



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 9, September 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.569

Study of Properties of Modified Composite Thermoreactive Polymer Materials and Their Significance in Engineering

PhD. M.M. Sadikova.

Bukhara Engineering Technological Institute, Uzbekistan

ABSTRACT: The article provides a literary review of studies of friction of parts of cotton pickers and raw cotton. One of the tasks of the authors is to reduce the damageability of raw cotton when interacting with the metal organs of machines and mechanisms. The article presents the results of studies on the use of a new composition of a polymer-composite material treated with ultrasound, a technological scheme for obtaining this material, as well as graphs of the dependence of the properties of composite materials on the modes of ultrasonic treatment.

KEYWORDS: machine, mechanism, part, raw cotton, friction, coefficient, polymer composite materials, coatings, moisture, graphite, talc, molybdenum, ultrasound, filler, fiberglass, epoxy material.

Currently, in the world of increased interest is the improvement of the working capacity and efficiency of machines and mechanisms used in the primary processing of raw cotton of industrial production through the development and research of parts of working bodies coated with antifriction-wear-resistant composite polymer materials. In this regard, the development of highly efficient modified composite polymeric materials and coatings based on them for coating the working bodies of machines and mechanisms used in the cleaning of raw cotton is of particular importance.

All over the world, research is underway to create working bodies of machines and mechanisms based on composite polymer materials (CPM). In this regard, it is advisable to cover the working bodies of machines with antifriction composite polymer materials to increase their productivity.

Raw cotton has been and remains the main crop of our country, therefore, highly efficient technologies are required for its cultivation, assembly and processing.

As you know, the use of highly efficient modern technologies is determined by a high level of mechanization and automation, and one of the most important problems is reducing the damageability of raw cotton when interacting with the metal organs of machines and mechanisms, since in connection with the transition to new spinning methods, modern textile the industry has high demands on fiber quality. [one; 2015-20199, 3; 2017-2021].

Since the damageability of cotton fibers and seeds, mainly, occurs as a result of the frictional interaction of raw cotton with the surfaces of the main working bodies of machines and mechanisms for its processing, then one of the main factors determining the tribotechnical properties of coatings is the nature of their contact interaction during friction, which numerous works are devoted to [4; 1941, p. 126].

The author explains the growth of the friction coefficient with an increase in the moisture content of raw cotton by the intensifying interaction of water molecules with molecules of the contacting surface. The decrease in the friction coefficient with increasing pressure is explained by an increase in the density of the cotton, as a result of which a more easily displaceable lattice is formed, lying on the protrusions of the contacting surface of the solid.

It is shown that the coefficient of friction depends on the harvesting method and the type of raw cotton. Thus, the coefficient of friction of machine-picked raw cotton is always higher than that of hand-picked cotton. With a decrease in the grade of cotton for pressures of 0.0001-0.0002 MPa, there is a tendency to a decrease in the coefficient of friction, and at high values of pressure - to its increase.

The sliding speed significantly affects the coefficient of friction of the raw cotton on the studied surfaces. When the speed increases from zero to 2.0-2.5 m / s, the friction coefficient increases. A further increase in speed did not significantly affect the change in the friction coefficient. Depending on the sliding speed at high pressures, the friction coefficient changes less than at low pressures. Cotton moisture, variety, collection method and pressure did not change the general nature of the increase in the friction force with an increase in the sliding speed, but did affect the value of the coefficient of friction.

The author explains the effect of sliding speed on the coefficient of friction by the viscoelastic nature of the bond of cotton with a metal surface, based on the well-known theoretical positions of I.V. Kragelsky.

A manifestation of this nature of the relationship is an increase in the friction coefficient to a maximum with an increase in speed from zero to a certain value, then a decrease in the friction coefficient with an increase in speed.

It is known that the coefficient of friction of raw cotton on a steel mesh [9, 1967, p28] ranges from 0.8 to 1.2. All other things being equal, this is twice as high as when raw cotton slides on a smooth steel surface.

There is also [10; 1968. P.31] a study of the friction of pubescent cotton seeds on the surface of various materials. Cotton seeds had 10-14% fibrous cover and had physical and mechanical properties similar to raw cotton. As a result of the research, it was found that, although the friction coefficients for raw cotton and seeds were different, they depended on similar parameters.

The disadvantages of these studies include the fact that they covered an insufficiently wide range of changes in speed and load modes and did not study the dependence of the friction force of raw cotton on other factors, for example, roughness parameters, temperature, etc.

If we analyze the nature and regularities of friction and wear of the studied materials, taking into account their properties and temperature in the friction zone, it can be seen that the relatively high sliding friction coefficient of HDPE and FAED, on the one hand, is associated with an increase in temperature in the friction zone and, hence, as a consequence, decrease in the modulus of elasticity and microhardness. On the other hand, an increase in the coefficient of friction is associated with the formation of a large charge of static electricity, as well as mechanical engagement of cotton fibers on the surface roughness of polymeric materials.

