STUDY OF THE PROPERTIES OF SYNTHETIC POLYMER CARBAMIDE GLICER AND THE PROPERTIES OF DIFFERENTIAL THERMAL ANALYSIS AND IR SPECTRUM ANALYSIS.

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Abstract. In this article, the properties of polyvinyl alcohol and machina and glycerin were analyzed, and IR spectrum analysis was studied to study the physicochemical properties of the substance and their composition. Differential thermal analysis and properties and reaction equation were derived. As a result of the synthesis, the formation of a transparent colorless sponge-like substance was observed. To improve the chemical and mechanical properties of the films, urea was added to the PVS solution, and to ensure elasticity, propane 1,2,3 triol was added. The synthesis process was controlled using special equipment. The influence of the conditions of the formed substance and the synthesis parameters on the quality of the film was analyzed. As a result, synthesis conditions and materials for improving film properties with high elasticity, strength, and stability were developed. The following research contributes to the synthesis of modern polymer materials that can be used in industry.

Keywords. Urea, synthesis, glycerin, transparent substance, IR spectrum, coating, polymer substance, differential thermal analysis.

Аннотация.В данной статье проанализированы свойства поливинилового спирта и триолового глицерина мачивины и изучены ИК-спектры и аналитические анализы для изучения физико-химических свойств вещества и их состава. Приведены дифференциально-термический анализ и свойства и уравнение реакции. В результате синтеза наблюдалось образование прозрачного бесцветного каучакообразного вещества. Для улучшения химических и механических свойств пленок в раствор ПВА добавляли карбамид, а для обеспечения эластичности добавляли Глицерин процесс синтеза контролировали с помощью специального оборудования. Образовавшееся вещество Проанализировано влияние условий и параметров синтеза полученного вещества на качество пленки. В результате были разработаны условия синтеза и материалы для улучшения свойств пленки с

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высокой эластичностью, прочностью и стабильностью. Следующее исследование способствует синтезу современных полимерных материалов, которые могут быть использованы в промышленности.

Ключевые слова: Мочевина, синтез, глицерин, прозрачное вещество, ИК-спектр, покрытие, полимерное вещество, дифференциально-термический анализ

Annotatsiya. Ushbu maqolada polivinil spirt va mochivina hamda glitserin moddalarning fizik-kimyoviy xossalarini o'rganish uchun IQ-spektri, analizi tahlillari o'rganib chiqildi. Differensial termik tahlil va xususiyatlar va reaksiya tenglamasi keltirildi. Sintez natijasida tiniq rangsiz kauchuksimon modda hosil bo'lishi kuzatildi. Plyonkalar kimyoviy va mexanik xossalarini yaxshilash maqsadida PVS eritmasiga karbamid qo'shildi. hamda elastikligini taminlash maqsadida prapan 1,2,3 triol qo'shildi. Sintez jarayoni maxsus uskunalar yordamida boshqarildi. Hosil bo'lgan modda sharoitlari va sintez parametrlari plyonka sifatiga ta'sir ko'rsatishi tahlil qilindi.CHirish jarayoni o'rganildi. Yuqori elastiklik, mustahkamlik va barqarorlikka ega, Plyonka xossalarini yaxshilash uchun sintezga, optimal sharoit tanlandi.Materiallari ishlab chiqarildi.

Kalit so'zlar: Karbamid, sintez, glitserin, shaffof modda, IQ-spektr, qoplama, polimer modda, differensial termik tahlil.

Аннотация. В данной статье проанализированы свойства поливинилового спирта и триолового глицерина мачивины и изучены ИК-спектры и аналитические анализы для изучения физико-химических свойств вещества и их состава. Приведены дифференциально-термический анализ и свойства и уравнение реакции. В результате синтеза наблюдалось образование прозрачного бесцветного каучакообразного вещества. Для улучшения химических и механических свойств пленок в раствор ПВА добавляли карбамид, а для обеспечения эластичности добавляли Глицерин процесс синтеза контролировали с помощью специального оборудования. Образовавшееся вещество Проанализировано влияние условий и параметров синтеза полученного вещества на качество пленки. В результате были разработаны условия синтеза и материалы для улучшения свойств пленки с высокой эластичностью, прочностью и стабильностью. Следующее исследование способствует синтезу современных полимерных материалов, которые могут быть использованы в промышленности.

