



Thematic section: Research into New Technologies.

Subsection: Medicinal Chemistry.

Full Paper

The Reference Object Identifier – ROI-jbc-C/21-2-4-8

The Digital Object Identifier – DOI: 10.37952/ROI-jbc-C/21-2-4-8

Received 20 November 2021; Accepted 23 November 2021

Analysis of consumer characteristics of a three-layer spunmelt material after radiation sterilization

Maria S. Lisanevich,*⁺ and Reseda Yu. Galimzyanova

*Department of Medical Engineering. Kazan National Research Technological
University. Karl Marx St., 68. Kazan, 420015. Russia. Phone: +7 (843) 231-43-36.
E-mail: lisanevichm@gmail.com*

*Supervising author; ⁺Corresponding author

Keywords: nonwoven material, spunmelt material, rigidity, electrification, hygroscopicity, pore size, consumer characteristics.

Abstract

For the production of nonwovens of medical value and clothing from them, one of the most pressing problems at the present time is the development of materials with improved consumer characteristics. The rapid development of the clothing market requires domestic manufacturers to create competitive products not only through new products and technologies, but also new sensations for the consumer, provided that the price is competitive. According to medical professionals, disposable surgical gowns based on spunmelt materials cause discomfort during use. Since a large number of medical clothes and linen are currently sterilized by radiation, and also taking into account the prospects for the development of nonwoven materials, an urgent task is to assess the effect of radiation sterilization on the consumer properties of nonwoven materials for medical purposes.

The object of the study was a 3-layer CMC nonwoven fabric (manufactured by *Avgol Ltd*, Israel) with a surface density of 35 g/m². Analysis of the results of experimental data showed that radiation sterilization (exposure to an absorbed dose of 60 kGy) leads to a change in the structure of the material, namely, a decrease in the size of large and medium pores and an increase in small pores. Due to these changes, the hygroscopicity of the material increases by 30%. The studies carried out also made it possible to establish that the treatment of nonwoven material by radiation sterilization leads to an increase in electrification by almost 2 times. It should be noted that the values of electrification are within the normal range established by GOST 32995 "Textile materials. Methods for measuring the strength of the electrostatic field." It is shown that after the treatment with radiation sterilization, a significant (by 44%) increase in the rigidity of the material is observed.

For citation: Maria S. Lisanevich, Reseda Yu. Galimzyanova. Analysis of consumer characteristics of a three-layer spunmelt material after radiation sterilization. *Butlerov Communications C.* **2021.** Vol.2. No.4. Id.8. DOI: 10.37952/ROI-jbc-C/21-2-4-8

References

- [1] R.Yu. Galimzyanova [et al.]. The effect of radiation sterilization on the properties of a two-layer laminated nonwoven fabric. *Herald of Technological University.* **2014.** Vol.17. P.194-196. (Russian)
- [2] Yu.N. Khakimullin, M.S. Lisanevich, R.Yu. Galimzyanova, B.L. Shakirov. Predicting the durability of ionizing radiation sterilized laminated nonwoven fabric. *Herald of Technological University.* **2015.** Vol.18. P.120-122. (Russian)
- [3] L.S. Travkina, M.S. Lisanevich, R.Yu. Galimzyanova, Yu.N. Khakimullin, E.E. Tsareva. Influence of ionizing radiation on the properties of nonwovens for medical use. *Herald of Technological University.* **2013.** Vol.16. P.28-31. (Russian)
- [4] E.R. Rakhmatullina, M.S. Lisanevich, R.Yu. Galimzyanova, Yu.N. Khakimullin, N.A. Mukmeneva. Influence of processing conditions on the properties of polypropylene. *Deformation and Destruction of Materials.* **2017.** Vol.12. P.35-39. (Russian)
- [5] R.Yu. Galimzyanova, M.S. Lisanevich, E.R. Rakhmatullina, Yu.N. Khakimullin. Influence of radiation sterilization on the physical and mechanical properties of nonwoven fabric based on polypropylene. *Herald of Technological University.* **2020.** Vol.23. P.19-23. (Russian)
- [6] Yu.N. Khakimullin, A.R. Bakhritdinova, R.R. Shaimardonova, M.S. Lisanevich, R.Yu. Galimzyanova. Influence of radiation sterilization on the properties of spunmelt materials. *Herald of Technological University.* **2015.** Vol.18. P.251-253. (Russian)
- [7] M.S. Lisanevich [and etc.]. Predicting the durability of sterilized spunlace nonwovens. *Herald of Technological University.* **2014.** Vol.17. P.144-146. (Russian)
- [8] *Pat. RU 2615514.* Khakimullin Yu.N., Galimzyanova R.Yu., Rakhmatullina E.R., Lisanevich M.S., Zhanzhora A.P., Mukmeneva N.A. **2017.**(Russian)
- [9] R.Yu. Galimzyanova, Yu.D. Shakirova, M.S. Lisanevich, Yu.N. Khakimullin, A.P. Zhanzhora. Influence of gamma and electron radiation during radiation sterilization on the properties of a material based on viscose fiber. *Herald of Technological University.* **2016.** Vol.19. P.99-101. (Russian)
- [10] Maria S. Lisanevich, and Reseda Yu. Galimzyanova. Influence of ionizing radiation on air permeability and structure of five-layer spunmelt materials. *Butlerov Communications C.* **2021.** Vol.2. No.4. Id.2. DOI: 10.37952/ROI-jbc-C/21-2-4-2
- [11] Maria S. Lisanevich, and Reseda Yu. Galimzyanova. Effect of radiation sterilization on air permeability and structure of Holofiber® nonwoven fabric. *Butlerov Communications C.* **2021.** Vol.2. No.4. Id.1. DOI: 10.37952/ROI-jbc-C/21-2-4-1
- [12] E.R. Rakhmatullina [and etc.]. The influence of stabilizers on the properties of medical compositions based on polypropylene. *Herald of Technological University.* **2013.** Vol.16. P.181-183. (Russian)
- [13] Yu.N. Khakimullin [and etc.]. The possibility of obtaining nonwovens resistant to traditional methods of sterilization in modern production conditions. *Herald of Technological University.* **2013.** Vol.16. P.118-120. (Russian)
- [14] M.S. Lisanevich [and etc.]. The use of phenolic and mixed phenol-phosphite antioxidants for anti-radiation protection of medical polypropylene. *Herald of Technological University.* **2015.** Vol.18. P.181-182. (Russian)
- [15] M.S. Lisanevich, R.Yu. Galimzyanova, and R.G. Ibragimov. Influence of non-equilibrium low-temperature plasma on consumer characteristics of spunmelt material. *Butlerov Communications.* **2020.** Vol.64. No.11. P.143-148. DOI: 10.37952/ROI-jbc-01/20-64-11-

