**DISPOSITIVO PARA ESTUDO DAS PROPRIEDADES TERMOFÍSICAS DE MATERIAIS
TÊXTEIS DE VOLUME E SUAS EMBALAGENS PELO MÉTODO DE MODO REGULAR
NO AR****A DEVICE FOR STUDYING THE THERMOPHYSICAL PROPERTIES OF BULK TEXTILE
MATERIALS AND THEIR PACKAGES BY THE REGULAR MODE METHOD IN AIR****УСТРОЙСТВО ДЛЯ ИССЛЕДОВАНИЯ ТЕПЛОФИЗИЧЕСКИХ СВОЙСТВ ОБЪЕМНЫХ
ТЕКСТИЛЬНЫХ МАТЕРИАЛОВ И ИХ ПАКЕТОВ МЕТОДОМ РЕГУЛЯРНОГО РЕЖИМА
В ВОЗДУШНОЙ СРЕДЕ**

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RESUMO

Os tecidos têxteis têm diferentes propriedades de transferência de calor, que dependem das condições de consumo do produto e de vários tipos de processamento. Tudo isso é de interesse científico para identificar fatores e propriedades de materiais individuais. O objetivo do estudo foi monitorar a transferência de calor através de embalagens de materiais têxteis multicamada em condições térmicas estacionárias e transitórias. Uma propriedade especial dos materiais têxteis reside na capacidade de se deformar sob o seu próprio peso, de modo que uma amostra possa ser colocada entre as células do material com alta resistência ao calor. A transferência de calor é realizada por convecção de calor entre a superfície do material e o ar. Para o estudo, a lei de Fourier foi usada nos cálculos e métodos numéricos para resolver problemas de condução de calor. O programa desenvolvido, criado para pesquisa, permite gravar parâmetros em um computador e usá-los para calcular as propriedades termofísicas da amostra. Como resultado do trabalho, foram apresentados gráficos do estado de embalagem dos materiais e foi proposto um dispositivo que permite determinar os modos que caracterizam as propriedades termofísicas dos materiais utilizados na fabricação de roupas e suas embalagens. O dispositivo permite com alta precisão registrar, gravar e armazenar alterações nos parâmetros em que os estudos foram realizados.

Palavras-chave: *material têxtil, coeficiente de condutividade térmica, condutividade térmica equivalente, propriedades termofísicas, regime térmico regular.*

ABSTRACT

Textile fabrics have different heat transfer properties, which depend on the conditions of consumption of the product and various types of processing. All this is of scientific interest for identifying factors and features of individual materials. The purpose of the study was to track heat transfer through packages of multilayer textile materials in stationary and transient thermal conditions. A particular property of textile materials lies in their ability to deform under their weight so that a sample can be placed between meshes of a material with high heat resistance. Heat transfer is carried out by convective heat transfer between the surface of the material and the air. To conduct this study, the Fourier law was used in the calculations and numerical methods for solving heat conduction problems. The developed program, which was created for the study, permit to write parameters to a computer and uses them to calculate the thermophysical properties of the sample. As a result of the work, graphs of the state of the package of materials were presented, and a device was proposed that allows to determine the modes that characterize the thermophysical properties of the materials used in the manufacture of clothing and

its packages. The device admits with high accuracy to record, record and store changes in the parameters at which studies were conducted.