Ключевые слова: Мочевина, синтез, глицерин, прозрачное вещество, ИК-спектр, покрытие, полимерное вещество, дифференциально-термический анализ

INTRODUCTION.

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Synthetic plastic has brought humanity many advantages. The application of polymers in medicine, oil and gas, and textiles is very diverse, covering areas from the manufacture of new chemical reagents and medical devices to the replacement of body tissues. Polymers are high-molecular-weight chemical compounds with specific properties. Their strength, lightness, flexibility, and chemical inertness make them an ideal material for medical and multi-purpose use. It became necessary for human life. However, the main environmental problems, such as waste disposal and damage to the marine environment, are mainly non-destructive plastic. Uncontrolled destruction of packaging. The remarkable resistance of synthetic plastic against biological degradation has become a serious problem. Due to the acute environmental problem, the latest trend shows that a number of scientific works have been carried out on the development of biodegradable plastics, not only on new design strategies, but also on optimizing their compatibility. Below is an analysis of the essence and content of the most important research in this area and the proposals made in them.

LITERATURE REVIEW.

Relevance of the research. A biodegradable coating is an ecological polymer that dissolves in water at high temperatures. Environmentally friendly soil has mineralogical properties, such as water solubility and thermal properties, the degree of crystallization, and the degree of hydrolysis. It is non-toxic and biodegradable under certain conditions [2]. This made it possible to obtain biodegradable composite films based on polyvinyl alcohol with improved mechanical properties and high water adsorption capacity. These features can be useful in some applications in the food industry and as an alternative to synthetic films. Polyvinyl alcohol increased the viscosity of composite films based on cellulose and glycerin, which act as plasticizers. However, viscosity decreased with increased glycerin concentration [3]. In the study, urea was used as the fertilizer core, bio as the coating material, and polyvinyl alcohol as the binder, designed to assess the physicochemical properties and slow-release properties of nitrogen fertilizers. Compressive resistance of urea increased with an increase in the ratio of wear resistance and moisture resistance, which showed that biofouling can reduce ingredient losses during packaging, transportation, and storage [4]. Therefore, more efficient and sustainable approaches are required.In this regard, electrochemical oxidation (electrooxidation) has emerged as a powerful strategy for breaking down organic pollutants such as urea and glycerin in wastewater. Electrooxidation allows these molecules to be oxidized directly or indirectly on the electrode surface, transforming them into harmless products such as CO_2, N_2, and H_2O under mild conditions. Studies conducted in recent years have shown that various electrode

