RESEARCH OF PHYSICAL AND MECHANICAL PROPERTIES OF HETEROCOMPOSITE POLYMER MATERIALS AND COATINGS FORMED FROM THEM HELIOTECHNOLOGICAL METHOD.

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Abstract: The results of studies of the influence of fillers from industrial kaolin of various grades on the performance properties of composite polymeric materials are presented. Processed when cured with direct exposure to natural solar radiation. The optimal amounts of fillers from a local natural mineral in the composition of a composite polymer material are determined. It is shown that in the future it is advisable to use concentrating solnachnoy radiation (CSR) with different parameters.

Keywords: composite polymeric materials (CPM), fillers, dispersion, microhardness, impact strength, operational properties, mechanical properties.

It is known that direct exposure to the sun improves the physical and mechanical properties of hetero-composite polymeric materials (HCPM). This is due to the fact that during direct processing of the polymer coating in the sun, a chemical crosslinking reaction occurs with a curing agent, heating the substrate and the polymer mass. 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[1].

The term "heterocomposite" is understood as a kind of composite materials consisting of heterogeneous organic, like polymeric, and inorganic, like mineral, metal, etc., components that practically do not have chemical interaction with each other at the macrostructural level. Moreover, each component has its own purpose. The traditional three-component technology (pressure, temperature, time) for obtaining a composite material with the required properties today needs further development in a combination of methods of colloid chemistry and physics, in particular, ultradispersion of particles-nanoparticles [1,2,3,4]. This new scientific direction, which is intensively developing all over the world today, has received the name "nanotechnology", as a result of which "nanocomposites" are obtained that meet the modern requirements of materials science.

Stabilization of the structure, increasing the resistance of polymers to degradation and aging are achieved by various technological and operational measures of a general and specific nature. A relatively common method of inhibition of degradation under the influence of 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.

One of these fillers is kaolin, mined in Angren. The Angren deposit of Uzbekistan produces kaolins of two genetic types - primary and secondary. Kaolin clays are composed mainly of kaolinite, quartz and less often calcite, tourmaline, zircon, rutile, chlorite, and iron hydroxides[5,6,7,8,9].

Primary kaolins are products of alteration of parent aluminosilicate rocks. They lie below the thick coal deposit being developed by the Angren open pit. Their reserves are estimated at 45.6 million tons.

The results of the study of the performance properties of coatings (Fig. 1) showed that the coatings filled with Angren kaolin grade AKT-10 have the best performance properties, and the worst are observed in the composite coating filled with AKF-78 (Fig. 2).

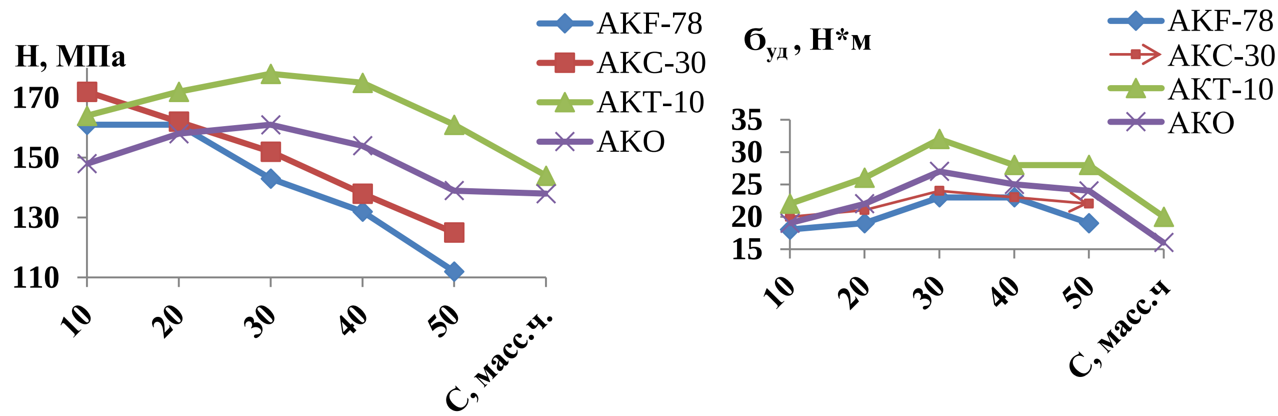

Fig.1. Influence of the type and content of fillers (Angren kaolins - AKF-78, AKS-30, AKT-10 and AKO) on micro hardness (a) and impact strength (b) of epoxy coatings.

The composition is a dispersed system consisting of a polymer matrix in which solid filler particles are distributed [16,17,18,19,20] The properties of such a system are determined not only by the properties of the polymers and the filler, but also by the nature of the distribution of particles in the volume of the matrix and the interaction processes at the interface.