On the basis of a comprehensive analysis of the results of theoretical and experimental studies, a new formula was derived to describe the nature of the friction of polymers with a pulp [4; 1941, p. 126].

$$f = \left(\frac{\tau_0}{G_0}\right) \rho^{-x} + \beta(1 + \lambda) + \frac{k\alpha k_1}{2} \left[\sqrt{\frac{\Delta h}{r}} + \left(\frac{1}{k_1} - 1\right) \frac{h}{d} \right]$$

where τ_0 is the specific force of molecular interaction. N / m²

G_0 - average actual pressure, N / m².

P_0 - coefficient characterizing the increase in strength with growth normal pressure;

λ - coefficient taking into account the influence of triboelectric forces;

k_1 - coefficient taking into account the share of solid mechanical inclusions in the cotton mass;

k - coefficient depending on the type of contact;

β is the piezo coefficient;

Δh is the depth of penetration of solid non-fibrous inclusions;

r is the radius of rounding of the vertices of the inclusion;

α - coefficient taking into account the shape of the protrusion and fibers

This formula has four components. The first component reflects the specifics of the objects under study and connects the molecular interaction of materials with the cotton fiber mass. The second takes into account the influence of electrostatic forces inherent in the interaction of two dielectrics. The third and fourth components characterize the effect of the pulp on the roughness of the surfaces of the counterbodies.

To impart specific properties, fillers of various origins are introduced into polymeric materials [26; 1985, p.103-104].



Graphite, talc, molybdenum disulfide and other powdered fillers of a layered structure improve antifriction properties, reduce the coefficient of friction, increase wear resistance, and increase the rigidity and water resistance of filled polymer materials. The essence of the action of these powdered fillers lies in the fact that due to the layered structure (graphite, talc, etc.) and easy splitting along the cleavage planes in the process of friction, the filler flakes are oriented under the action of normal forces and form a film on the surface of the polymer sample [27; 1985, from. 66-71].

Fillers can reduce the coefficient of friction if they are sufficiently finely dispersed and capable of effectively increasing the glass transition temperature of the matrix near the friction surface, since the softening of the matrix due to heat release during friction is often the main reason for the high coefficient of friction. The smoothest surface and low coefficient of friction of the filled compositions are obtained when using fillers that provide the highest packing density of particles.

Friction is largely associated with wear, so the factors that determine the coefficient of friction of filled compositions also affect their wear resistance. Three factors mainly determine the wear resistance of filled polymer compositions: the hardness of the filler, the adhesive strength, and the relative volume fraction of the particles.

Ultrasonic vibrations in acoustics are considered to be such mechanical vibrations, the frequency of which lies beyond 15 kHz, and this is the lower limit of ultrasonic vibrations. The upper limits of high-frequency ultrasonic vibrations are limited by the fact that they are absorbed during propagation; and the higher the altitude, the greater the absorption [44; 1956, p76].

Ultrasonic vibrations are distinguished by a special form of propagation of elastic waves; they can spread in any material medium, gas, liquid, or solid. Like light rays, they obey the laws of geometric optics: they can be reflected, refracted and focused. Ultrasonic waves with a frequency close to 20 kHz behave like sound waves, and with high frequencies like light waves [45; 1975, pp. 1-6]. The propagation speed of ultrasonic waves depends on the medium in which they propagate, and in solids the speed is highest. Ultrasonic waves can be longitudinal, transverse and surface. All types of waves propagate in solids, and therefore in metals, while only longitudinal waves propagate in liquids and gases.

The main parameters of ultrasonic waves are its intensity, amplitude and pressure. Intensity is understood as the energy passing per unit of time through a unit area oriented perpendicular to the direction of wave propagation. The intensity of ultrasound used in industry reaches up to 100 W / cm² [45; 1975, pp. 1-6.46; 1970, p. 600].

The propagation of ultrasonic vibrations in liquids is associated with the so-called ultrasonic effects of the second order [44; 1956, p76.46; 1970, p. 600]. These include: radiation pressure, sound wind and cavitation. The phenomenon of the sound wind consists in the fact that, in addition to the main oscillatory motion of particles, in the direction of wave propagation in liquids, there is a constantly acting displacement of the particles of the medium. The flow of energy, under the influence of which this displacement occurs, is called the sound wind.

Under the influence of ultrasonic waves, the liquid, sensitive to tensile forces at the moment of the stimulation phase, bursts in those places where its strength is lowest and so-called cavitation bubbles are formed. These bubbles expand and contract at a frequency corresponding to the frequency of the ultrasonic wave. During the compression phase, the bubbles collapse, resulting in a high pressure in the liquid, reaching hundreds of atmospheres (water hammer). The process of formation and collapse of a bubble is accompanied by local electrification and, obviously, in connection with this, a structural change occurs in substances (the chemical action of ultrasound).