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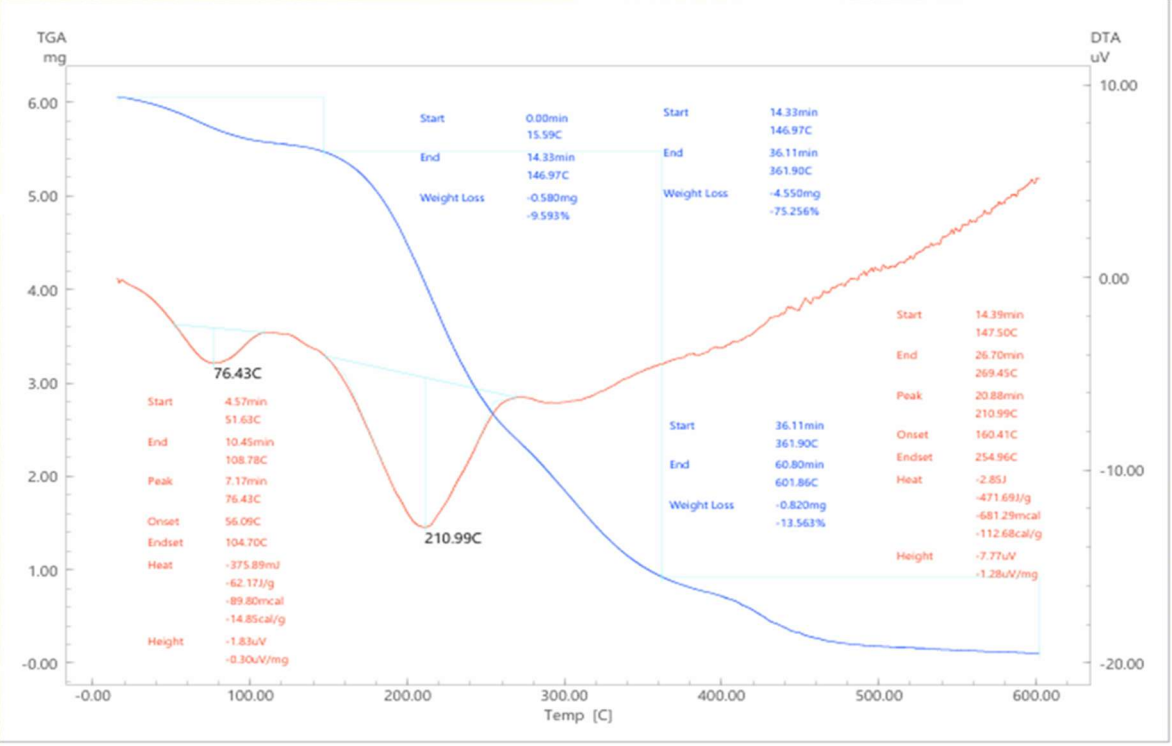
materials have the potential for this [5]. Polyvinyl alcohol has good biocompatibility and good resistance to chemicals. The high crystalline structure made it possess high mechanical properties. PVS also has a downside, as it is expensive and causes long-term environmental damage. To overcome this weakness, blending with starch becomes one of the cost-stimulating solutions for production. Infrared Spectroscopy IR Spectroscopy (a Fourier spectrometer manufactured in Japan. IR spectroscopic studies were carried out on an infrared Fourier spectrometer (range 400-4000 cm-1, dimensions 4 cm-1) by the powder method. If there is a difference in the physicochemical properties of the new substance formed as a result of the experiments compared to the initial substances, the composition of the synthesized substances was analyzed using IR spectra to determine whether the reaction proceeded or not, and in other similar cases.

RESEARCH, DISCUSSION AND RESULTS. Analysis of the thermokinetics, differential heat, and entropy of the biocomposite. Differential thermal analysis (DTA) is the process in which physical or chemical changes in materials (e.g., melting, crystallization, phase transitions, decomposition) are accompanied by heat absorption (endothermic) or heat emission (exothermic). This method is used to analyze the internal phase changes, reactions, or thermal phenomena of a material during heating or cooling. This, in turn, helps to understand the mechanism of action and the effectiveness of the corrosion inhibitor.Kinetics of thermal processes: Determines the rate of thermogravimetric reactions, plays an important role in optimizing the conditions for the effective use of inhibitors. Polyvinyl alcohol (PVC) Application: chemical and polymer industry, adhesives and binders (stationery glue), coating in the production of water-soluble films. since the materials are polymeric, there is no specific boiling point. Molar mass: PVS 9+% from average molecular weight 89000-98000 g mol-1 and density 1.269 g cm-3 depending on the degree of work of the purchased polymer Condition: solid substance (white or colorless powder/granules) Smell: odorless Taste: tasteless Solubility in water:- slowly dissolves in cold water, well dissolves in hot water. Density: 1.19-1.31 g/cm3 Melting point: uncertain, decomposes at 200-230 °C. Boiling point: absent (polymer, decomposes) Mechanical properties: strong, elastic, forms a film. Hygroscopicity: absorbs moisture. Density: 1.19 - 1.31 g/cm^3. Decomposes upon heating (≈ 200-230 °C). Urea (urea) - CO (NH_2) Area of application of urea or (urea) substance. For the production of urea and formaldehyde resins, these resins are one of the most common polymers. Synthetic in the wood industry.

