tryhlorpropilphosfat and tryhloretylphosfat) and nitrogen [2; 7] (dyetylether N, N-dyhidroksyetylaminometaphosforic acid). The greatest effect was obtained with the full replacement of DBF dyetylether N, N-dyhidroksyetylaminometaphosforic acid.

Simultaneously, there was effect on physical and mechanical properties of the compound by the following characteristics: strength at break, compression strength, elongation at tensile stresses at destroying zhynani (fig. 2).

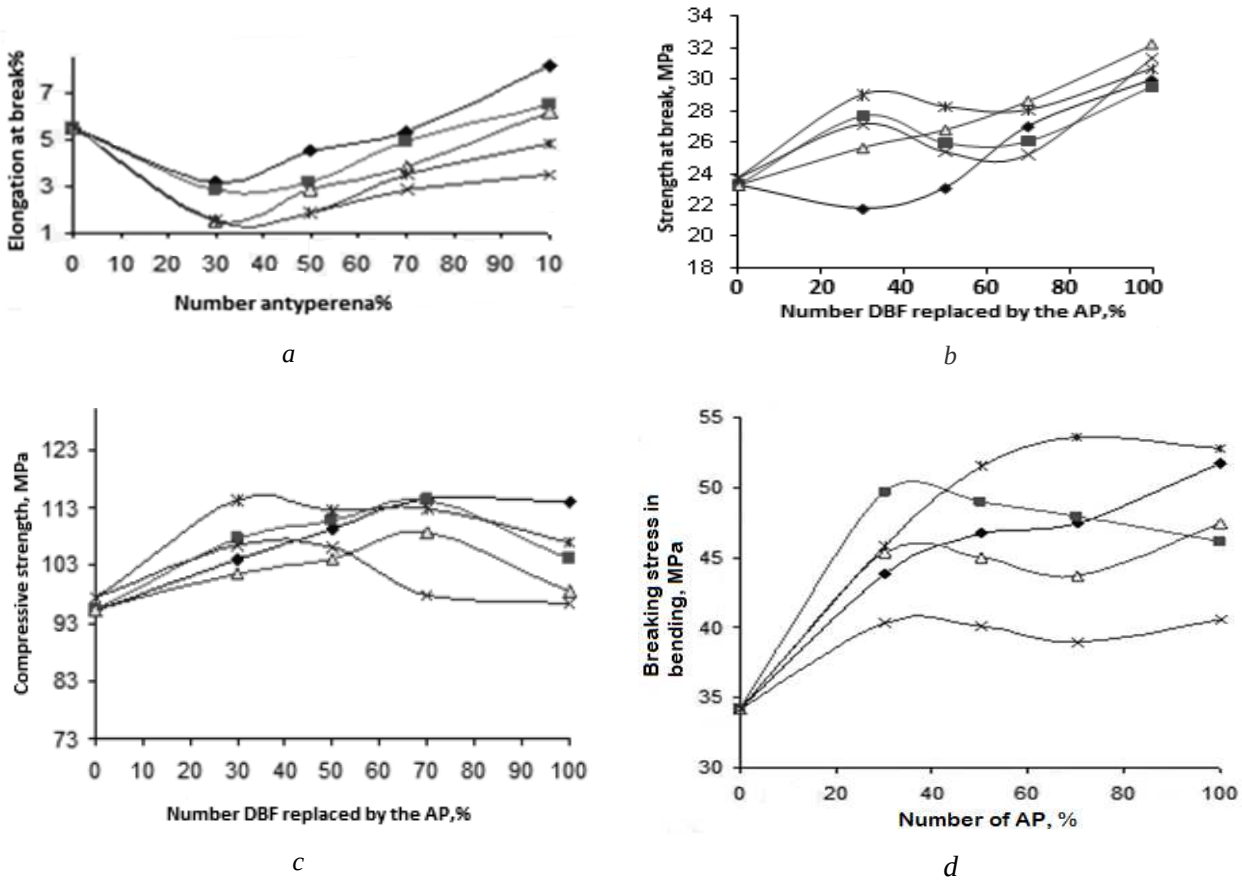

Fig. 2. Change the replacement of the AP and DBF) strength at break:
a – elongation at break;
b – strength at break;
c – compressive strength;
d – breaking stress in bending

Conclusions

The use of aliphatic AP hardly affects the physical and mechanical properties even at full replacement DBF them. The use of aromatic AP leads to a decrease in elongation at break, which probably can be attributed to reduced mobility and a large spatial volume of substituents in aromatic AP compared with DBF. Since the introduction of AP conducted on the basis of their properties plastycizing then the most optimal set of physical and mechanical properties obtained when entering tryhlorpropilphosfat can explain most long linear chain radicals Ri ((Ri-O) 3-P = O) [6].

In conclusion we can say that promising is the proposed introduction of aliphatic compound AP dyetylether N, N-dyhidroksyetylaminometaphosforic acid, which, in comparison with other aliphatic fire retardants, was the most effective, causes virtually no reduction in physical and mechanical properties of the compound.

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