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“WOMEN IN INNOVATION AND SCIENCE” XALQARO ILMIY-AMALIY KONFERENSIYA VA FORUMI ILMIY ISHLARI TO‘PLAMI

Toshkent davlat transport universitetida 2026-yil 27-mart kuni “Women in Innovation and Science” xalqaro forumi ilmiy ishlari to‘plami chop etildi.

Mazkur nufuzli tadbirlar O‘zbekiston Respublikasi Oliy ta’lim, fan va innovatsiyalar vazirligi hamda Transport vazirligi hamkorligida tashkil etilib, mamlakatimizda ilm-fan, innovatsiyalar va zamonaviy texnologiyalarni rivojlantirish, shuningdek xalqaro ilmiy hamkorlikni yanada kengaytirishga qaratilgan muhim platforma hisoblanadi.

Konferensiya ochilish marosimida davlat organlari, xalqaro tashkilotlar va yetakchi oliy ta’lim muassasalari vakillari ishtirok etdi. Jumladan, Toshkent davlat transport universiteti rektori G‘ulomov Abdulaziz Abdullayevich, O‘zbekiston Respublikasi Transport vazirligi vakili Ulmasova Lobarkhon Adilovna, Osiyo taraqqiyot banki eksperti Claire Charamnac, Istanbul Aydin universiteti vasiylik kengashi raisi Mustafa Aydin, Belarus davlat transport universiteti rektori Kazakov Nikolay Nikolayevich hamda Qirg‘iziston Respublikasi Transport vazirligi vakili Dinara Moldokalieva ishtirok etdilar.

Konferensiya ilmiy dasturi doirasida plenar va panel sessiyalar, shuningdek ilmiy ma’ruzalar taqdimoti o‘tkazilib, ularda sun’iy intellekt va raqamli texnologiyalarni iqtisodiyot va ta’limga joriy etish, transport va aviatsiya sohasida innovatsion yechimlar, sanoat va IT sohasida texnologiya transferi, shuningdek ta’limda raqamli platformalar va intellektual tizimlar kabi dolzarb masalalar yoritildi.

2026-yil 27-mart kuni o‘tkazilgan “Women in Innovation and Science” xalqaro forumi ayollar yetakchiligi, innovatsiyalar va STEM sohalariga bag‘ishlangan bo‘lib, mamlakatimizda ayollarning ilm-fan va texnologiya sohalaridagi ishtirokini kengaytirish, ularning yetakchilik salohiyatini rivojlantirish hamda xalqaro hamkorlikni mustahkamlashga qaratilgan strategik maydon sifatida tashkil etildi.

Forum doirasida ayollar yetakchiligini rivojlantirish va rag‘batlantirish, xalqaro tajriba almashinuvi va ilmiy tarmoqlarni kengaytirish, yosh tadqiqotchi ayollar va PhD talabalarni qo‘llab-quvvatlash hamda innovatsion ekotizimlarda gender tenglikni ta’minlash kabi ustuvor vazifalar amalga oshirildi. Shuningdek, forumda ayollar yetakchiligi va STEM, gender tenglik va ilm-fan institutsional rivoji, ayollar tadbirkorligi va innovatsion startaplar, innovatsiya ekotizimlari va xalqaro hamkorlik, yosh ayol tadqiqotchilarni rivojlantirish, mentorlik va akademik tarmoqlar yo‘nalishlarida tematik sessiyalar tashkil etildi.

Forumda davlat organlari, xalqaro tashkilotlar, yetakchi oliy ta’lim muassasalari va ilmiy markazlar vakillari, jumladan “OLIMA” uyushmasi raisi Murtazayeva Raxbar Hamidovna, “Sharq ayoli” xalqaro ayollar jamoat fondi raisi Tursunbayeva Saodat Gafurovna, Osiyo taraqqiyot banki eksperti Claire Charamnac, O‘zbekiston Respublikasi Transport vazirligi vakili Ulmasova Lobarkhon Adilovna, Toshkent davlat transport universiteti rektori G‘ulomov Abdulaziz Abdullayevich, Qirg‘iziston Respublikasi Transport vazirligi vakili Dinara Moldokalieva hamda Indoneziyadan universitet dekani Yoga Prihatin ishtirok etdilar.

Shuningdek, forumda Yevropa va Osiyo davlatlaridan yetakchi olimlar, ekspertlar va yosh tadqiqotchilar keng qatnashdi.