The absorption of ultrasonic vibrations is a consequence of the fact that part of the energy is absorbed by the substance and turns into thermal energy, the other part is spent on changing the structure of the substance. Consequently, the absorption of ultrasound depends on the properties and state of aggregation of the material being treated.

Radiation pressure usually arises at the boundary of two bodies with different wave resistance and speeds of sound. When a sound wave falls, the energy density changes, on which the magnitude of the radiation pressure depends.



Surface friction arises due to the movement of particles near the boundary surface, and in some cases can lead to the formation of tangential shears, which are the cause of strong local heating. In an ultrasonic field, small flat particles tend to be located perpendicular to the direction of propagation of vibrations.

Ultrasonic vibrations increase the self-diffusion of substances and, in some cases, facilitate the approach of particles to each other so that they enter the sphere of attraction of the other. In this case, hydrodynamic forces of attraction (Bernoulli forces) arise between the particles, on which the phenomenon of coagulation is based. These processes are carried out at low ultrasonic frequencies. At high frequencies of ultrasound, particles are dispersed, i.e. large particles do not have time to vibrate in this frequency range, a force proportional to its mass acts on the particle and particles that do not withstand intense vibrations are divided into small ones. Surface friction and cavitation are of great importance in dispersion. Dispersion by means of ultrasonic vibrations is widely used in production, in particular, to obtain stable emulsions.

Under the influence of ultrasonic vibrations, the degassing of liquids and melts occurs, i.e. ultrasound sets in motion suspended bubbles of air or dissolved gases, combines them into one bubble with increased pressure, and they float to the surface and burst.

Heat effects caused by surface friction are local in nature and appear at the boundary surface. Heating of the medium as a result of absorption and intensity of ultrasonic vibrations, caused by cavitation processes of mechanical action of ultrasound, leads to intensification of the processes of polymerization, oxidation, reduction and polycondensation. To carry out these technological processes, a frequency range of 200-1000 kHz is used. The chemical effect of ultrasound depends on the intensity, the greater the intensity of ultrasound, the greater its chemical effect [47; 1966, p168].

It is noted that the efficiency of ultrasonic treatment of polymer compositions increases if it is carried out at a relatively high frequency and power.

Consequently, the mechanical and chemical action of ultrasound manifests itself especially at high vibration frequencies and power, which contributes to the dispersion and movement of dispersed systems, degassing of liquids and melts, intensification of the polymerization process and other technological processes [48; 1968, p367].

It follows from the above that ultrasonic treatment of polymer solutions leads to significant changes in their structure, promotes the homogenization of filled emulsions and dispersions, dispersion of ingredients, reduces the consumption of solvents and changes the properties of polymer solutions, varnishes and paints within a wide range. It should be expected that during the ultrasonic treatment of thermosetting polymer compositions, it is possible that the formed active radicals lead to an acceleration of the process and an increase in the degree of curing. In addition, when the filled polymer compositions are treated with ultrasound, they degass and homogenize, and the homogeneity of the composition improves, which should be reflected in the properties of the resulting coatings.

For the use of composite polymer materials in the working bodies of cotton ginning machines, the following requirements are imposed on them: low coefficient of friction with raw cotton, high class of surface cleanliness, low wear rate and electrification, high adhesion to metal, manufacturability, non-scarcity and low cost. In addition, grate coatings must have high impact strength and hardness.

Analysis of literature data and conducted studies, comparison of the studied gearboxes showed that epoxy resin, pentaplast and polycamide have high tribotechnical and physicomechanical properties [13; 1984, p296.17; 1983, p24.43; 1982, p22, 71; 1996, s76-80.78; 1991, s53-58].

However, given the high cost and wear rate of pentaplast, the industrial polymer ED-16 epoxy resin was chosen to study the possibility of using the checkpoint on the working bodies of the raw cotton cleaner from coarse litter.

Based on the results of these studies, literature data on the effect of fillers on the properties of composites, as well as taking into account the scale of their production, scarcity, cost, manufacturability, compliance of the physical and mechanical properties with the operating conditions of cotton ginning machines, the following fillers were selected as the object of research, providing simultaneously high antifriction and physical and mechanical properties of the checkpoint - graphite, kaolin, talc, phosphogypsum, as well as those that meet the requirements of high wear resistance and hardness of coatings - iron powder, copper powder and fiberglass (Table 1).

