STUDY OF COMPOSITION AND CRITICAL PARAMETERS OF DUST FROM LOCAL COTTON INDUSTRY.

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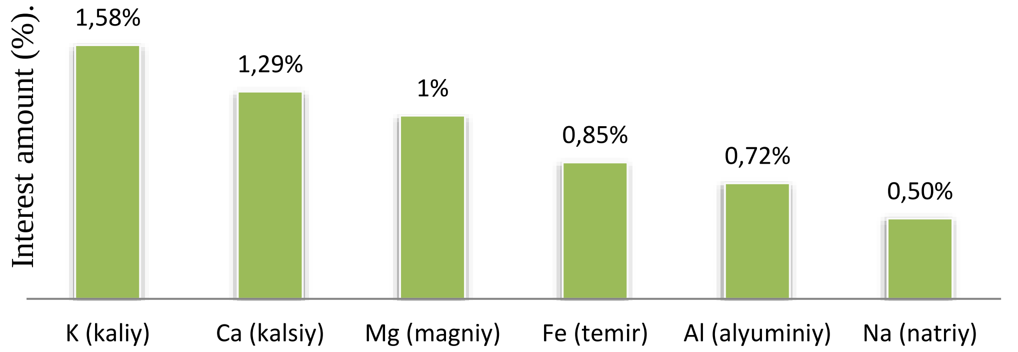
Key words:
Fibrous dust; dustiness; quantitative percentage of elements in dust; dust settling rate; deposition parameters; pieces of fibrous dust; free dust deposition time; dust settling time under pressure; dust loads; equivalent dust diameter; density of fibrous dust.

Abstract:
In the course of this study, the chemical composition of fibrous dust samples and the quantitative ratios of chemical elements in it were studied.
Also, the main parameters of the investigated fibrous dust samples were determined: length, weight, equivalent diameter of dust samples and the rate of their free (or under pressure) deposition. In this case, the dependence of the rate of settling of fibrous dust on the density of the sample was considered using the example of a local cotton gin.

Introduction.
At present, the bulk of fibrous dusts formed during cotton processing are inorganic and mineral compounds [1]. The quality index of cotton depends on several factors [2; 3]. Among them are the pre-treatment of raw cotton [4], soil particles in the feedstock and methods of its collection [5; 6].
At the same time, the amount of chemicals in fibrous dust is directly related to the stages of the technological process [7]. Fibrous dust leaving the machines for transporting and cleaning raw cotton at the beginning of the process contains up to 10-20% organic matter by weight [8; 9] and contains up to 80-90% of inorganic particles [10]. The elimination of these dusts is one of the urgent tasks.
Method and materials. For research, the composition of fibrous dust based on raw cotton was studied based on spectral analysis [11]. On the basis of experiments, the rate of free and pressure dust settling [12], specific gravity [13], equivalent diameter and density [14; fifteen].
Discussion of the results and their analysis. At the beginning of this research work, using special spectral analysis, the composition of fibrous dust emitted at a cotton gin in the Fergana region was studied. The results obtained are presented in the graph below (Fig. 1).

Figure 1.

The amount of chemical elements in fibrous dust.