Used in furniture and building materials. As a glue and binder, it increases the strength of paper, fabric, and wood fibers for bonding and reduces the cost of

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the product. Increases hardness and surface strength to improve plastic properties.Improves heat resistance to a certain extent. In coatings and varnishes Makes the surface smooth and durable.Forms a bleaching and protective layer.State: white crystalline substance Smell: odorless Taste: salty-bitter Water solubility: very good density: 1.32 g/cm^3 Melting point: 133 °C Boiling point: none (decomposes after melting) Hygroscopicity: bor Electrical conductivity: low molar mass: 60 g/mol Density: 1.32 g/cm^{3}Boiling point: None, decomposes before boiling. Decomposition temperature: ≈ 133 °C Glycerin (glycerol) - $C_3H_8O_3$ Area of application. Glycerin (glycerol) - $C_3H_8O_3$ Area of application in the production of nitroglycerin (explosive substance) in the production of resins, plastics and polymers as a solvent in antifreeze and cooling liquids in the manufacture of technical and industrial lubricants in the printing and dyeing industry increasing the elasticity of leather and textile industry properties in coatings elasticity glycerin (glycerol) state: colorless, viscous liquid Odor: odorless Taste: sweet Solubility in water: infinitely soluble. Density: 1.26 g/cm3 (20°:



1-picture Differential thermogravimetric analysis of biodegradable coating (DTA)

Synthesized in a dry mass, shown in 1. -picture The biodegradable coating was selected at a temperature of 600°C and studied according to the differential thermogravimetric (DTA) thermogravimetric derivatogram (TGA) and analysis, which presented the results of the coating analysis. At temperatures of 76.43°C and 210.99°C, an exothermic peak was observed, which is the peak on the thermal analysis curve representing the process of heat absorption. In endothermic

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processes, the material absorbs heat from an external source, which changes its internal energy state. We can see the change in the energy state in

Table 1.

DTA analysis view of biodegradable coating

Temperature	Total energy absorption, uV	Unit of mass, uV/mg	Heat, m/cal	Heat per mass cal/g,
76,43 °C	1.83	0.30	89,80	14.85
210.99 °C	7.77	1.28	681,29	112.68

Analysis of the thermogravimetric curve of biodegradable coating shows that the TGA curve mainly occurs in the temperature range of 2 intensive mass losses. The 1st mass loss interval corresponds to a temperature of 1559 - 14697°C, the mass loss interval corresponds to a temperature of 361.90 - 75.256°C. Analysis shows that in the 1st mass loss range, mass loss is -0.580mg, i.e., 9.593%, while in the 2nd mass loss range, mass loss is -4.550 mg, i.e., -75.256%. In the 3rd mass loss range, mass loss is -0.820mg -13.563%. Analysis of the thermogravimetric analysis curve (TGA) (blue line) shows that in the TGA curve, mass absorption occurs mainly in 2 temperature ranges, which can be seen in

Table 2.

TGA analysis of biodegradable coating.

Temperature °C	Mass loss, g	Mass loss, %
15.59-146-97°C	0.590	-9.593
250.66-601.68°C	45.50	-75,256
361.90-601.86	0.820	-13.563

Differential thermogravimetric analysis of biodegradable coating The analysis presented in Fig. 1 shows that energy absorption occurs in the range of 108.78C -51.63C°C. The highest heat absorption occurs at a temperature of 76.43°C, which is shown in Table 3 below.

