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PROPERTIES OF WEAR-RESISTANT POLYMER MATERIALS PRODUCED USING NATURAL SOLAR ENERGY.

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Abstract.

Objective The article deals with the process of the chemical reaction of polymer mass and substrate under the influence of solar energy. The results of experimental studies of the effect of fillers from industrial kaolins of various grades on interstructural plasticization and the performance properties of composite polymer materials (CPM) are presented. The quantities of fillers used to impart optimal properties of CPM are determined on the basis of the results of processing the experimental data.

Key words: Solar energy, composite polymer materials (CPM), heterocomposite, adhesion strength, microhardness, impact viscosity, dispersed (powdery), filler.

Methods. In the experiments, fillers obtained from local minerals - various types of industrial kaolin from Angren district of Tashkent region - were selected as fillers for composite materials.

Results. According to the obtained results, the great potential of the activation-solar technological method of processing KPM in creating multifunctional composite polymer materials and coatings from them is shown. It may be noted that the filler content for bulk materials is 60 wt.h. it is found that the density of the material increases in different intensity with the increase of filler content.

Introduction. The medium of renewable sources of energy is solar radiation and large-scale resources, ecological cleanliness and the greatest perspective.

The main climate-forming factor is a significant influx of solar radiation, reaching 800–1000 MJ/m^2 per month in summer [1]. This creates favorable conditions for the development of solar energy in the Republic of Uzbekistan.

Solar energy is carried mainly by light and to a lesser extent by infrared rays. When light interacts with a substance, part of the incident light is absorbed with the substance and it heats up. When heated, the degree of freedom of the elements of the polymer macromolecule increases, and the polymer passes into a highly elastic state. Polymers tend to stick when heated.

It is also known that direct exposure to the sun improves the physical and mechanical properties of CPM [2,3]. This is due to the fact that during direct processing of the polymer coating in the sun, that is, during the course of the chemical crosslinking reaction, the polymer mass and the substrate with the curing agent are heated [2]. Reducing the viscosity of the composition leads to an increase in the mobility of the macromolecular chains of the polymer and improves the orientation of the functional groups of the interacting components.

The authors studied the impact on the technical state of technology of the aging process of structural materials under the influence of loads and environmental factors: temperature, humidity, solar radiation. According to the authors of the experience of operating aviation equipment in various climatic conditions, the most significant impact on its technical condition is not the mechanical wear of parts, but the processes of corrosion and aging of materials under the influence of environmental

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factors. With regard to PCM, these factors contribute to the development of physical-chemical processes in materials, causing a change in their performance, in particular, strength indicators [3-5].

Methods.

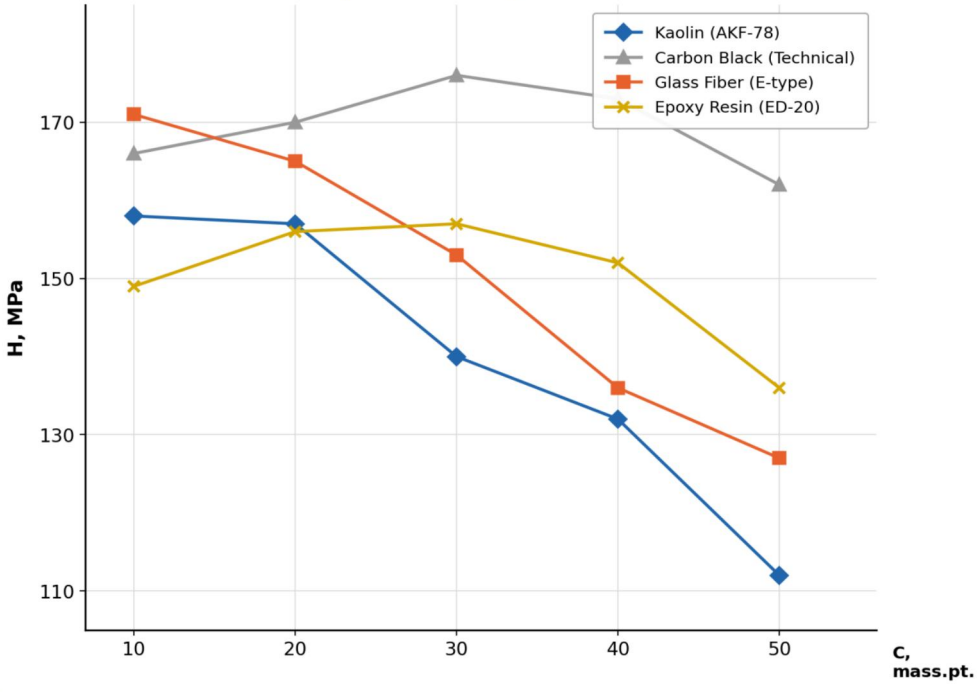
Stabilization of the structure, increasing the resistance of polymers to degradation and aging is achieved by various technological and operational measures of a general and specific nature. A relatively common way to inhibit degradation when exposed to light and irradiation is the introduction of chemical reagents (compounds) capable of absorbing ultraviolet and other rays without undergoing photosynthesis or changes themselves. Such reagents include fillers, stabilizers, etc.