Forum dasturiga ochilish marosimi, panel muhokamalar, ilmiy chiqishlar hamda professional rivojlanish bo‘yicha workshoplar kiritilgan bo‘lib, ular doirasida gender tenglik, ayollar karyerasini rivojlantirish, ilmiy tadqiqotlar va innovatsion boshqaruv bo‘yicha amaliy seminarlar tashkil etildi.

Mazkur tadbirlar Osiyo taraqqiyot banki (ADB), “OLIMA” — O‘zbekiston xotin-qizlar olimlari uyushmasi, “Sharq ayoli” xalqaro ayollar jamoat fondi, Germaniya xalqaro hamkorlik jamiyati (GIZ), shuningdek Rossiya, Turkiya, Indoneziya va Qirg‘iziston oliy ta’lim muassasalari hamda Belarus Milliy fanlar akademiyasi ilmiy institutlari hamkorligida o‘tkazildi.

Mazkur xalqaro ilmiy-amaliy konferensiya va forumning ahamiyati shundaki, ular xalqaro ilmiy hamkorlikni mustahkamlash, innovatsion ishlanmalarni amaliyotga joriy etish, raqamli va barqaror rivojlanishni ta’minlash, shuningdek ayollarning ilm-fan va innovatsiya sohalaridagi rolini kuchaytirishga xizmat qiladi. Shu bilan birga, mazkur tadbirlar yosh olimlar va tadqiqotchilarni qo‘llab-quvvatlash, ilmiy tajriba almashish hamda global ilmiy makonga integratsiyalashuvni jadallashtirishda muhim ahamiyat kasb etadi.

Mazkur xalqaro ilmiy-amaliy konferensiya va forumning maqsadi zamonaviy ilmiy tadqiqot yo‘nalishlarini muhokama qilish, innovatsion yondashuvlar va ilg‘or texnologiyalar bo‘yicha ilmiy natijalar almashuvini ta’minlash, shuningdek xalqaro ilmiy hamkorlikni rivojlantirishdan iboratdir.

Tadbirda O‘zbekiston Respublikasi hamda xorijiy mamlakatlarning oliy ta’lim muassasalari va ilmiy-tadqiqot institutlari olimlari, shuningdek amaliyotda muhim natijalarga ega bo‘lgan mutaxassislar o‘z ilmiy ishlari bilan ishtirok etdilar.

Ushbu ilmiy to‘plamda muhandislik, transport, raqamlashtirish, sun’iy intellekt, innovatsion boshqaruv, gender tenglik va barqaror rivojlanish sohalarida faoliyat yuritayotgan yetakchi olimlar, professor-o‘qituvchilar va tadqiqotchilarning ilmiy ishlari jamlangan. To‘plamda dolzarb ilmiy muammolar, zamonaviy yechimlar, nazariy va amaliy tadqiqot natijalari yoritilib, ushbu yo‘nalishlarning bugungi holati va istiqboldagi rivojlanish tendensiyalari aks ettirilgan.

Mazkur nashr mamlakatimizda ilm-fan va innovatsion rivojlanishni ta’minlash, xalqaro ilmiy aloqalarni mustahkamlash hamda yosh olimlar va tadqiqotchilarni qo‘llab-quvvatlash yo‘lidagi muhim qadamlardan biri sifatida e’tirof etiladi.

Shuningdek, mazkur ilmiy to‘plamda keltirilgan natijalar kelgusida ilmiy tadqiqotlar samaradorligini oshirish, amaliyotga yo‘naltirilgan innovatsion yechimlarni keng joriy etish hamda sohalararo integratsiyani chuqurlashtirish uchun muhim ilmiy asos bo‘lib xizmat qiladi. To‘plam materiallari nafaqat ilmiy jamoatchilik, balki ishlab chiqarish sohasi mutaxassislari, doktorantlar va talabalar uchun ham foydali manba hisoblanadi.

Mazkur nashrda yoritilgan ilmiy g‘oyalar va ilg‘or yondashuvlar asosida yangi ilmiy izlanishlar olib borilishi, xalqaro ilmiy aloqalarning yanada rivojlanishi hamda innovatsion rivojlanish strategiyalarining takomillashishiga xizmat qilishi kutilmoqda.

Investigation of the thermal stability of the compositions of thermoset-based, anti-friction, wear-resistant polymer composite materials

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Abstract: This article shows the thermal stability of an antifriction, wear-resistant polymer composite material developed for the drum spikes of machines used for cleaning fine particles from cotton. The obtained samples were tested using STA200 thermogravimetric and differential thermal analysis equipment in the temperature range of 25-600 °C. The article discusses how properties vary depending on the filler type and its mass fraction. It also highlights that the resulting materials can be used as coatings for machine parts, potentially extending their service life due to their wear-resistant properties. A key advantage of the proposed material is that the application of composite polymer coatings can simplify the repair processes of structures, thereby achieving economic efficiency.