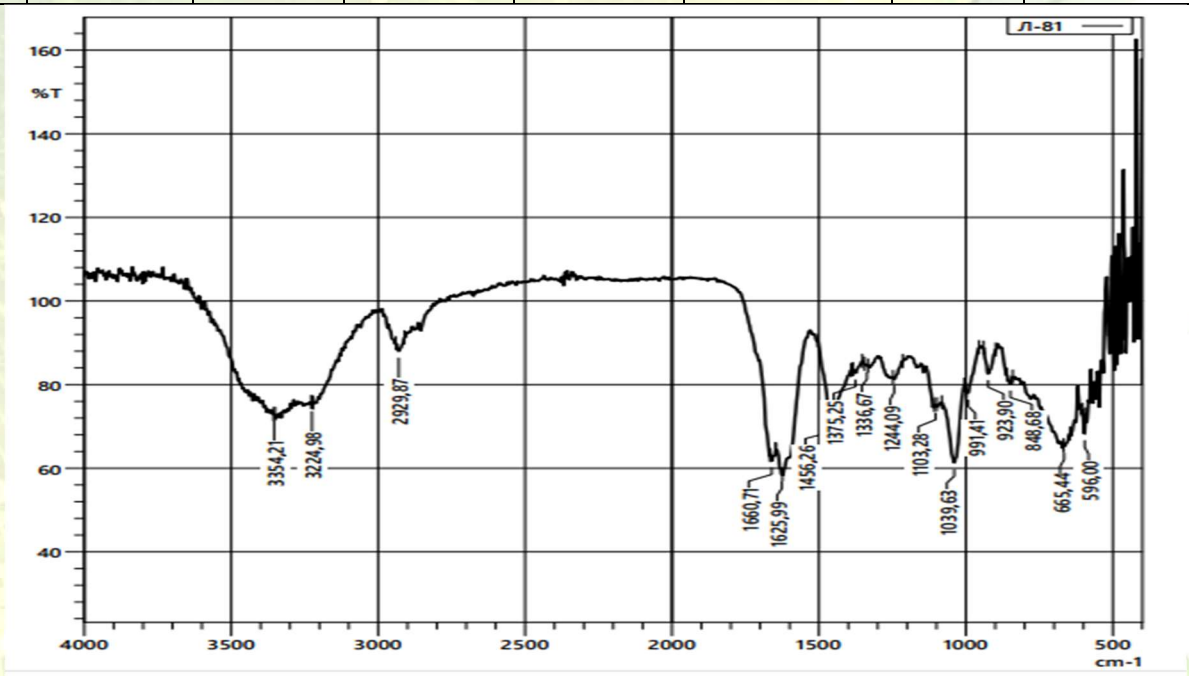
Table 3

Analysis of the results of the TGA and DTA curves of biodegradable coating

№	Temperature °C	Weight loss, mg (6.046 mg)	Weight loss, mg, %	Amount of energy consumed (µV*s/mg)	Time spent (min)	dw (mg)	dw/dt (mg/min)

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1	100	0.456	7.54	-3.26	9.56	5.59	0.047
2	200	1,586	26.23	-12.2	19,8	4.46	0.08
3	300	4,206	69,5	-6.48	29,8	1.84	0,14
4	400	-5,346	88,42	-3.64	40,0	0.171	0,13
5	500	-5,876	-97,18	0.374	50,3	0.172	0,12
6	600	-5,946	-98,34	5.067	60,6	0,100	0,098



2-picture Infrared spectroscopy (IR) of biodegradable coating

Analysis of the IR spectrum of polyvinyl alcohol, urea, and glycerin.

3354.21 cm-1O-H and N-H groups are present, strong hydrogen bonding and interaction of three substances are shown, 2929.82 cm-1C-H stretching vibration indicates the presence of a carbon chain. 1660.7 cm-1 C=O indicates the presence of urea in this line, 1103.28 cm-1 C-O stretching indicates the presence of the substance. 1456.27 cm-1 1373.52 cm-1 there is an NH group, which is for urea and glisthenes - these changes indicate that these substances are interacting. 848.68 cm-1 -O-H and N-H vibrations depharmacy vibrations hydrogen bonding 7665.44 cm-1 and 596.00 cm-1 C-H and C-C vibrations PVS and glycerin.

CONCLUSION. Differential thermal analysis of biodegradable coatings is a method of studying the physical and chemical processes occurring during temperature changes of a substance. The main essence is that the investigated sample and the reference substance are heated under the same conditions. The temperature difference (ΔT) between them is measured. Through this difference, phase or chemical changes in the substance are determined. The purpose of IR spectral analysis is to determine the functional group, which shows the presence of nitrogen, carbon, and OH bonds. From the results of differential thermal analysis,

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we can say that. The obtained biodegradable coating shows activity and a noticeable effect. The biodegradable coating was selected at a temperature of 600°C and studied according to the differential thermogravimetric (DTA) thermogravimetric derivatogram (TGA) and analysis, which presented the results of the coating analysis. At temperatures of 76.43°C and 210.99°C, an exothermic peak was observed, which is hot.

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