Table 1
Research objects

Materials (edit)	Brand	Normative Document	Appointment	Filler shape	The size particles filler, micron
Epoxy resins ED-16	ED-16	GOST 105-87	Polymer binders	Viscous-flowing	
Steel	St. 3	GOST 501	Substrates		
Dibutyl phthalate (DBP)		GOST 8728-66	Plasticizer	Liquid	
Polyethylene polyamine (PEPA)		TU-6-02-594 STU-49-2529-69	Hardener	Liquid	
Iron powder	PZhK-3	TU-3648 GOST-9849	Filler	Powdery	10 - 20
Copper powder	PMS-2	GOST-4960	Filler	Grainy	10 - 20
Aluminum powder	PACK	GOST-5494-71	Filler	Powder	
Iron oxide		TU 4173	Filler	Powder	1-3
Copper oxide		TU 26539	Filler	Powder	1-3
Graphite		GOST44404	Filler	Lamellar	20-50
Talc	A	GOST 878-52	Filler	Scaly powder	5-10
Kaolin		GOST 6138	Filler	Powder	5-10
Phosphogypsum		1	Filler	Powdery	3-8
Quartz sand		GOST 8424-72	Filler	Powdery	
Fiberglass	ZhS-0.7	TU6-11-191	Filler	Fiber fillers	5-10
Fluoroplastic	4D		Filler	Powdery	
Synthetic rubber	SKN-40		Filler	Powder	

To study the tribotechnical properties of composite polymer coatings, raw cotton of the C-6524 variety was chosen as a counterbody.

As a result of a preliminary assessment of the properties of the checkpoint on the basis of the above-mentioned components, the quality indicators of raw cotton were established: W - moisture 5-8%, 3 - contamination 3-5% (in experiments W = 3-70%, 3 = 3-30%) close to real ones.

The compositions were prepared in the following order: the ED-16 oligomer was heated to 360 K to isolate the existing gas inclusions. At this temperature, the required amount of DBP plasticizer was introduced into the oligomer with thorough stirring. The fillers were dried, and then mixed with each other in the required proportion and introduced into the composition. Then the composition was treated with ultrasound: frequency 400-600 kHz, power 90 W, processing time 25-35 minutes. The PEPA hardener was added to the mixture, the temperature of which was not higher than 300 K, in parts, in order to avoid spontaneous heating. With the introduction of the hardener, the mixture was thoroughly mixed for five minutes. After that, the composition was applied to the working surface (Fig. 1).

The adhesion strength of the coatings to the metal was determined by the fungal method. This method measures the amount of force required to detach the adhesive from the substrate simultaneously over the entire contact area. This force is applied perpendicular to the plane.

The strength of the glue line, and the amount of adhesion are characterized by the strength, per unit area of contact (GS / cm², kgS / cm³, MPa).

The breaking stress of the adhesive joint with uniform separation is determined by the formula:

$$\tau_{ad} = \frac{P}{S}$$

where: P - breaking load

S is the area of the adhesive joint

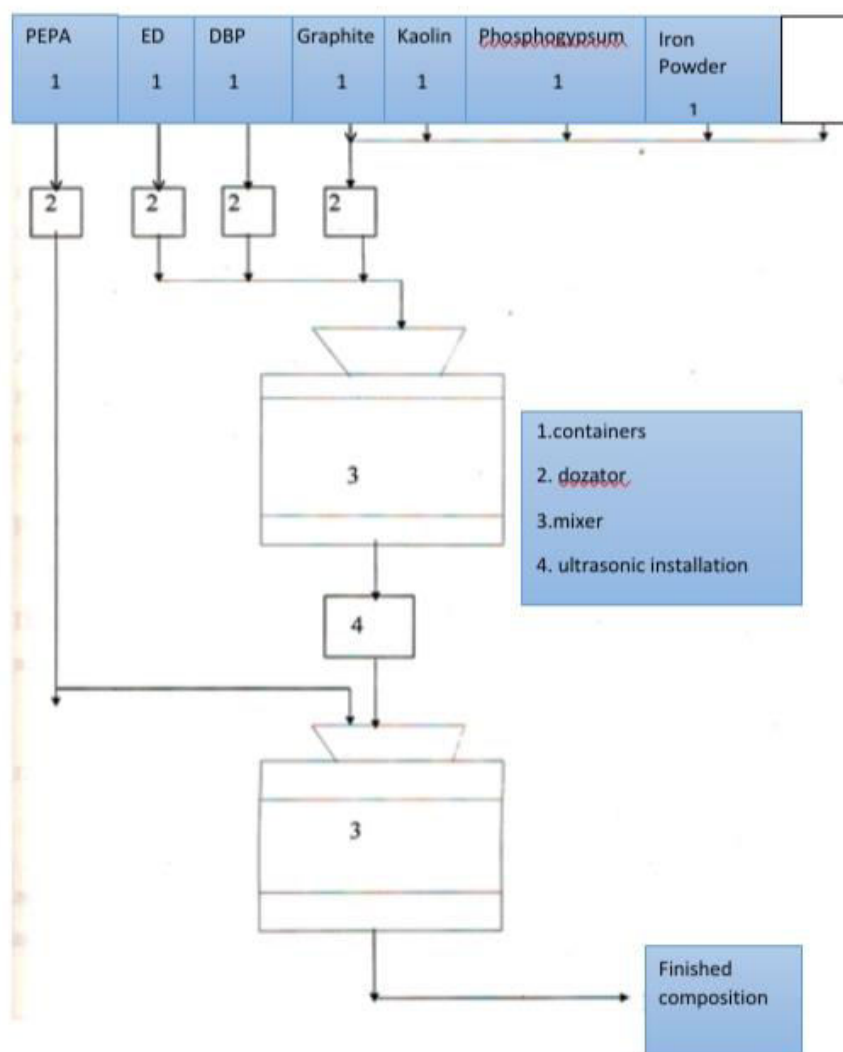


Fig. 1. Technological scheme for obtaining a mixture of the composition

When determining adhesion by the fungal method, it is necessary to ensure the alignment of the fungi and the thickness of the adhesive seam. It should be noted that the size of the weight applied to the fungi during the formation of the glue seam affects the strength of the adhesion, which must be taken into account during testing.

The impact strength of epoxy coatings was determined on a U-1 and U-2 device after 10 impacts without visible damage to the coating surface, peeling and deformation of the film at the impact site, arising from the free fall of the load. The impact strength of the coating (N. m) was estimated by the maximum height (in m) from which the

suspended weight (in m) of the device falls before the appearance of mechanical failure. The test was carried out 4-5 days after receiving the coating. The finished composition was applied to the surface of samples made of steel grade 08 KP with a size of 9x120x1 mm.

The microhardness of the coating was studied on a PMT-3 device in the following modes [31; 1986, p20]

$\tau = 15$ sec; $P_H = 100$ grams

After determining the diagonal of the imprint, the microhardness of the coatings was calculated using the following Formula:

$$H = \frac{18540 \times P_H}{d^2}, \text{ MPa}$$

where P_H is the value of the load; d is the length of the diagonal of the print, mm;
18540 - constant of the device.

The arithmetic mean value of the microhardness value was determined from 10-12 parallel measurements, the finished composition was applied to the surface of steel 3 samples with a size of 50x50x3 mm.

The tensile strength of free film samples under tension under the action of a uniformly increasing load until the film breaks down was determined on an M-40 tensile testing machine at a speed of 20 mm / min. For this, it is necessary to obtain a free polymer film from the epoxy composition on the surface of fluoroplastic sheets. Samples were made in the form of rectangular strips 3-b mm wide and at least 15 mm long.

Tensile strength τ_i was calculated using the Formula:

$$\tau_i = \frac{10 \times P_i}{h_i \times b_i}, \text{ MPa} \quad (2)$$

where P_i - load at break, kgf;

h_i — average value of the sample, mm;

b_i is the sample width, mm.

Elongation at break, %, was calculated using the Formula:

$$\varepsilon = \frac{\Delta l_i}{l_0 - K} \times 100, \% \quad (3)$$

where Δl is the increment in the length of the working part of each sample, mm;

K - large-scale Factor;

l_0 is the initial length of the working part of each sample, mm.

Structural research of composite polymer coatings was carried out on an electron microscope of the REM-100U type.

For processing the polymer composition, an ultrasonic unit with a frequency of 1000 kHz was selected, which makes it possible to process polymer compositions by varying the power of ultrasonic vibrations from 80 W to 250 W. The ultrasonic generator is designed for carrying out catalytic, polymerization processes, for obtaining dispersed systems, etc.

Below are the technical data of the installation:

Power supply 220 V, 50 Hz

Power consumption 1.5 kW

Oscillator rated power ... 250 W

Nominal frequency of the oscillator ... 1000 kHz

Oscillator power control 6 steps from 80 W to 250 W

Warm-up time About 1 minute

Duration of action About 8 hours.

at full power cooling with water at a temperature of 15 ° C

Type and size and emitter ... Silicon plate with a diameter of 50mm,
4mm thick, $S = 20$ mm

Wednesday transformer oil

Weight 150 kg

The essence of the method lies in the fact that the ultrasonic treatment of the composition is carried out in two stages, first a binder mixture is prepared, plasticizer and filler and ultrasonic treatment. In this case, there is a uniform distribution of the components of the polymer composition in the volume, the dispersion of the fillers and the improvement of the wettability of the filler particles with the binder, the acceleration of the diffusion of the liquid phase into the pores and cracks of the filler.

The treatment of the epoxy composition was carried out at powers of 90 W, 120 W and 150 W in the range from 5 to 35 minutes. The results obtained are shown in Fig. 3. Curve 1 corresponds to the ultrasonic processing power of 90 W, curve 2 - to the power of 120 W and curve 3 - to the power of 150 W. Figure 3 shows that the adhesion strength of the treated epoxy compositions is different and significantly depends on both the power of exposure and the duration.