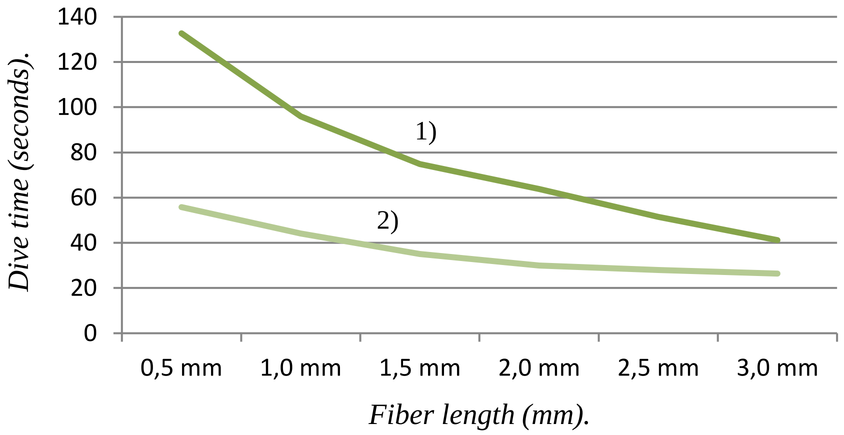


From the analysis of the graph above, it can be seen that the fibrous dust contains a large amount of chemical elements. The highest quantitative indicator in the obtained samples belongs to the element potassium (1.58%). The next are calcium (1.35%), magnesium (1.14%), iron (0.85%), sodium (0.5%). In addition, it was found that this fibrous powder contains a small amount of: titanium, manganese, aluminum, iron, chromium, phosphorus, chlorine and other chemical elements.

In the course of our research, the parameters of free and pressured settling of these fibrous powders were studied. In this case, the dependence of the length of the fibrous powder on the deposition rate was considered (Fig. 2).

Figure 2.

Fiber Powder Length depending on drop off time.



1) Free dive time
2) Settling time under pressure

Analyzing the data of graph 2, it can be seen that the settling rate of fibrous dust particles taken as a sample is proportional to their size and the pressure applied to it. That is, by exerting pressure on a fibrous dust particle of the same length, it reduces the drying time by half.

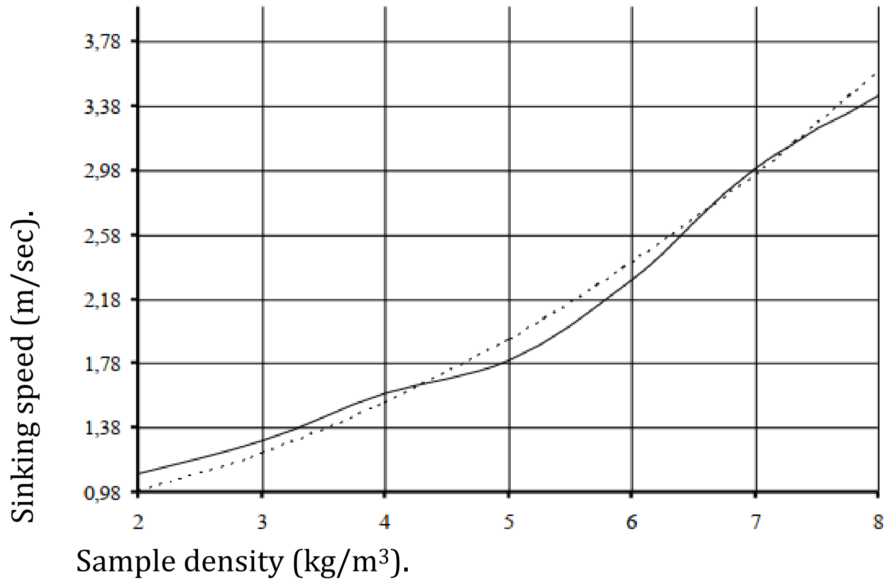
In addition, the weight and equivalent diameters of the above fiber dust samples are given in the following table (Table 3).

Table 3
Basic measurement parameters for fibrous dust samples.

Sample size (mm).	Sample weight (kg).	Equivalent diameter of samples (m).
0,5 mm	$0{,}4 \cdot 10^{-6}$	$0{,}9 \cdot 10^{-3}$
1,0 mm	$0{,}8 \cdot 10^{-6}$	$1{,}19 \cdot 10^{-3}$
1,5 mm	$1{,}1 \cdot 10^{-6}$	$1{,}32 \cdot 10^{-3}$
2,0 mm	$2{,}9 \cdot 10^{-6}$	$1{,}87 \cdot 10^{-3}$
2,5 mm	$4{,}5 \cdot 10^{-6}$	$2{,}2 \cdot 10^{-3}$
3,0 mm	$6{,}8 \cdot 10^{-6}$	$2{,}6 \cdot 10^{-3}$

and it can be seen that it depends on the equivalent diameter.
In addition, it has been established through research that the relationship between the settling rate of fibrous dust samples and their density for the study area is non-linear. Based on this, we got the opportunity to use the theory of correlation and the method of non-linear regression as the mathematical apparatus of the process.
As a result, indicators were obtained related to the change in the studied sedimentation rate. As a result, a specific mathematical model was developed that reflects the relationship between the studied indicators. The graph below shows the rate of sedimentation, obtained from the non-linear regression equation, as a function of their density. (Figure 4).

