

«МАТЕРІАЛОЗНАВСТВО, ПОЛІМЕРНІ, КОМПОЗИЦІЙНІ МАТЕРІАЛИ ТА ХІМІЧНІ ВОЛОКНА»

ELABORATION OF TEXTILE MATERIAL FOR RESPIRATORY PROTECTION

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ABSTRACT

Abstract: As a result, the analysis of security of the organism against negative environmental influences was pointed scientific objectives and chosen object to study. The article provides an analysis of the impact of the environment on the human respiratory system and the body as a whole. This led to the classification and range of protective equipment, made recommendations to the use of respiratory protection from the negative effects of the environment, depending on the operating conditions. The paper presents examples of masks that we developed for further research and introducing them into operation.

Set targets and identify areas for further study and design of individual means of protection from the effects of the environment. Were held analysis and classification of adaptability of respiratory masks as individual respiratory protection, depending on their specific application. Actual ecological situation related with air pollution and industrial waste of water causes the necessity to develop new technologies, the use of cheap filter elements that allow multiple regeneration.

Key words: filter materials, structure, knitwear, ecology, protection.

1. INTRODUCTION

In a wholerange of textile manufacture, textiles for protection of human respiratory stand on special place. Today air pollution by industrial and automobile exhaust fumes causing irreparable damage to the human respiratory organs. Even difficult to say who suffers most, residents of cities, cyclists, traffic police, or people whose work is directly related to the constant movement of the city.

Nowadays the production of textiles for respiratory functions is quite profitable area in which there is a possibility of increasing the volume by replenishing therange of new types of products. Due to its properties that distinguish jersey from other textile materials, it is used in the production of various fabrics: technical (air filters, barriers, reinforcing fiberglass in the automotive, aviation and agriculture branches), medical (sanitary ware clothing for patients with special properties, compression preventive products - tights, stockings, socks, bandages, bandages and belts that have varying degrees of pressure, sanitary napkins, clothing for medical personnel, materials and products for common-medicine: gauze - hemostatic, multilayer, gypsum and simple, dressings, materials for compression of medical action, therapeutic lingerie and underwear to prevent occupational diseases, surgical materials: suture materials; implants - dentures various vessels, meninges, larynx, ear shells, abdominal membranes, artificial tendons etc.; other materials for cardiac surgery, fixing materials, filter materials).

Knitted cloth is more widely used for sewing for sports, tourism and active recreation. The peculiarity of these products is that they are directly adjacent to the body.

Nowadays, thanks to the emergence of new non-traditional commodities, there is a tendency to look for opportunities knitting equipment in the production of technical and medical knitted fabric.

The special attention of scientists to studying the influence of the environment on human respiratory organs, led to the realization of their exposure to modern types of diseases. Insufficient range of respirators and amount of information about ways of respiratory protection results the multiple respiratory diseases of human. Improving the quality and expanding the range of consumer goods - one of the main tasks of the economy of any country. In a market economy, quality products largely determine its competitiveness. The range and quality of textile products, is inextricably linked with the material and cultural standard of living.

Today the consumer does not have enough choice of respiratory protection, although the demand for this product is growing every day. Consumer quality of human respiratory protection greatly depends on the material and technology of their production.

Creating a filter material that combines high performance with high holding ability is the most important task at present, which contributes to the successful solution as the right choice of designs filter system, filtration process conditions and by the choice of filter material. Depending on the purpose and size of the input and output concentrations filters conventionally divided into three classes: fine filters, air filters, industrial filters.

To ensure adequate respiratory protection is necessary to have information on the composition and concentration of hazardous substances polluting the air and clearly understand the purpose and limitations in the operation of facilities for respiratory protection. It is necessary to take into account such factors as the state of health of the user, the degree of physical activity, time spent in the contaminated area, the need for freedom of movement, temperature and humidity, the individual characteristics of the user, possibility to provide remedies. Requirements for most respirators set forth in the standard.

At the core of porous filters of all kinds is the process of gas filtration through the walls, in which solid particles are trapped, and the gas passes completely through them. Filtering partitions varied in structure, but they are composed of fibrous or granular elements and are divided into the following types: flexible porous walls - woven materials from natural, synthetic or mineral fibers; Nonwoven fibrous materials (felt, glued and punched materials, paper, cardboard, fibrous mother); mesh sheets (spongy rubber, polyurethane, membrane filters); semi porous membrane; rigid porous walls.

