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TECHNOLOGY OF ELECTROMAGNETIC FIELD SHIELDING FABRICS MANUFACTURING**ТЕХНОЛОГИЯ ПРОИЗВОДСТВА ТКАНЕЙ, ДЛЯ ЗАЩИТЫ ОТ ЭЛЕКТРОМАГНИТНОГО ИЗЛУЧЕНИЯ****Ryklin D.B.* , Dubrouskaya V.A., Kvetkovski D.I.***Vitebsk State Technological University, Belarus**e-mail: ryklin-db@mail.ru****Рыклин Д.Б.* , Дубровская О.А., Кветковский Д.И.***Витебский государственный технологический университет, Республика Беларусь*

Keywords: electromagnetic shielding, Nega-Stat, Bekinox, reflection and transmission coefficients.

Ключевые слова: экранирование электромагнитного излучения, Nega-Stat, Bekinox, коэффициенты отражения и передачи.

Abstract. The aim of this research is the development of technology of fabrics manufacturing using Nega-Stat[®] P210 and yarns containing stainless steel fiber Bekinox[®] and a comparative assessment of their shielding effect in order to be able to use them to create screens that protect against electromagnetic radiation. As an object of research, samples of experimental fabrics of different compositions and two-layer package formed from the experimental fabric were used. As a result of the tests, the influence of a combination of two types of electrically conductive components in the warp and weft on the shielding ability of fabrics and their packages was determined.

Аннотация. Целью работы является разработка технологий производства тканей, в структуре которой используются углероднополиэфирные нити Nega-Stat[®] P210 и пряжа, содержащая стальные волокна Bekinox[®], а также сравнительная оценка их экранирующего действия для определения возможности их использования при создании экранов, защищающих от воздействия электромагнитного излучения. В качестве объекта исследований использовались образцы опытных тканей разного состава и двухслойные пакеты, сформированные из опытной ткани. В результате испытаний определено влияние сочетания двух видов электропроводящих компонентов в основе и утке на экранирующую способность тканей и их пакетов.

One of the promising methods for developing electromagnetic shielding systems is the use of fabrics with high conductivity. The advantages of textile screens are their flexibility, lower consumption of metals, breathability, lightness and the possibility of obtaining a variety of structures that provide a given set of required properties.

Reducing the specific electrical resistance of fabrics is achieved in several ways: by applying coatings of metals, metal oxides and other conductive materials and by introducing electrically conductive yarns into the structure of fabrics.

Most often, yarns containing metals such as stainless steel or copper are used as a conductive component. Such fabrics, in addition to the shielding effect, are characterized by high antistatic properties, which, however, appear only when products made from them are grounded.

Among other types of conductive yarn, the Nega-Stat® P210 offered by Barnet is of interest. Nega-Stat® P210 neutralizes the surface charges on the base material by induction and dissipates the charge by conduction through grounding. The screening effect of fabrics with this type of yarns has not been studied.

The aims of this research were the development of technology of fabrics manufacturing using Nega-Stat® P210 and stainless steel fiber Bekinox® and a comparative assessment of their shielding effect. The influence of a combination of two types of electrically conductive components in the warp and weft in the composition of the fabric was also determined.

For the research 3 samples of 2/2 twill weave fabrics were produced in which electrically conductive yarns were arranged in the form of a square grid of different sizes. Two types of conductive yarns were used:

- yarn Nega-Stat® P210 twisted with cotton yarn,
- blended yarn 20 tex × 2 (10 % Bekinox®, 90 % Polyester).

Electrically conductive yarns were introduced into the base fabric, in the warp and weft of which cotton yarn 25 tex × 2 was used.

The manufacturing of experimental fabric samples was carried out on a shuttleless weaving loom STB-2-175. In the case of fabric density 17.4 threads/10 cm in warp and 18.0 threads/10 cm in weft, the basis weight of the test fabric samples was about 180 g/m². Structures of two experimental fabric samples are presented in Figure 1.