Keywords: *textile material, thermal conductivity coefficient, equivalent thermal conductivity, thermophysical properties, regular thermal regime.*

АННОТАЦИЯ

Текстильные ткани имеют разные теплообменные свойства, что зависит от условий потребления продукта и различных видов обработки. Все это представляет научный интерес для выявления факторов и свойств отдельных материалов. Целью исследования было отслеживание теплообмена через пакеты многослойных текстильных материалов в стационарных и переходных тепловых условиях. Особое свойство текстильных материалов заключается в их способности деформироваться под действием собственного веса, так что образец может быть помещен между ячейками материала с высокой термостойкостью. Теплопередача осуществляется путем конвективного теплообмена между поверхностью материала и воздухом. Для проведения исследования использовался закон Фурье в расчетах и численные методы решения задач теплопроводности. Разработанная программа, созданная для исследования, позволяет записывать параметры в компьютер и использовать их для расчета теплофизических свойств образца. В результате работы были представлены графики состояния упаковки материалов и предложено устройство, позволяющее определять режимы, характеризующие теплофизические свойства материалов, используемых при изготовлении одежды и ее упаковок. Устройство допускает с высокой точностью регистрировать, записывать и хранить изменения параметров, при которых проводились исследования.

Ключевые слова: *текстильный материал, коэффициент теплопроводности, эквивалентная теплопроводность, теплофизические свойства, регулярный тепловой режим.*

1. INTRODUCTION:

The features of the thermal processes occurring in textile materials under various processing conditions and consumption conditions are of great theoretical and practical interest, both for choosing the optimal processing conditions and for ensuring thermal comfort during operation. This is due to both the variety of textile materials and the conditions of use of clothes, the processes in which can be complex. The thermophysical properties of clothing play an essential role in ensuring the thermal comfort of the user, and in the effectiveness of protection against exposure to low or high temperatures. The design of heat-protective clothing is a multilayer package of materials, the properties of which are determined by the amount of materials, the order of their location and the properties of each layer (Angelova *et al.*, 2017; Cherunova *et al.*, 2018b; Cilveli *et al.*, 2020; Ivashchenko *et al.*, 2017; Labanieh *et al.*, 2019; Liu *et al.*, 2018).

Numerous works have been devoted to studies of the heat-protective properties of materials, the results of which have been successfully used to study the properties of textile materials and theoretical calculations of the relationship between the properties of individual materials and their packages (Kolesnikov, 1964; Bessonova and Zhikharev, 2007; Tsirkina and Nikiforov, 2016), based on the general theory of

heat transfer (Mikheev and Mikheeva, 1977; Carslaw *et al.* 1959; Xu *et al.* 2019), the development of methods research instruments (Carslaw *et al.* 1959; Clulow and Rees, 1968; Tessier, 2017; Ghang, 2001; Sokolovskaya, 2005) by research automation that allowed experimental studies of materials and multilayer packets under various conditions of thermal processes, including with fixing constant parameters in the automatic mode (Cherunova *et al.*, 2018a; Shaid *et al.*, 2019; Cherunova *et al.*, 2015), using a special dummy recreate human thermal comfort (Hunter and Fan, 2015; Osmanov and Sharpar, 2017; Siddiqui and Sun, 2018; Trofimovich *et al.*, 2018; Venkataraman *et al.*, 2016). To examine the relationship between the thermal insulation properties of the individual materials and multilayer package (Matusiak, 2006; Matusiak and Kowalczyk, 2014; Ronald *et al.*, 1987; Liang *et al.*, 2019; Michalak *et al.*, 2009; Sokolovskaya *et al.*, 2012; Sokolovskii and Shablygin, 2015).

However, the methods have the disadvantage that the thermal process in a textile material is examined in contact with a heater, most often a metal one, and it differs from the specific heat exchange of a person with an external (air) environment through a package of textile clothing materials. Therefore, it is advisable to study and evaluate the specificity of thermal processes in textile materials in various conditions, including the air. In the air, drying processes of textile

materials, and textile products, wet-heat treatment; Thus, during the wet-heat treatment, the processing time is determined by the time of heating the package of processed materials and the time of free cooling in the air. During the operation of clothes, an unsteady mode occurs when a person enters a warm room after a cold or vice versa. The work aimed to study the heat transfer through multilayer packets of textile materials in the air under conditions of stationary and non-stationary thermal conditions. For research, a method was proposed, and a device was developed in which the heat packet of air is affected by a package of materials, the power of which can vary (Bartkowiak and Greszta, 2018; Matusiak and Sybilska, 2016; Neves *et al.*, 2017; Seretis *et al.*, 2018; Wazna *et al.*, 2019).