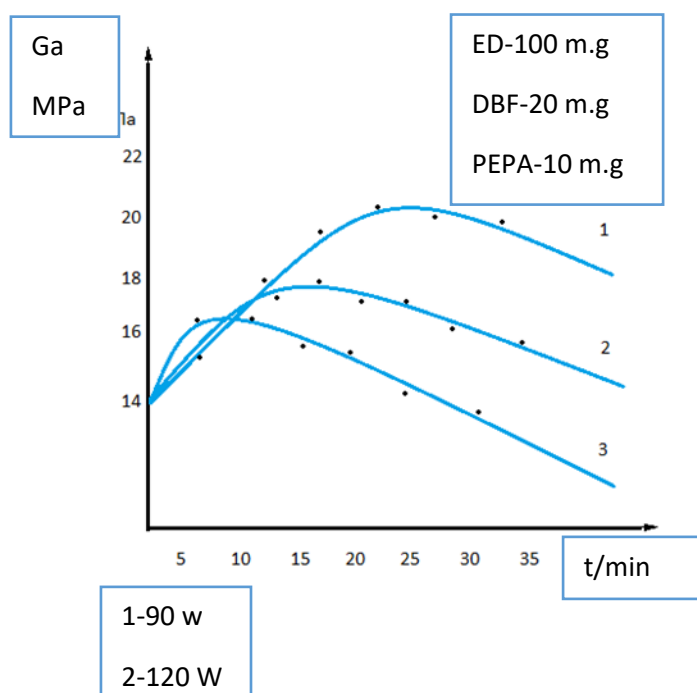


Fig 2. Dependence of the adhesive strength of epoxy composite materials on the modes of ultrasonic treatment

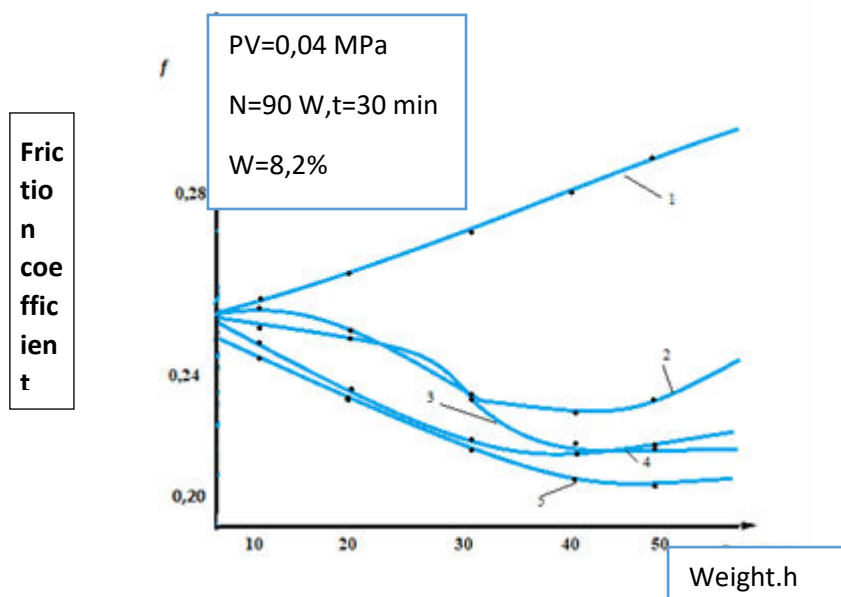
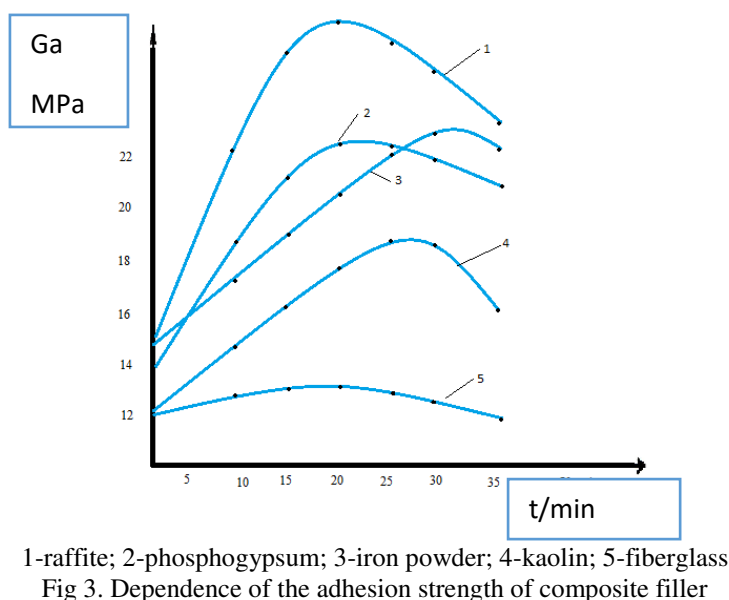
At an ultrasound power equal to 150 W, the maximum adhesive strength - 17.2 MPa (curve 2) is achieved with an exposure time of 10 minutes, and at 120 W a higher strength - 18.3 MPa is observed with an ultrasound exposure time of 16 minutes. Such a technological mode is more convenient from the point of view of temporary conditions, i.e. the composition can be in an unchanged state for more time.