Figure 4
Settling rate of fibrous dust, sample density dependence.



The experimental points presented in the image above (Fig. 4) are obtained based on Equation 5:

$$\omega_ч = 0{,}7593 + 0{,}0312 \cdot \rho_H + 0{,}0403 \cdot \rho_H^2,$$

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Accordingly, the established value of the correlation coefficient in this equation (r = 0.976) also indicates the presence of a clear correspondence between the studied factors.
That is, with an increase in the density of the studied samples of fibrous dust from 2 to 8 kg/m3, it is reasonable to assume that the dust settling rate increases to 3.6 m/s.
Conclusions. In these studies, based on the chemical composition of local dust from cotton production, various factors affecting particle size and efficiency were investigated based on experience. In the fibrous particles under study, the aerodynamic effects of the deposition process and optimal conditions are determined.

References:

1. Арисланов, А. С., Шамшидинов, И. Т., Мамаджонов, З. Н., & Мухиддинов, Д. Х. (2020). СПОСОБ ПОЛУЧЕНИЕ СУЛЬФАТА АЛЮМИНИЯ ИЗ МЕСТНЫХ АЛЮМОСИЛИКАТОВ. In ИННОВАЦИОННЫЕ ИССЛЕДОВАНИЯ: ТЕОРЕТИЧЕСКИЕ ОСНОВЫ И ПРАКТИЧЕСКОЕ ПРИМЕНЕНИЕ (pp. 12-14).
2. Соддиков, Ф. Б., Зулярова, Н. Ш., & Мирзакулов, Х. Ч. (2016). Исследования по получению рассолов для производства кальцинированной соды из галитовых отходов калийного производства. Universum: технические науки, (9 (30)), 41-45.
3. Usmonova, Z., Boyturaev, S., Soadatov, A., G’oyipov, A., & Dehkanov, Z. (2018). PROCESSING OF CALCIUM NITRATE GRANULATED CALCIUM SALTPETER. Scientific-technical journal, 1(2), 98-105.
4. Жураев, М. У., Каримов, А. М., & Ботиров, Э. Х. (2022). Scutellaria adenostegia Briq ўсимлиги таркибидаги апигенин (5, 7, 4'тригидроксифлавон) ни ажратиб олиш ва тахлил қилиш. Ta’lim fidoyilari, 22(7), 178-179.
5. Гайипов, А. Р., Нормурадов, И. У., & Таджиходжаева, У. Б. (2020). ИЗУЧЕНИЕ ВЛИЯНИЕ СОСТАВА ФЕНОЛА СПИРТА НА ПРОЦЕСС ВШИВАНИЕ МОДИФИЦИРОВАННЫХ ФЕНОЛ-ФОРМАЛЬДЕГИНЫХ ОЛИГОМЕРОВ. Экономика и социум, (12-1), 457-461.
6. Соддиков, Ф. Б., Усманов, И. И., & Мирзакулов, Х. Ч. (2017). Исследование процессов получения и очистки насыщенных растворов из сильвинитов Тюбегатанского месторождения. Химия и химическая технология, (2), 16-20.
7. Qodirova, G. (2019). ШЎРСУВ ДОЛОМИТЛАРИ АСОСИДА КАЛЬЦИЙ ВА МАГНИЙ ФОСФАТЛИ ЎҒИТЛАР ОЛИШ. Scientific and technical journal of NamIET.
8. Нормурадов, И. У., Сабирова, Р. Г. К., & Гойипов, А. Р. У. (2021). ИССЛЕДОВАНИЕ ТЕПЛОВЫХ СВОЙСТВ МОДИФИЦИРОВАННЫХ ФЕНОЛФОРМАЛЬДЕГИДНЫХ ОЛИГОМЕРОВ. Universum: технические науки, (6-3 (87)), 65-69.
9. Shermatov, A., & Maulyanov, S. (2022). ЎСИМЛИК ТАРКИБИДАН КОЛХИЦИН ВА КОЛХАМИН АЛКАЛОИДЛАРИНИ АЖРАТИБ ОЛИШ КИНЕТИКАСИ. Science and innovation, 1(A5), 431-436.
10. Abdullayev, M. T., Xayitov, B. A., Tavakkalova, D., & Xakimova, X. (2021). WATER BASED DISINFECTION OF BIOFACTORY ROOMS IN ELECTROCHEMICALLY ACTIVATED ACIDIC ENVIRONMENT (pH= 3-4). Экономика и социум, (6-1), 10-14.
11. Qodirova, G. (2017). КАЛЬЦИЙ ВА МАГНИЙ ФОСФАТЛИ ЎҒИТЛАР ОЛИШДА МАҲАЛЛИЙ ДОЛОМИТ ХОМАШЁСИДАН ФОЙДАЛАНИШ. Scienceweb academic papers collection.