2. MATERIALS AND METHODS:

The method helps to explore the thermal state of the package of materials at various temperature conditions; determine the equivalent coefficient of thermal conductivity, λ_{eq} of multilayer packets. In the device, heat transfer between the surface of the material and the air is carried out by convective heat transfer, and inside the package between the outer layers by heat conduction. The Fourier law and numerical methods for solving heat conduction problems are used in the calculations (Mikheev and Mikheeva, 1977; Carslaw *et al.* 1959; Cremer *et al.*, 2016). Fourier law under stationary thermal conditions (Equation 1).

Where: λ is the thermal conductivity coefficient $W/(m \times K)$; Q is the heat flux power, W ; F is the heat exchange surface area, m^2 ; τ is the time, s ; Δt is the temperature head, temperature difference: $^{\circ}C$; l is the length, m .

The thermal conductivity coefficient λ , $W/(m \times K)$ is a characteristic of the physical properties of the material, is determined by the formula (Equation 2).

Where δ is the thickness of the test sample, m ; q is the heat flux density from the heater, W/m^2 , ΔT is the temperature difference at the sample boundaries, $^{\circ}C$.

It is believed (Kolesnikov, 1964; Deryabina and Lisienkova, 2016; Deryabina and Lisienkova, 2017) that for multilayer packets, the value of the equivalent coefficient of thermal conductivity depends on the values of thermal conductivity and the thickness of individual layers and can be calculated by the formula (Equation 3).

Where: λ_{eq} is the equivalent thermal

conductivity of the multilayer packet $W/(m \times K)$; Δ is the thickness of the package, m ; δ_i is the thickness of an individual layer, m ; λ_i is the thermal conductivity coefficient of an individual layer, $W/(m \times K)$.

The proposed method was based on the method of heating/cooling the material in the air, which is described in (Mikheev and Mikheeva, 1977; Celcar, 2012; Kim *et al.*, 2016; Lizák and Mojumdar, 2013; Lizák and Mojumdar, 2015). The temperature field of the material is determined by the influence of the environment, the physical properties of the materials, the geometrical shape and dimensions of the system in which the process proceeds, as well as its initial thermal state. We accept the studied material package/sample as a single-layer (homogeneous) flat wall with a thickness of Δ , m with unknown thermal conductivity (Kobakov *et al.*, 2017; Peng *et al.*, 2019; Satomi *et al.*, 2016). Characteristics of the materials included in the studied system (device): δ is the thickness, m ; F area m^2 ; λ is the coefficient of thermal conductivity, $W/(m \times K)$; α is the heat transfer coefficient $W/(m \times K)$. Process parameters: temperature of the outer surfaces of the sample, t_{c1} and t_{c2} , $^{\circ}C$; air temperature near the sample surface t_{i1} and t_{i2} , cooling time (heating) τ , with heat transfer: $^{\circ}C$; heat flux power Q , W . The nature of the temperature change is shown in Figure 1.

Before testing, the sample is maintained under normal conditions for 24 hours. Therefore, the initial test conditions are stationary temperature field, temperature head $\Delta t = 0$. Air temperature $t_{i1} = t_{i2}$. On the sample surfaces $t_{c1} = t_{c2}$; time $\tau = 0$. Testing: a heat flow of air of constant power Q_1 is supplied on one side of the package, which ensures a stationary (regular) heat transfer mode. As a result, the air temperature $t_{i1} > t_{i2}$, $(t_{i1} - t_{i2}) > 0$; temperature on sample surfaces $t_{c1} > t_{c2}$, $(t_{c1} - t_{c2}) > 0$. The flow is supplied until the temperature on the surface of the material reaches a predetermined value $t_{c1} = N$, $^{\circ}C$. After which the flow stops. Then the sample cools down, and the parameters are fixed when the temperature difference on the surfaces of the sample is $\sim 1^{\circ}C$; $t_{c1} - t_{c2} = 1^{\circ}C$ the field is stationary. The air temperature is determined t_{i1} , t_{i2} , time is the τ . If the heat fluxes Q_1 and Q_2 are supplied on both sides of the sample, or if $Q_1 > Q_2$, more complex heat transfer processes can be simulated; a stationary or non-stationary temperature field is reached regular and irregular thermal conditions.