For example, the smaller the amount of fillers (AKF-78, AKS-30), the less intensively the density of the material increases. 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.

It should be noted that there are the following main types of renewable energy (Fig. 2.)

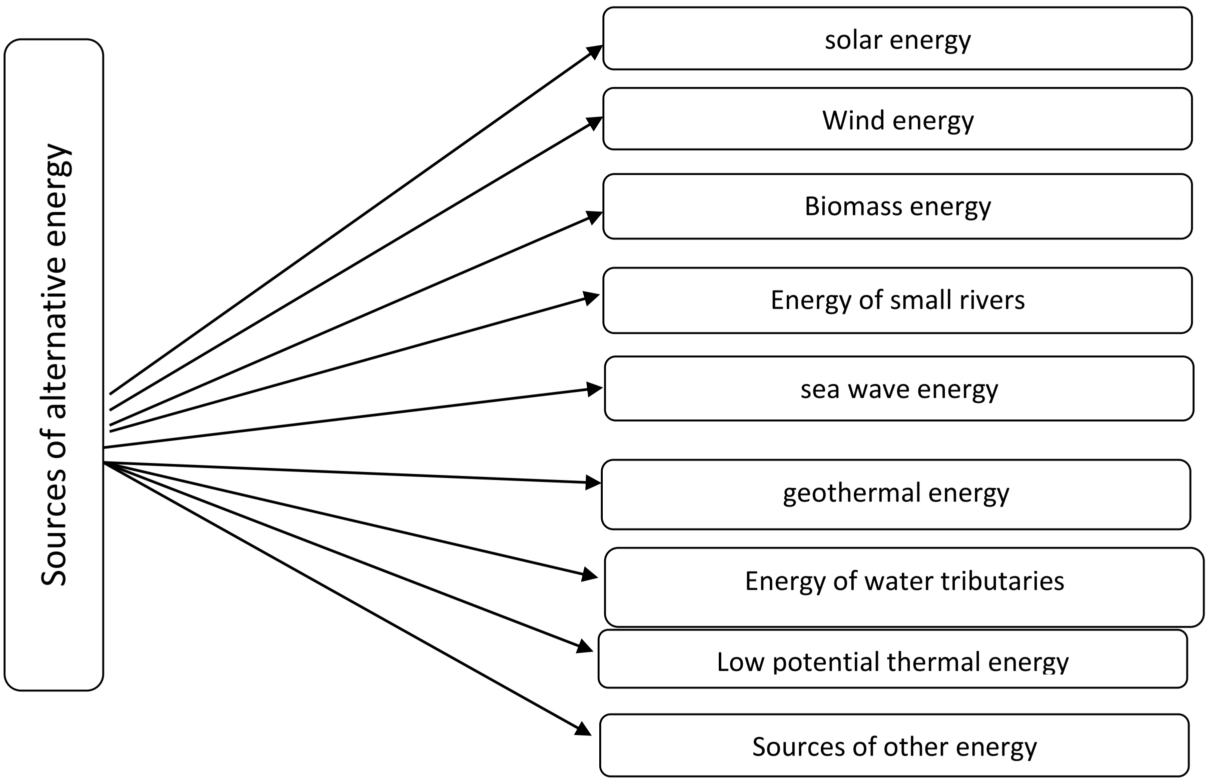

Fig.2. The main outputs of alternative energy sources

The study showed that in the future it is expedient to use concentrating solar radiation (CSI) with different parameters [10,11,12,13,14,15] The report will provide detailed information.

As can be seen from the analysis of the obtained results, the micro hardness and impact strength of the coatings are different depending on the grades of kaolins. At the same time, it should be noted that the larger the grain size distribution index of the filler particles (AKF–78) (Table 1), the higher the operational properties of the coatings at its low (10–20 mass. parts) contents, and at its high contents (30– 50 wt.h.) there is a deterioration in the operational properties of the coatings.

№	Industrial grades of Angren kaolins	Grain distribution, %	
		less than 1 мкм	5-45 мкм
1	AKF-78	71-73	25-28
2	АКС-30	49-50	47-49
3	АКТ-10	25-32	65-72
4	АКО	21-25	72-75

It is shown that in the future it is expedient to use concentrating solar radiation (CSI) with various parameters [21,22,23,24]. The report will provide detailed information

Conclusions: The amount of Kaolin fillers in the composition of composite polymeric materials affect the physical and mechanical properties of materials, depending on their grades, associated with their fineness, the lower the fineness of the filler, the higher the operational properties of coatings at low (10–20 wt.h.) filler contents , and at high filler contents (30–50 wt.h.) deterioration in the properties of coatings is observed at a particle size content of less than 1 μm in an amount of 50–73% (AKF–78, AKS–30).

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