12. Ergashev, S., G'oyipov, A., & Alimuxamedov, M. (2022). KOMPOZITSION FENOL-FORMALDEGID OLIGOMERLARINING TARKIBINI NEFELOMETRIK USULDA O 'RGANISH. Science and innovation, 1(A5), 424-430.
13. Соддиков, Ф. Б., Мавлянова, М. Н., & Мирзакулов, Х. Ч. (2018). Исследование процесса конверсии насыщенных растворов хлорида натрия углеаммонийными солями. Universum: технические науки, (7 (52)), 47-53.
14. G'oyipov, A. (2022). TERMOPLASTIK POLIEFIRLAR ISHRIROKIDA MODIFIKATSIYALASHNING AFZALLIKLARI. Eurasian Journal of Academic Research, 2(7), 191-197.
15. Мирзаев А. Н., Рахмонов Д., Буриева З. Р. Влияния Режимных Параметров На Степень Очистки В Двухступенчатом Аппарате //CENTRAL ASIAN JOURNAL OF THEORETICAL & APPLIED SCIENCES. – 2022. – Т. 3. – №. 5. – С. 10-14.
16. Azizbek, G., & Muzaffar, D. (2022). PRODUCTION OF POLYESTER BASED ON ADIPIC ACID AND DETERMINATION OF OPTIMAL COMPONENT RATIO OF COMPONENTS. Universum: технические науки, (7-4 (100)), 43-46.
17. Мамаджанов, З. Н., Абдуназаров, Ф. А., & Рустамов, И. Т. (2022). ЦЕНТРОБЕЖНАЯ МЕЛЬНИЦА С КЛАССИФИКАТОРОМ СЛОИСТОГО ПОТОКА ДЛЯ ИСПОЛЬЗОВАНИЯ В ПРОИЗВОДСТВЕ ПОРОШКОВОГО НЕФТЯНОГО КОКСА В УЗБЕКИСТАНЕ. Universum: технические науки, (3-5 (96)), 23-28.
18. Абдуллаев, М. Т., Хайитов, Б. А., & Рахимов, У. Ю. (2018). The use of electrochemical activated water in order to increase the efficiency of breeding larvae of grain moth in bio-factory. Молодой ученый, (6), 86-88.
19. Атаханов, Ш. Н., Дадамирзаев, М. Х., Акрамбоев, Р. А., & Нишанов, У. Р. (2019). Разработка технологии полуфабрикатов овощных и фруктовых соусов-паст для предприятий общественного питания. Universum: технические науки, (6 (63)), 67-70.
20. СОДДИКОВ, Ф. Б., Усманов, И. И., Набиев, А. А., Мирзакулов, Х. Ч., & Меликулова, Г. Э. (2016). Исследование процесса получения насыщенных растворов из низкосортных сильвинитов Тюбегатана. Химия и химическая технология, (3), 67-73.
21. Нормурадов И. У., Сабирова Р. Г. К., Гойипов А. Р. У. ИССЛЕДОВАНИЕ ТЕПЛОВЫХ СВОЙСТВ МОДИФИЦИРОВАННЫХ ФЕНОЛФОРМАЛЬДЕГИДНЫХ ОЛИГОМЕРОВ //Universum: технические науки. – 2021. – №. 6-3 (87). – С. 65-69.