The calculation of indicators is carried out according to generally accepted formulas (Mikheev and Mikheeva, 1977; Firšt Rogale *et al.*, 2018). The calculations take into account the heat

flux passing through the walls of the device. A device for implementing the enclosed method is a housing made of heat-permeable material that allows exchange with the environment; sensors are mounted in the housing that transmit data to a computer. The device diagram is shown in Figure 2a, the sensor connection diagram in Figure 2b. The technical solution of the device is protected by the patent for utility model of the Republic of Uzbekistan No. FAP 00950 (Appendix 1), the software is protected by a patent for a computer program No. DGU 02633 (Appendix 2) (Juraev et al., 2012; Rikhsieva et al., 2012).

The housing (1) is made of organic glass with a thickness of 0.08 m with a heat transfer coefficient of 3.6 W/m²K. Case dimensions 0.3 × 0.4 × 0.5 m³. The body is divided into two compartments (8), (9) with a horizontal partition (3), with an opening in which the sample holder (3) is placed (Fig. 1a). The size of the sample is 0.3×0.3 m². A specific property of textile materials (bags) is the ability to deform under their own weight; therefore, the sample (2) can be placed between the grids (13) of a material with high thermal resistance, the distance between the grids can vary from 0.005 m to 0.025 m. The thickness of the material package was determined in a non-contact manner (Nemirova et al., 2008; Cherunova et al., 2019; Gilewicz et al., 2013).

Air is supplied to the compartment by fans (4) and (5) with an adjustable mode, which allows changing the density of the heat flow. When choosing a device, it should be borne in mind that a household hair dryer allows you to set the nominal temperature of the exhaust air in one of three modes: weak 40°C, moderate 55°C, strong 70°C, the nominal capacity is adjustable and leaves from 3×10⁻³ m³/s, up to 16×10⁻³ m³/s, depending on the type of hairdryer. To obtain a higher temperature, building hair dryers should be used. For their fastening in the case above and below there are holes in the form of a truncated cone with a curvilinear generatrix: through the upper hole (6) cold air is supplied from the hairdryer in cooling mode, and a heated air stream (from the hairdryer during heating mode is supplied through the lower hole (7)). The power consumption of hairdryers is measured using electronic power meters (11) and (12). The temperature on the surface of the sample is recorded by contact temperature sensors, thermocouples (10), (15). The air temperature in the compartments is recorded by thermometers. Air supply stops when the temperature, or temperature difference, reaches a certain value — temperature measurement range from 40

to +126°C.

A specially developed program writes parameters to a computer, for which the device is connected via USB to a computer and the USBTermo program opens. By the “measure” command, the measured parameters are shown on the monitor: time, heat flow, air temperature, temperature and temperature difference of the sample surfaces. The results are stored and used to calculate the thermophysical properties of materials. According to the results in Excel, a graph of the thermal state of the test sample can be built (Appendix 1, 2).

3. RESULTS AND DISCUSSION:

Experimental studies on the proposed installation were carried out in the testing laboratory of SentexUz, Republic of Uzbekistan. In this study, hairdryers with a maximum power of 1800 watts were used. with an electronic temperature regulator with an interval of 10°C. Tests were carried out under the following modes of nominal productivity: 3×10⁻³ m³/s, 8×10⁻³ m³/s. Test samples of textile bags included cotton gabardine, cotton wool and cotton lining twill (Table 1).