143 (Russian)

- [16] E.V. Mezentseva, V.Yu. Mishakov, M.S. Lisanevich. Multifunctional nonwovens as a promising direction of development. *Actual problems of the economy of commerce and service. Collection of scientific papers of the Department of Commerce and Service*. **2021**. P.111-116. (Russian)
- [17] R.Yu. Galimzyanova, M.S. Lisanevich, Yu.N. Khakimullin, K.V. Legaeva, N.S. Podemirova. Influence of nonequilibrium low-temperature plasma on the properties of nonwoven multilayer material based on polypropylene. *Herald of Technological University*. **2015**. Vol.18. P.141-143. (Russian)
- [18] Yu.N. Khakimullin [and etc.]. Study of the influence of non-equilibrium low-temperature plasma on the properties of laminated nonwoven fabric. *Proceedings of higher educational institutions. Textile industry technology*. **2016**. Vol.34. P.68-71. (Russian)
- [19] E.V. Mezentseva, V.Yu. Mishakov. Selection of statistical models and analysis of free characteristics of the sample for quality indicators of self-regulated nonwoven thermal insulation materials. *Proceedings of higher educational institutions. Textile industry technology*. **2020**. Vol.6. P.67-73. (Russian)
- [20] E.V. Mezentseva, V.Yu. Mishakov. Investigation of the thermal insulation properties of nonwovens as part of clothing sets on a thermomanikin in a state of motion and imitation of perspiration. *Proceedings of higher educational institutions. Textile industry technology*. **2019**. Vol.5. P.143-150. (Russian)
- [21] Maria S. Lisanevich, and Rezeda Y. Galimzyanova. Low-temperature plasma modification of five-layer spunmelt medical materials. *Butlerov Communications C*. **2021**. Vol.1. No.2. Id.6. DOI: 10.37952/ROI-jbc-C/21-1-2-6
- [22] M.S. Lisanevich, R. Yu. Galimzyanova. Influence of low-temperature plasma on the hygroscopicity index of spunmelt materials. *Herald of Technological University*. **2021**. Vol.24. P.14-17. (Russian)
- [23] A.E. Tsarev, M.S. Lisanevich. Study of the effect of radiation sterilization on the electrostaticity of nonwoven spunmelt medical materials. in *Fundamental and applied problems of materials creation and aspects of textile and light industry technologies*. under. ed. L.N. Abutalipova. *Collection of articles All-Russian scientific and technical conference*. **2019**. P.47-50. (Russian)
- [24] Maria S. Lisanevich, Reseda Yu. Galimzyanova. Analysis of consumer characteristics of a three-layer spunmelt material after radiation sterilization. *Butlerov Communications*. **2021**. Vol.68. No.12. P.83-88. DOI: 10.37952/ROI-jbc-01/21-68-12-83 (Russian)