Keywords: antifriction-wear-resistant, polymer material, composite, thermal stability, thermogravimetric analysis, differential thermal analysis, antifriction material, drum spikes

1. Introduction

It is well known that modern machinery, technology, and mechanisms, including the technolog ical equipment used in the cotton industry, must possess the required performance and operational reliability. Along with improving the design of this equipment to maintain productivity and preserve fiber quality, the targeted application of new, highly effective anti-friction, wear-resistant composite polymer materials is considered one of the most pressing innovative scientific and technical challenges awaiting a solution**.** In particular, the materials used as friction pairs in technological equipment for cleaning cotton of fine particles must simultaneously possess a number of important properties, such as wear resistance, mechanical strength, and thermal stability [1, 2]. In this context, applying a coating of anti-friction, wear-resistant polymer composite (AWPC) material and optimizing operating mode parameters are currently essential tasks.

The use of anti-friction, wear-resistant polymer composite materials (AWPCM) based on thermosetting epoxy resins is advisable as a solution to these problems.

2. Research methodology

The expediency of structuring methods, which allow for the rational use of local raw and energy resources, has been substantiated as an effective type of modification for heterocomposite polymer materials used in the spiked working parts of cylindrical ginning drums for loosening and cleaning raw cotton [3, 4]. For the research, when preparing coating samples from anti-friction, wear-resistant polymer composite materials, composites based on the thermosetting binder epoxy resin ED-20 and fillers from local raw materials - kaolin (AKF-78), technical carbon, and fiberglass - were selected, along with a hardener, and samples were obtained in various mass parts (Table 1).

From the polymer composite materials prepared based on the compositions proposed above, coatings were obtained by roll-coating the anti-friction, wear-resistant polymer composite onto the surface of ST4 grade steel. The thermal stability of the resulting coatings was studied.

Table 1

Composition of polymer materials resistant to antifriction-wear

Composition	Function	Mass Part
Epoxy-dian resin (ED-20)	Binder	100
E-type fiberglass	Reinforcement (filler)	2
Kaolin AKF-78	Filler	35
Technical carbon	Modifier	3.5
Dibutyl phthalate (DBP)	Plasticizer	10

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Polyethylenepolyamine (PEPA)	Hardener	8

.**Methods**

To assess the thermal properties of the selected anti-friction, wear-resistant polymer composite material sample, **STA200** brand thermogravimetric differential thermal analysis (DTA) equipment was used.

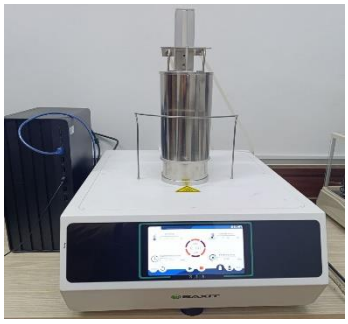

Fig. 1. STA 200 thermogravimetric differential thermal analysis (DTA)

This is a combined testing device capable of simultaneously performing thermogravimetric analysis (TGA) and differential thermal analysis (DTA), a method that rapidly measures how the mass of a material changes with temperature [5].

The evaluation of thermal properties, which are important for coatings, is conducted based on the composition and mass of the antifriction, wear-resistant polymer material under investigation. During the research, the obtained sample was heated from room temperature to 600 °C at a rate of 10 °C/min. Nitrogen (N2) gas was used as an inert medium at a flow rate of 40 ml/min. For the analysis, a 10-20 mg sample was placed in an alumina crucible. The mass change and thermal resistant to antifriction-wear 25-600 °C.

3. Results and discussion

One of the main factors ensuring the effective operation of antifriction-wear-resistant polymer composite materials based on reactoplastic under conditions of friction or abrasive wear is their thermal stability.

To determine the thermal stability of our samples, the experiment was conducted under real conditions at room temperature. 2 grams of the prepared samples were crushed, placed in a special container, and the result was obtained for 20 minutes.