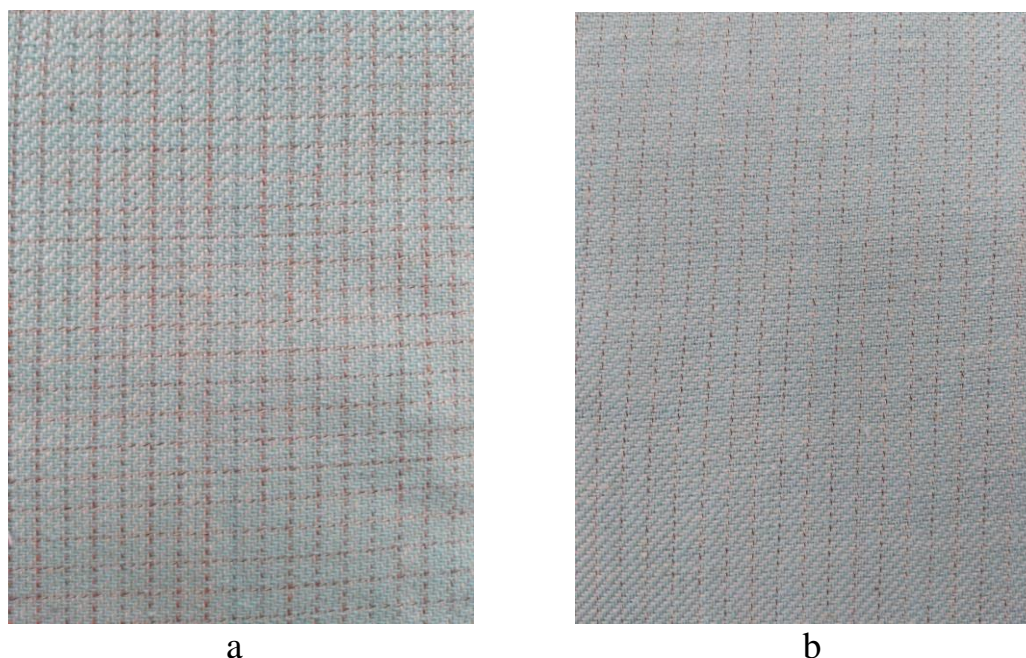


Figure 1 – Structures of experimental fabric samples:
a – yarn Nega-Stat® P210 in warp and weft,
b – blended yarn with 10 % fibers Bekinox in warp
and yarn Nega-Stat® P210 in weft

The loom-state fabric was subjected to tests to determine the electromagnetic properties. The determination of the reflection and transmission coefficients was carried out in the frequency range from 0.7 to 17 GHz.

As a result of the research, it was found that fabrics containing only Nega-Stat[®] P210 as a conductive component do not have a significant shielding effect. However, when combining Nega-Stat[®] P210 and yarn with 10 % Bekinox[®] in the fabric structure a sufficiently high shielding effect is achieved.

In the frequency range from 0.7 to 2.5 GHz the transmission coefficients is in the range from 15 to 20 dB. For two layers of fabric the transmission coefficient in the range from 1 to 5 GHz is reduced to 20–30 dB. Significant values of the reflection coefficient (more than 10 dB) are observed in the range from 10 to 13 GHz when the fabric is folded into 2 layers.

For comparison, it can be noted that fabrics with a similar content folded into 2 layers were characterized by a close value of the reflection coefficient and a 5 dB lower value of the transmission coefficient in the indicated ranges.

The results obtained are the basis for the design of fabrics and packages of materials for shielding electromagnetic radiation.

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FEATURES OF THE COMPOSITIONAL FORMATION OF PAGES OF ONLINE STORES

ОСОБЕННОСТИ КОМПОЗИЦИОННОГО ФОРМИРОВАНИЯ СТРАНИЦ ИНТЕРНЕТ-МАГАЗИНОВ

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Ключевые слова: интернет-сайт, эргономические особенности сайта, функциональные показатели, эстетические требования.

Abstract. The paper examines the types of online stores, their specifics, as well as ergonomic features. The selection of the most preferred sites of online stores and the comparative characteristics of objects according to functional and aesthetic indications were made.

Аннотация. В работе изучены виды интернет-магазинов, их специфика, а также эргономические особенности. Произведен выбор наиболее предпочтительных сайтов интернет магазинов и сравнительная характеристика объектов по функциональным и эстетическим показателям.