To reproduce standardized conditions, the flow of heated air into the compartments was stopped when the surface temperature on the “hot” side of the sample was 50°C. Measurements were continued until the temperature difference on the sample surfaces became less than 1.0°C. To assess the accuracy and reproducibility of the results obtained on this device, tested a sample of a package of materials, the results of which are shown in Table 1.

According to the results of statistical data processing, it was found that the relative measurement error is from 4% to 10%. Therefore, the developed device allows the study of the thermophysical properties of materials for clothing and their packages, providing the required accuracy (up to 10%), adopted in studies in the light industry. The error is lower when testing in 2 modes. Table 2 shows the data characterizing the thermal state of the package of materials and the values of the equivalent coefficient of thermal conductivity under various heating conditions under given conditions: heating the surface of the sample in air to 50°C.

A graph of changes in the thermal state of a package of materials during heating and cooling in air is shown in Figure 3.

The obtained experimental data show that

with an increase in the heating power in air, the time for establishing thermal equilibrium in the sample is reduced, which can be taken into account when choosing the parameters of heat treatment of materials and products. The results show that the proposed device allows you to set the modes and measure the parameters characterizing the thermophysical properties of materials and clothing packages, provides high measurement accuracy, reproducibility of the results, as well as the preservation of the results of each experiment.

4. CONCLUSIONS:

As a result of the study, it was found that the developed device facilitates the study of thermophysical properties of materials for clothing and their packaging, providing the necessary accuracy (up to 10%), which was adopted in light industry research. Using the program developed for the study, it is possible to write parameters to a computer and calculate the thermophysical properties of the sample. The method that we used in the research process allowed us to analyze the thermal conditions of the package of materials at different temperatures, as well as to calculate the equivalent thermal conductivity of multilayer packages. The device provides high-precision recording and storage of the results of temperature changes in the sample. The results obtained help to formulate and solve the problems of choosing materials in packages, taking into account thermal conditions.

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$$\lambda = -\frac{[\overline{q}]}{\text{grad } T} = \frac{Q}{F\tau\Delta t/l}, \quad (\text{Eq. 1})$$

$$\lambda = \frac{q \cdot \delta}{\Delta T}, \quad (\text{Eq. 2})$$

$$\lambda_{eq} = \frac{\Delta}{\frac{\delta_1}{\lambda_1} + \frac{\delta_2}{\lambda_2} + \frac{\delta_3}{\lambda_3}} = \frac{\delta_1 + \delta_2 + \delta_3}{\frac{\delta_1}{\lambda_1} + \frac{\delta_2}{\lambda_2} + \frac{\delta_3}{\lambda_3}} \quad (\text{Eq. 3})$$

Figure 1. Non-stationary thermal conductivity: nature of temperature change (Mikheev and Mikheeva, 1977)

Table 1. The measurement results of the test parameters of the package of materials