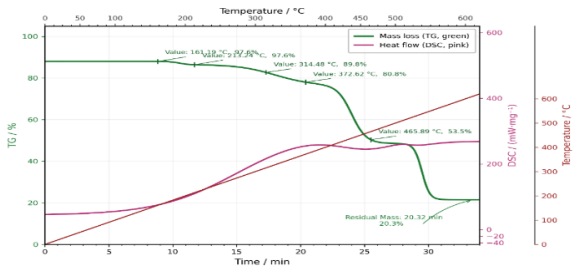

Fig. 2. Thermogravimetric and differential thermal analysis of the recommended sample

Analysis of the TGA curve shows that the thermal decomposition of the polymer composite material occurs in several consecutive stages (Fig. 2). Each stage reflects changes in the physicochemical properties characteristic of the material's constituent components (Table 2).

Table 2

Stage-by-stage analysis of TGA and DTA results

Stage	Temperature	Mass %	Loss %	Change in physicochemical properties
1	25-160	100 → 97.6	~2.4	Release of physically bound moisture and volatile components
2	160-314	97.6 → 89.8	~7.8	Initial thermal stability limit of the polymer matrix; onset of structural softening
3	314-372	89.8 → 80.8	~9.0	Onset of main polymer chain degradation
4	372-466	0.8 → 53.5	27.3	Acceleration of the degradation process
5	466-600	3.5 → 22-23	31	Almost complete degradation of organic components; residual mass - inorganic fillers

The analysis results show that in the first stage, a 2.4% decrease in sample mass was observed in the temperature range from 25 °C to 160 °C. This phenomenon is explained by the evaporation of adsorbed moisture from the sample. At this stage, no significant changes are observed in the main structure of the material[6].

In the second stage (160-314 °C), the mass decreased from 97.6% to 89.8%. This stage defines the initial thermal stability limit of the polymer matrix and is characterized by the onset of structural softening processes in the binder phase. It is important to note that the material's operational properties are maintained up to this temperature range.

In the third stage (314-372 °C), a more significant decrease in the sample's mass is observed (down to 80.8%). This stage corresponds to the beginning of the main decomposition process of the polymer chains [8].

In the fourth stage (372-466 °C), the decomposition process intensifies, and the sample mass decreases to 53.5%. In the fifth and final stage (466-600 °C), the residual mass was 22-23% as a result of the almost complete decomposition of the organic components. This residue confirms the presence of heat-resistant mineral or inorganic fillers.

Differential Thermal Analysis (DTA) Results.

Analysis of the DTA curve revealed several characteristic thermal effects:

Heat Absorption Process (80-150 °C): A weak endothermic peak was observed in this temperature range. This effect is attributed to the evaporation of moisture and low-boiling-point volatile substances present in the sample. The heat consumption is relatively small and does not significantly affect the material's structure.

Thermal Transition Process (280-350 °C): Within this range, an intensification of the thermal effect was observed. This indicates the glass transition (Tg) of the polymer matrix and the onset of initial decomposition processes. This temperature range is in full agreement with the TGA results.

Heat Release Process (above 400 °C): At these temperatures, strong exothermic processes were recorded. These are explained by the oxidation and intensive decomposition of the organic components. Such effects are characteristic of wear-resistant filler components [9].

Discussion

The results obtained indicate that the selected anti-friction, wear-resistant polymer composite material possesses sufficient thermal stability in the temperature range up to 300°C. This parameter is fully adequate for the actual operating conditions of the spiked drums in machines that clean cotton of fine impurities, as the temperature during the friction process on the drum spikes in these devices typically does not exceed 80-150°C.

A residual mass of 22-23% confirms the presence of heat- and wear-resistant mineral or inorganic fillers in the composition. These fillers play a crucial role in maintaining the material's mechanical strength and wear resistance during the friction process [10].

The small endothermic effect (80-150°C) recorded in the DTA results indicates the absence of excess moisture in the material, which in turn suggests its good moisture resistance. The exothermic processes observed at temperatures above 400°C can only occur under extremely high-temperature conditions (such as a fire or emergency), and such temperatures are not reached under normal operating conditions.

Furthermore, the research results show that reinforcing polymer composite materials derived from thermosetting resins with local raw materials and mineral fillers significantly enhances their thermal stability [11,12].

4. Conclusion

The research indicates that the resulting antifriction, wear-resistant polymer composite materials meet the operational requirements for the spikes of cotton cleaning machines, maintaining thermal stability up to 300°C. The 22-23% residual mass at the end of thermal decomposition corresponds to the inorganic fraction of kaolin and carbon black.

The correlation between the TGA and DTA results confirms the reliability of the experiments. Optimizing the composition and mass fractions of the filler materials achieved a 15-20% increase in thermal stability. This antifriction, wear-resistant composite polymer material, developed using local raw materials and waste, is an effective solution for ensuring equipment reliability and fiber quality in the cotton industry.

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