The best results of adhesion strength (21.2 MPa) were achieved when processing the composition with a power of 90 W at an exposure time of 20 minutes.

With such processing, the resulting epoxy composition has the highest adhesive strength and, in technological terms, has sufficient stability in time so that the resulting composition can be used for its intended purpose before the start of its polymerization and thickening.

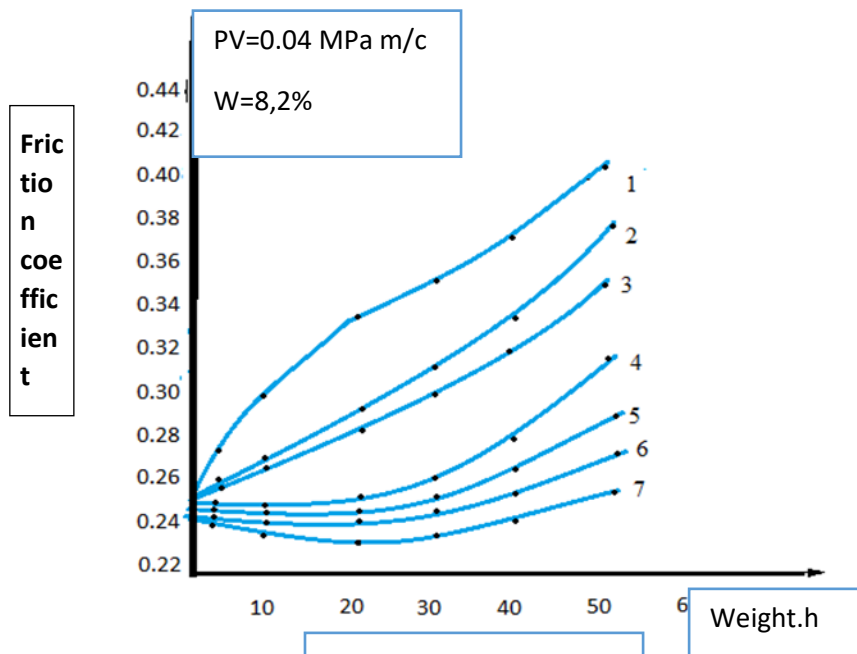
Thus, it was found that the maximum adhesive strength is observed at an ultrasound power of 90 W, which is selected for further research. Further, the influence of the duration of ultrasound on the physical and mechanical properties of filled epoxy coatings is considered. Figure 4 shows the change in the adhesion strength of epoxy coatings depending on the duration of ultrasonic exposure and the type of filler. As can be seen from the figure, with an increase in the time of exposure to ultrasound, the adhesive strength of the coating increases extremely and reaches a maximum after a certain value of the duration of ultrasound. For example, the time of ultrasonic exposure is 15-20 minutes for compositions containing graphite, 18-20 minutes for phosphogypsum, and 20-25 minutes for other fillers.

In this case, the adhesive strength of the coatings treated with ultrasound is 25-35% higher than that of the coatings not treated with ultrasound of the composition. This is clearly seen from the figure when filling the composition with granite, phosphogypsum and iron powder.



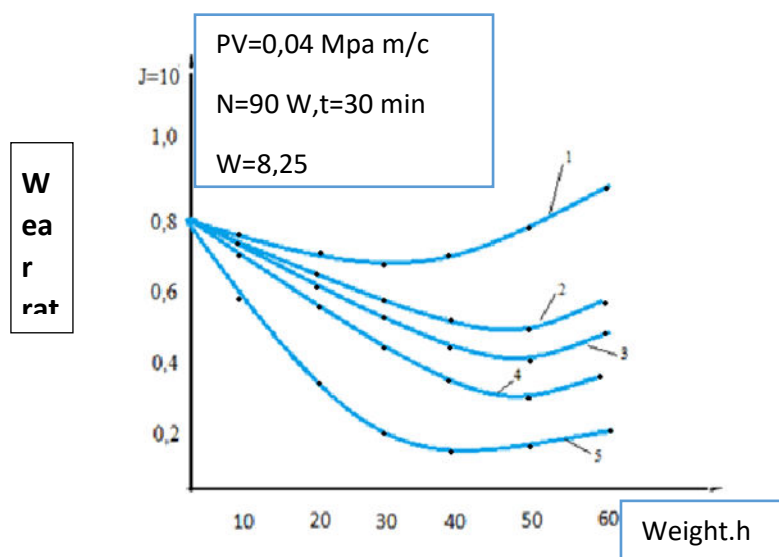
A further increase in the time of ultrasonic action leads to a decrease in the adhesive strength of the coating, which is apparently associated with the acceleration of the process of polymerization and curing of the coating, an increase in the viscosity of the compositions, etc.