The results of the study obtained by the author show the great possibilities of the activation-solar technological method for processing CPM when creating polyfunctional composite polymer materials and coatings from them.

As fillers for composite materials for the experiments, fillers from local minerals were chosen - various grades of industrial kaolins of the Angren district of the Tashkent region [6-7].

Results.

From Fig.1 and Fig.2 it can be seen that the nanocomposite coatings filled with Angren kaolin grade AKT-10 have the best operational properties, and the worst performance indicators are observed for the composite coating filled with AKF-



78.

Fig.1. Influence of the type and content of fillers
(Angren kaolin - AKF-78, Carbon black(Technical) Glassfiber (E-type), Epoxy resin (ED-20) on microhardness (H) of nanocomposite epoxy coatings

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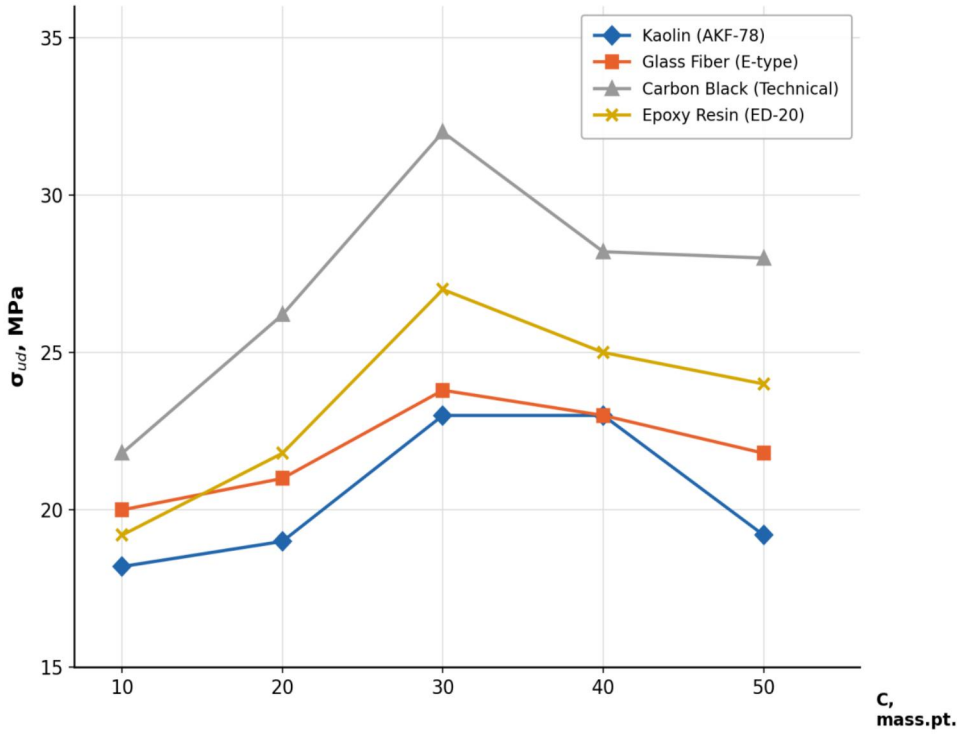


Fig.2. Influence of the type and content of fillers
(Angren kaolin - AKF-78, Carbon black(Technical) Glassfiber (E-type), Epoxy resin (ED-20)on impact strength (Бsp) of nanocomposite epoxy coatings

As can be seen from the analysis of the obtained results, fillers having the same natural properties affect the properties of coatings differently depending on the dispersionAt the same time, it should be noted that the greater the amount of nanosized filler particles (AKF-78), the higher the performance properties of coatings at low (10–20 mass. parts) filler contents, and at high economically favorable contents (30–50 mass. h.) there is a deterioration in the properties of coatings with a high content of nanosized particles [8-11].

This can be explained on the basis of technological properties, namely, the deterioration of the wettability of the filler particles, which is observed with a sharp increase in the viscosity of the composition. At contents of 60 wt.h. and more the quality of the coatings is greatly deteriorating.

From the analysis of the research results presented in fig. 3, it can be noted that for casting materials, the filler content is 60 wt.h. not the limit yet. Since with an increase in the filler content, the density of the material increases, however, with different intensity.

Conclusion. For example, the smaller the amount of nanosized filler particles (AKF-78, AKS-30), the less intensively the density of the material increases [12].This indicates the formation of micropores in the composition due to the deterioration of structure formation, due to the large specific surface area of the filler.

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