Options	Mode 1. Nominal productivity: $3 \times 10^{-3} \text{ m}^3/\text{s}$														
	Temperature measurement time τ_s , test, No.														
	1			2			3			4			5		
	5	884	1208	5	986	1164	5	832	1432	5	864	1344	5	904	1241
The surface temperature of the upper sample $t_{s1}, ^\circ\text{C}$;	24.3	42.4	31.75	24.43	40.31	32.81	24.3	41.56	35.87	24	42.18	34.56	24	42.48	31.19
lower $t_{s2}, ^\circ\text{C}$	24.4	50	32.68	25.01	50	33.7	24.28	50	36.81	24	50	35.5	24	50	33.16
Temperature drop $\Delta T, ^\circ\text{C}$		7.6	0.93		9.69	0.89		8.44	0.94		7.82	0.94		7.52	0.97
Equivalent thermal conductivity coefficient $\lambda_{eq}, \text{W}/(\text{m} \times \text{K})$	0.05														
Options	Mode 2. Nominal productivity: $8 \times 10^{-3} \text{ m}^3/\text{s}$														
	Temperature measurement time τ_s , test, No.														
	6			7			8			9			10		
	5	369	506	5	404	553	5	327	567	5	380	546	5	399	531
The surface temperature of the upper sample $t_{s1}, ^\circ\text{C}$;	24.2	41.5	36.0	24.43	42.37	34.56	24.13	41.97	33.5	24	42	34.12	24	42.37	34.68
lower $t_{s2}, ^\circ\text{C}$	24.4	50	36.93	25.01	50	35.5	24.9	50.06	34.43	23	50	35.06	24	50.0	35.62
Temperature drop $\Delta T, ^\circ\text{C}$		8.5	0.93		7.63	0.94		8.09	0.93		8	0.94		7.63	0.94
Equivalent thermal conductivity coefficient $\lambda_{eq}, \text{W}/(\text{m} \times \text{K})$	0.045														

Table 2. The measurement results of test parameters of samples of packages of materials

Options	Mode 1. Nominal productivity: 3×10 ⁻³ m ³ /s											
	Temperature measurement time τ, c											
	Sample 1			Sample 2			Sample 3			Sample 4		
	5	89 4	1278	5	1687	3522	5	1921	3046	5	698	1129
The surface temperature of the upper sample t _{s1} ,°C;	24. 2	41. 8	33.2	24. 1	44.1	32.5	24.3	44.7	30.8	2 4	36.9 3	30.9 3
lower t _s ’2, °C	24. 3	50	34.2	23. 9	50	33.4	24.2 8	50	31.7	2 4	50	31.8 7
Temperature drop ΔT,°C		8.2	1.0		5.9	0.9		5.3	0.9		13.0 7	0.94
Equivalent thermal conductivity coefficient λ _{eq} , W/(m×K)	0.036			0.0152			0.143			0.035		
Options	Mode 2. Nominal productivity: 8×10 ⁻³ m ³ /s											
	Temperature measurement time τ, c											
	Sample 1			Sample 2			Sample 3			Sample 4		
	5	37 6	640	5	696	1842	5	864	1344	5	373	579
The surface temperature of the upper sample t _{s1} ,°C;	23. 8	42. 1	34.6	25	39.1 8	29.6 8	24.3	42.3 7	35.8 7	2 4	42.1 8	34.5 6
lower t _s ’2, °C	24. 1	50	35.5 3	25	50	30.6 2	24.2 8	50	36.8 1	2 4	50	35.5
Temperature drop ΔT,°C		7.9	0.93		10.2	0.9		7.62	0.9		7.82	0.94
Equivalent thermal conductivity coefficient λ _{eq} , W/(m×K)	0.05			0.01			0.04			0.02		

APPENDIX

O'ZBEKISTON RESPUBLIKASI INTEKTTUEL MULK AGENTLIGI АГЕНТСТВО ПО ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ РЕСПУБЛИКИ УЗБЕКИСТАН

**Foydali Modelga Patent
ПАТЕНТ НА ПОЛЕЗНУЮ МОДЕЛЬ**

№ FAP 00950

Ushbu patent O'zbekiston Respublikasining
"Patent" foydali model va sanoat nomlari qo'shida"
Qonuniga asosan taydarli foydali
modelga berildi.

Nastoiyati patent ushbu asosida berildi.
Nastoiyati patent "O'zbekiston Respublikasining
qonunlarida ko'rsatilgan va qonunlarida ko'rsatilgan
usullar, usullar va usullar" asosida berildi.