The introduction of fillers of various nature and structure significantly changes the tribotechnical properties and wear of composite epoxy materials when rubbed with raw cotton (Fig. 4-5).



1-fiberglass; 2-wollaston; 3-cotton linters; 4-kaolin; 5-talc; 6-phosphogypsum; 7-plasticity graphite.
(according to S.S.Negmatov).

Fig 5. Dependence of the coefficient of friction of composite epoxy materials with raw cotton on the content of organomineral fillers



1- graphite; 2-talk; 3-kaolin; 4-phosphogypsum; 5-fiberglass;

Fig 6. Dependence of the wear rate of composite materials on the content of organomineral fillers

As can be seen from Figures 10, 12, the introduction of organomineral fillers into an epoxy polymer material treated with ultrasound with a power of 90 W with a treatment time of 30 minutes, the friction coefficient, in addition to the composition with glass fiber, is characterized by an extreme nature of the passage through the minimum.

With an increase in the content of glass fiber, the coefficient of friction of compositions with raw cotton increases significantly, while with an increase in the content up to 10 ... 60 wt. h. the coefficient of friction increases linearly and ranges from 0.255 to 0.285. As can be seen from the experimental results, the smallest coefficient of friction is observed for compositions filled with graphite and phosphogypsum in the amount of 40 and 50 masses. h respectively, while talc and kaolin have the lowest coefficient of friction at their content of 40 and 50 wt. h. A decrease in the coefficient of friction in coatings filled with graphite ikaolin is associated with their lamellar structure and fine dispersion in coatings with phosphogypsum and graphite filler, as well as with a relatively low steady-state temperature in the contact zone, increased thermal conductivity, reduced specific surface resistance and electrification.

An increase in the friction coefficient with a further increase in the concentration of fillers, especially graphite ones, is associated with an increase in the surface roughness of the coatings due to aggregation of the filler and deterioration of the strength properties of the coatings.

Hence it can be seen that we have developed modified composite thermosetting epoxy materials are 2-2.5 times lower than in previously investigated works.

A similar nature of the change is observed with the introduction of metal fillers and their oxides. This is well observed especially at high filler values.

So, for example, when such fillers as iron and copper powders are introduced into the composition of epoxy compositions, an extreme character of the change in the arrival through the minimum is observed, the character of the change in the friction coefficient depending on the type and content of the filler.

Thus, from the above studies, the author obtained the following results:

A scientifically grounded approach has been developed to create modified antifriction-wear-resistant composite thermosetting polymers and coatings based on them with high physical, mechanical and tribotechnical properties by introducing finely ground organomineral fillers into their composition with simultaneous ultrasonic treatment of the resulting compositions.

A method has been developed for obtaining a polymer composite coating from filled epoxy compositions, which, in contrast to unfilled ones, is produced in two stages. In the first stage, a mixture of binder, plasticizer and filler is prepared and subjected to ultrasonic treatment for 900-1200 s, after which the mixture is cooled to room temperature. Then a curing agent is introduced into it and the finished composition is subjected to ultrasonic treatment for 300-1200 s, depending on the type and content of fillers. It has been established that the ultrasonic modification of the compositions makes it possible to obtain highly filled polymer coatings from difficult-to-mix fillers with higher strength and performance properties.

REFERENCES

1. Miroshnichenko G.I. Equipment and technology for the production of primary processing of cotton. T., Ukituvchi, 1980, 323 p.
2. Matkarimov S.Kh. Investigation of the friction of composite polymer coatings with raw cotton. Abstract of thesis. Cand. diss. - R. on D. 1978. -- 20 p.
3. Negmatov S.S. Fundamentals of creating inorganic composite materials. - Tashkent, UzRNTK "Fan va taragiyot", 1994. - 242 p.
4. Negmatov S.S. Polymer coating technology. - Tashkent: Uzbekistan, 1975. -- 231 p.
5. Negmatov S.S.; Y. Evdokimov; Sodikov Kh.U. Adhesion and strength properties of polymeric materials and coatings based on them - Tashkent: Fan 1979. - 270 p.
6. Negmatov S.S. Operating conditions of the main working bodies of machines and mechanisms for harvesting and processing raw cotton. - Tashkent: Uzbekistan, 1980. -- 60 p.



**Impact Factor:
7.569**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details