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DETERMINATION OF THE TOXICITY INDEX OF GASES AND PRODUCTS INTENDED FOR SPECIAL CLOTHING

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Abstract: The article provides information on determining the toxicity indicators of textile materials - fabrics and products intended for special clothing, using the AT-05 analyzer, comparing the obtained results with the standards and calculating the reliability of the difference in sample mean values
Keywords: textile materials, toxicity indicators, special clothing, AT-05 analyzer, fabric testing, standard comparison, sample mean values, reliability analysis

When our President declared 2025 as the “Year of Environmental Protection and “Green” Economy” in our country at the next session of the Legislative Chamber of the Oliy Majlis, it was another practical expression of the high attention paid to preserving mother nature and ensuring ecological stability in New Uzbekistan. In fact, the beautiful nature, clean air, clear and healing waters of our country have fascinated humanity for centuries. However, the development of industry, increased demand for energy resources, and a change in attitude towards nature have led to problems such as climate change, environmental pollution, and water shortage [1]. In particular, it has been noted that air and water pollution, soil erosion, desertification, and the indiscriminate use of fossil fuels lead to global warming, an increase in natural disasters, and harm the environment and public health [2]. To find a solution to these issues, the implementation of the nationwide project "Green Space" has revived one of the ancient values of our people - planting saplings on vacant lots and creating gardens. It has strengthened the sense of connection with Mother Nature.

It is known that textile materials undergo dyeing and finishing stages, as a result of which toxic substances may remain in the fabrics, data on the toxicity of some dyes have been confirmed by research and recommendations for toxicological control have been given [3].

In world practice, several thousand individual dyes and several hundred textile chemical auxiliaries are used in the finishing of textile products, including alkalis, acids, salts, oxidizing agents, organic solvents, reducing agents, organic and inorganic substances, low and high molecular weight compounds. It follows that they represent a set of chemical compounds belonging to different hazard classes and, accordingly, can be a source of harmful effects on the human body, as a result of which the human body is observed to manifest itself in the form of redness, skin damage, suffocation, weakness, dizziness, memory loss, nausea [4].

The issue of the safety of textile materials for special clothing remains relevant today, since such clothing is made of materials from chemical fibers and yarns, as well as textile auxiliaries, which are treated with various chemicals to give the products fire-resistant, oil-repellent, waterproof, flame-retardant, anti-electrostatic and other properties [5]. In order to prevent the negative impact on human health of factors associated with the use of textile materials for special clothing that pose a health hazard, sanitary and epidemiological expertise, namely the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On approval of the General Technical Regulations on the Safety of Light Industry Products” dated May 11, 2016 No. 148, was introduced. It includes conducting tests aimed at confirming the compliance of products with current regulatory and methodological documents [6].

pISSN:2349-5707 Volume:12,Issue 10,October-2025 eISSN:2349-5715

As a result of research [7], it was noted that in order to ensure the safety of textile materials in terms of toxicity, the content of synthetic fibers should be minimal.

The toxicity index of textile materials is determined according to the GOST 32075-2013 standard [8]. This standard establishes methods for studying the toxicity indices of textile materials and finished clothing. According to the established standard, a point sample is taken from textile materials, pieces of fabric 10 cm long and a working sample 10x10 cm in size from finished clothes. If it is not possible to cut out samples from finished clothes, an elementary sample with a mass of 1.0±0.01 g is prepared. The experiments are performed on an AT-05 [9] type analyzer.

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The AT-05 type analyzer is designed to create digital images of the objects under study, to highlight the necessary objects in digital images and measure their linear dimensions for implementing toxicity assessment methods.
The use of the analyzer determines the toxicity level of solutions and extracts in textile materials by assessing the effect of a suspension of bull spermatozoa on the mobility. The device operates in laboratory rooms with artificial conditions of air temperature from +15 to +350C and relative humidity of 80%. The test process, processing of experimental results, calculation of the toxicity index, coefficient of variation and all indicators of the experiment are carried out automatically.
In order to determine and assess the toxicity level of textile and light industry products as harmful substances listed above, experiments were conducted in 2025 to determine and analyze the toxicity level of textile materials and items intended for special workers produced in Uzbekistan.
Samples for the study were taken from special clothing manufactured at the enterprise “NIHOL XAMKOR BREND” LLC. The tests were conducted at the SLM “Light Industry Chemical Biological Safety Laboratory” under the State Enterprise “Uzbek Scientific Testing and Quality Control Center”, the results are presented in Table 1.
Analysis of the characteristics of the selected samples and the results of the test indicators is presented in Table 1.

1-Table

Requirements for special and work clothing according to regulatory documents

T.r	Name (parameters) of the specified properties	Regulatory documents defining product requirements	Determination of regulatory documents for test methods	Actual test value	Additions, deviations or exceptions to the method
1.	Appearance of the subgroup	GOST 12.4.280-2014,	Orgonoleptic	Special clothing for protection against general industrial pollutants	
2.	Size of the items	Section 4	GOST 4103-82		N/A
3.	(according to the marking)	GOST 12.4.280-2014,	GOST 4103-82	According to the industry of sewing materials, skeins and seams	
4.	Classification and	Section 5.1.4	GOST 3813-	311.7N	N/A

pISSN:2349-5707 Volume:12,Issue 10,October-2025 eISSN:2349-5715

	types of seams, seams and seams must comply with the requirements		72		
5.	Tearing strength of sewing threads, N, not less than 250	GOST 12.4.280-2014,	GOST 3811		
6.	Surface density, g/m2, not more than 350	Section 5.3.9	GOST ISO 1833-1-2022	275.4 g/m2	N/A
7.	Gas composition, %	GOST 12.4.280-2014,	GOST ISO 1833-11-2022		
8.	Tearing strength of gauze strips, N,	Section 5.3.10	GOST	Polyester-100%	N/A
9.	Tand-490 N	GOST 12.4.280-2014,	GOST 3813-72		
10.	Silky-not less than 255N	Section 5.4.2.1,	GOST ISO 9237-2013	Tanda-558.2 N	N/A
11.	Air permeability, dm3/m2c,	Table 3	GOST 18976-73	Arqoq-331.9N	
12.	not less than 20	OTR No. 148 Section 28	GOST ISO 105-C10-2014		

The evaluation of the experimental results was carried out on the basis of the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated May 11, 2016 No. 148 “On approval of the General Technical Regulations on the Safety of Light Industry Products”.

It can be noted that the actual test values of the characteristics of small groups and the regulatory requirements established for them, test methods, and the presence of deviations and results in the samples from 70% to 120% of the toxic elements are at the required level, and that there are deviations and results.

In conclusion, it is recommended to use the theory and principles of qualimetric assessment when making decisions on the accuracy levels of the tested samples.

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