**Деформацияланган материалларнинг исхилки уткузувчиларини аниқлаш учун қурилган
Устройство для определения теплопроводности деформированных материалов**

Telefona kelib tushgan sana:
Дата поступления заявки:

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Patent egali (egali):
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Patent O'zbekiston Respublikasining markazi hududida 06.10.2012 yilgi
patent qonuniga asosan berildi. Ushbu patent "O'zbekiston Respublikasining
qonunlarida ko'rsatilgan va qonunlarida ko'rsatilgan usullar, usullar va usullar"
asosida berildi. O'zbekiston Respublikasining foydali model va sanoat nomlari qo'shida
12.06.2014 yilda tasvirlanishiga asoslangan o'zbekiston.

Patent davlat tomonidan barcha tomonlari Respublika Uzboekiston
12.06.2014 yilgi qonuniga asosan berildi. Ushbu patent "O'zbekiston Respublikasining
qonunlarida ko'rsatilgan va qonunlarida ko'rsatilgan usullar, usullar va usullar"
asosida berildi. O'zbekiston Respublikasining foydali model va sanoat nomlari qo'shida
12.06.2014 yilda tasvirlanishiga asoslangan o'zbekiston.

**Bosh direktor v.b.
И.о. Генерального директора**

3. Янв. 2013

Appendix 1. Documents on copyright protection of intellectual activity for a utility model; b) for software

**O'ZBEKISTON RESPUBLIKASI INTEKKTUAL MULK AGENTLIGI
АГЕНТСТВО ПО ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ
РЕСПУБЛИКИ УЗБЕКИСТАН**

**ELEKTRON HISOBILASH MASHINALARI UCHUN YARATILGAN DASTURNING
RASMIY RO'YXATDAN O'TKAZILGANLIGI TO'G'IRISIDAGI GUVONNOMA
СВИДЕТЕЛЬСТВО ОБ ОФИЦИАЛЬНОЙ РЕГИСТРАЦИИ ПРОГРАММЫ ДЛЯ
ЭЛЕКТРОННО-ВЫЧИСЛИТЕЛЬНЫХ МАШИН**

№ DGU 02633

<p>Ushbu guvonnoma O'zbekiston Respublikasining Elektron hisoblash mashinalari uchun yaratilgan dasturlar va ma'lumotlar bazalarining "Rasmiy ro'yxatdan o'tkazilgan" shartlari asosida berilgan. Эта программа выдана на основании Закона Республики Узбекистан «О правовой оценке программ для электронно- вычислительных машин и баз данных» в соответствии с программой для ЭВМ</p> <p>Деформированный текст материала за компьютерные программы, анализ этих данных возможен</p> <p>Программное обеспечение для определения температуры деформированных текстильных материалов в пачках</p>	<p>Настоящее свидетельство выдано на основании Закона Республики Узбекистан «О правовой оценке программ для электронно- вычислительных машин и баз данных» в соответствии с программой для ЭВМ</p>
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Tasvirlama kabi topilgan sana: Дата поступления заявки:	11.10.2012	Tasvirlama tashkil: Номер заявки:	DGU 2012 0198
Huquq xarakterini: Правовый характер:	Tasvirlama xarakterini va o'zini o'zining instituti, UZ Ташкилнинг институти текширилди ва о'zini o'zining instituti, UZ		
Dastur muallifi: Автор(и) програми:	Raximova Barinon Abdurajova, Musayonov Azamat Akhmedjonov, Tashpulatov Salim Shukurjon, Durratov Akbar Durratjon, Artybekov Nasim Muxomedjonov, Musayonov Yuldas Abdurajonov, UZ		

O'zbekiston Respublikasi elektron hisoblash mashinalari uchun
dasturlar bazasi ma'lumi 18.11.2012 yilga Tashkent shahrida
uzatilib o'tkazilgan.

Berilganliklari va tasdiqlanishlari dastur programi uchun
elektron hisoblash mashinalari Respublika hokimiyati va
Tashkent 18.11.2012 y.

**Bosh direktor v.b.
И.О. Генерального директора**

З. Ганиев

Appendix 2. Documents on copyright protection of intellectual activity for software