Currently, for the manufacture of filter elements, a broad range of synthetic polymers. Along with polyethylene, polypropylene, polyamide and polyester fibers advantage of using thermoplastics that are very suitable for extrusion processing, which makes it possible to obtain single thread or yarn.

The most common means of filtering gases or steam are activated carbon, which has a huge internal surface and is able to hold molecules of organic vapors. In order to keep the molecules or inorganic acid gases, or ammonia, activated carbon is subjected to an appropriate chemical treatment [Vincent J., 2006]. Filtering elements with activated carbon having no life indicators should be used only to protect against gases or vapors, which have evident identification characteristics.

2. RESULTS AND DISCUSSION

Perform basic functions of respiratory protection can be achieved by performing a thickness fabric, combination of materials, multi-layer structure. Recently there was a question in the development of multifunctional textile materials, layers which would be diametrically opposite properties. There are several ways to get the desired result: 1) a combination of materials with different properties in the weaving or knitting; 2) creation of multifunctional multilayer composite textile material layers are made of materials with different properties.

In order to identify functionality of bicomponent jersey formed from materials with opposite hygroscopic properties we selected two-layer jersey. During respiration between the body and the respiratory mask there is condensation which needs to be removed to bring comfortable feeling. Therefore, the inner layer of samples is responsible for the excretion of moisture and external - for filtering and absorbing. (Fig. 1)

To develop experimental models of knitted fabrics used roundknitting double needle-holder machine "Bentley", which is designed to produce linenlastic, bilastic, forging, jacquard and combined weaving and has 24 knitting systems.

One of the important properties of the filter fabric is resistant to physical and chemical effects of water vapor, high temperature, acid, alkali and other chemicals. Most textile fibers characterized by high resistance to various physical and chemical effects. Certain types of fibers exhibit these properties in different ways [Nikolaev S., 2001]. For example, the moisture has little effect on synthetic fibers - polyester (PE), polypropylene (PP) Polyamide (PA), polyvinyl chloride (PVC). When wet extensibility of

all types of fibers, with the exception of a number of synthetic increases in some cases up to 25-30%. Strength when exposed to water increases only natural cellulose fibers - cotton, elementary flax fibers, hemp fibers in the other species, with the exception of certain plastics, synthetic fibers - viscose, copper-ammonia, acetate and protein fiber strength is reduced by 40-60%.

Most textile fibers are not affected by water and steam of temperature under 100 °. Influenced by light and nature fibers due to oxidation processes gradually are getting old, resulting in a decrease in strength and elasticity, increased hardness, brittleness and fragility. Found that the most destructive light and nature affects on silk fiber, and the most stable in this action is wool and fiber of nitron.

Most textile fibers satisfactorily tolerate temperatures of about 120-150 °, and when moisture and higher temperatures. However, synthetic fibers - nylon, PP, PE, etc. - is thermoplastic, it means with high temperature they first deformed and then melted. Therefore, products made from these fibers or mixed with other fibers, can't be exposed to high temperatures.

Acids, alkalis and other chemical reagents consumed in the processing and use of textiles, textile fibers acting on differently. Satisfy most of the above specific requirements can only materials with synthetic strings.

The most commonly used linen with polyester, polypropylene, nylon yarns. For sample making, as a hydrophilic type of raw material used yarn whose composition - 34% cotton, 33% linen, viscose 33%, as well as hydrophobic - polypropylene multifilament yarn complex. The combination of natural and synthetic materials as a result gives different kinds of masks for different conditions (see Fig. 2).

3. CONCLUSIONS

As a result of the research and analysis of the impact properties of textile materials, knitted fabrics on quality index of products from them, has been developed and manufactured dual-layer jersey respiratory masks for human respiratory protection from exposure to harmful substances. Was analyzed the range of protective masks for sport and domestic purpose.

Tasked with designing means of protection of human respiratory, upgrading existing samples on market by application or proposal developed weaves and new raw materials and study the basic properties of samples and the development of multifunctional textile materials with layers with diametrically opposite properties.

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