

**THE IMPACT OF ULTRASONIC TREATMENT ON THE FABRICATION OF
FLEXIBLE COMPOSITE POLYMER COATINGS FOR REINFORCED CONCRETE
MOLDINGS**

M.B. Mukhitdinov

Doctor of philosophy technical sciences(PhD)

Namangan State Technical University

e-mail: muzaffarbek0047@gmail.com.

Khamidov Muhammadali Shodmonali ugli,

Master's Student (Namangan State Technical University)

e-mail: xamidovmuhammadali65@gmail.com.

Abstract: The article the influence of type and main technological parameters of physical modification by ultrasound on wear resistance and other operational and physical-mechanical properties of composite epoxy polymeric materials and coatings on their basis for application on working surfaces forming equipment of reinforced concrete products working in contact interaction with concrete is investigated.

Keywords: ultrasound, metal equipment, wear resistance, adhesive strength, physical and mechanical properties, composition, thermosetting polymer, epoxy resin, coatings, reinforced concrete product.

Introduction. On the basis of the analysis of the obtained research results the most optimal types of physical modification by ultrasound and processing modes for providing high wear resistance to epoxy compositions in relation to the conditions of forming tooling in the production of architectural and artistic reinforced concrete structures are determined. [1].

An attempt has been made to establish the relationship of abrasive wear resistance of epoxy compositions with their physical and mechanical properties and the possibility of purposeful regulation of these characteristics through the use of physical modification by ultrasound and electromagnetic field has been shown. The complex analysis of the obtained research results allowed us to identify the most optimal types and compositions of epoxy compositions, as well as modes of physical modification by ultrasound in order to increase the efficiency and durability of forming tooling[2].

Object and research methodology. The object is two types of basic composition (BC) of binder from 100 wt.% of epoxy resin ED-16, 12 wt.% of hardener-polyethylene polyamine, 20 wt.% of plasticizer-dibutyl phthalate - BC-1 and from 100 wt.% of epoxy resin ED-16, 7 wt.% of hardener-piperidine, 20 wt.% of aliphatic low molecular weight epoxy resin - BC-2 [3 wt.%]. ED-16, 7 wt.h. of hardener-piperidine, 20 wt.h. of aliphatic low molecular weight epoxy resin - BC -2 [3].

In the development of such compositions both binders are used, because each has its own advantages and disadvantages, which is of both scientific and practical interest. For example, BC-1 is more wear-resistant and has a relatively lower adhesion strength with concrete, and BC-2 has good adhesion with steel [4].

Research Methods. In the study, mainly standard methods of installation were used. Thus, adhesion strength according to GOST 14-760-69, bending strength according to GOST 4648-71. Wear properties of composite thermosetting epoxy polymer thermosetting epoxy materials in interaction with concrete were studied on disk tribometer UzDST3330:2018.

For ultrasonic treatment of polymer compositions we used the LP -250W unit with a frequency of 1 MHz, which allows us to vary the ultrasonic oscillation power from 80 to 250 W. The choice of the installation is due to the fact that ultrasonic vibrations, especially with a frequency of 600-1000 kHz, accelerate the polymerization reaction, the processes of oxidation of substances, dispersion of ingredients, provide the intensity of mixing, homogeneity of the composition. All these processes are important for obtaining high-quality composite polymer materials and coatings.

Results and their discussion. Processing of samples in the ultrasonic field was carried out according to our chosen method [5], at a constant frequency of ultrasound oscillations 1 MHz and field intensity 5 kW/m².

The results of the experimental study of the dependence of the wear intensity of epoxy compositions on the time of ultrasonic field exposure are presented in Figure 1.

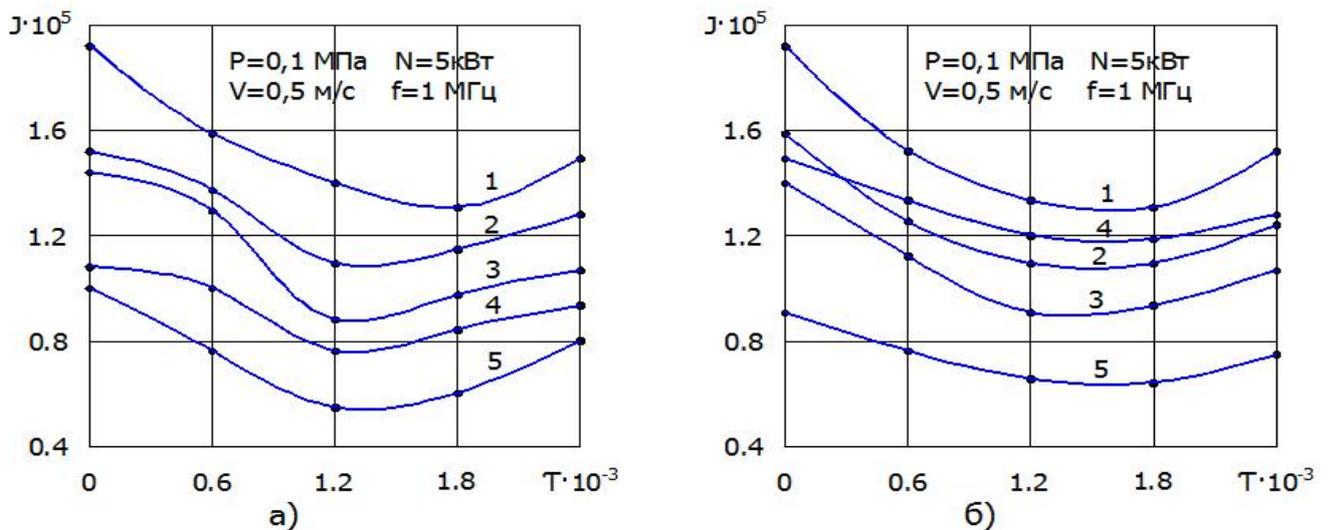


Fig.1. Dependence of wear intensity of epoxy compositions ABIEC-3(1), OIEC-1(2), OIEC-3(3), OIEC-5(4), ASIEC-3(5) on concrete (a) and in the presence of moist medium (b) from the duration of processing in the ultrasonic field.

As can be seen from the figure, with increasing time of ultrasonic field exposure the wear intensity of epoxy compositions changes extremely, passing through the minimum in the period of duration 1200-2000 sec. Moreover, the position of the minimum is different depending on the type of composite and binder. For example, the minimum value of wear intensity at BC-1 - $0,8 \cdot 10^{-5}$ is observed at time of influence of ultrasonic field 1000-1200 s, whereas at BC-2 the minimum wear intensity is equal to 0,95 and corresponds to 900-1000 sec of time of ultrasonic

processing [6].

No less important feature of ultrasonic treatment of polymer compositions before applying them to the surface of samples is that after ultrasonic treatment of the components of the composition, especially fillers, are distributed more uniformly, reduce aggregated particles of fillers and thereby reduce to a minimum microdefects and heterogeneity in the volume of polymer material.

Conclusion: Based on the results of the study the following conclusions can be made:

1. It was shown that by modifying the composition by means of ultrasonic field it is possible to significantly change the wear resistance and other, operational and physical-mechanical properties of epoxy compositions. The optimal time of ultrasonic field exposure to increase the wear resistance of compositions is 900-1800 s. And for increasing their adhesion strength is effective ultrasound exposure duration of 1500-2000 s.

The optimal modes of ultrasonic treatment of compositions have been established. Ultrasonic processing gives the desired results at 1800-2000 seconds of exposure of the field with the power $N=5 \text{ kW/m}^2$ and frequency $f=1 \text{ MHz}$

Literature:

1. Мухитдинов, М. Б. (2024). ВЛИЯНИЯ УЛЬТРАЗВУКА НА СВОЙСТВА КОМПОЗИЦИОННЫХ ПОЛИМЕРНЫХ МАТЕРИАЛОВ И ПОКРЫТИЙ НА ИХ ОСНОВЕ. *Universum: технические науки*, 2(1 (118)), 32-34.
2. Аликобилов Ш. А. и др. Применение композиционных полимерных материалов в формах для повышения эффективности производства железобетонных строительных конструкций // *КОМПОЗИЦИОННЫЕ МАТЕРИАЛЫ*. – Т. 169.
3. Негматов С. С. и др. ИССЛЕДОВАНИЕ ВЛИЯНИЯ РЕЖИМОВ ЭКСПЛУАТАЦИИ МЕТАЛЛИЧЕСКОЙ ОСНАСТКИ НА ИЗНОСОСТОЙКОСТЬ КОМПОЗИЦИОННЫХ ПОЛИМЕРНЫХ МАТЕРИАЛОВ // *Universum: технические науки*. – 2022. – №. 11-5 (104). – С. 54-59.
4. Негматов С. С. и др. & Улмасов, ТУ Исследование влияния содержания различных наполнителей на износостойкость и другие физико-механические свойства композиционных эпоксидных полимерных материалов // *КОМПОЗИЦИОННЫЕ МАТЕРИАЛЫ*. – Т. 72.
5. Негматов С. С. и др. Исследование влияния содержания различных наполнителей на износостойкость и другие физико-механические свойства композиционных эпоксидных полимерных материалов // *КОМПОЗИЦИОННЫЕ МАТЕРИАЛЫ*. – Т. 72.
6. Раджабов Ё. С. и др. Комплексный анализ современного состояния железобетонных формирующих оснасток в производстве строительных конструкций и изделий, пути повышения их эффективности // *КОМПОЗИЦИОННЫЕ МАТЕРИАЛЫ*. – Т. 172.