INFLUENCE OF TECHNOLOGY PRODUCTION ON COMFORT USE OF NONWOVENS SURGICAL GOWNS

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Abstract

The paper presents the results of the impact of technology manufacturing nonwoven, disposable surgical garments on their selected useful properties. During the research examined four most commonly used surgical gowns in the operating rooms and an assessment of their physical and useful characteristics. In connection with the impossibility of assessing resistance to penetration of microorganisms as well as pollination of human epidermal of investigated surgical gowns, made a comparative investigation of filtration characteristics of the evaluation of fractional pore distribution.

The surgical clothing should fulfill requirements for comfort of use, which largely are linked to guidelines for surgical gowns shown in the standard PN-EN 13795-3:2006 "Surgical drapers, gowns and clean air suits, used as medical devices for patients, clinical staff and equipment- Part 3: Performance requirements and performance levels".

According to it, all the available products on the market, which are surgical gowns should be within the specified range of analyzed properties. The obtained results allowed to determine how the manufacturing technology can affect on the barrier protection as well as the comfort of use.

Key words: *nonwovens, surgical gowns, comfort of use, spun-bonded, SMS*

[Engineering of Biomaterials, 99-101, (2010), 11-12]

Introduction

In the world almost 70% of the textiles used in health care for personal protective equipment including masks, headgear, clothing, surgical gowns, etc. are disposable goods and only 30% of this materials are reusable. A special group of medical products to protect against infectious factors is a disposable clothing for medical staff, visitors and for sick people. [1,4]

Surgical garments should fulfill requirements for comfort of use, which largely are linked to guidelines for surgical gowns shown in the standard PN-EN 13795-3 [6]. The development of manufacturing techniques of gowns have a significant impact on properties connected to the protective properties, which are important to health personnel.

Among the standards for barrier materials used as gowns, mention should be standard:

• EN 13795-1:2002 – describes the general requirements for producers, processors and products,

• EN 13795-2:2002 – presents the test methods,

• EN 13795-3:2002 – describes the requirements and levels of action. .[4-6]

Standard EN 13795 states that the surgical covering and gowns must be a barrier to infection. This means that at the time of use they can't leak fluid and microorganisms, they must withstand the proper pressure, which may be exerted on the gowns and covering during the surgery. The requirements for barrier concern:

– Resistance to microbal penetration (dry and wet),
– Resistance to liquid penetration,
– No dust,
– Adhesion,
– Cleanliness- Microbial,
– Cleanliness- Particulate Matter
– Resistance to pushing and tearing (dry and wet).[6]

Materials and methods

For the investigation have been used four disposable surgical gowns received the following techniques: spun lace (SL), spun bonded-melt blown-spun bonded (SB-MB-SB) (gowns compared the two companies X and Y) and spun-bonded + film (SB + F). [2,3]

Nonwoven fabric as well as the final product should have the appropriate functionality to the standard PN-EN 13795-3:2006. In this standard have been specified requirements in relation to the dry and wet microbes penetration resistance, microbiological purity, lack of contaminating particles that could be released mechanically. Requirements for non-polluting particulate material and pollination of materials used in the surgical room are of great importance, since these particles may be a carrier of infectious factors.

The surface mass nonwoven surgical gowns were analyzed according to standard: PN-EN 29073-1:1994, thickness based on the standard PN-EN 29073-1:1994. Air permeability measurements were carried out in accordance with the PN-EN ISO 9237:1998, determination of bending length – PN-EN ISO 9237:1998 and water absorption determined. [4]. There have been also determinate the distribution of pore size distributions using Capillary Porometer PMI company. Obtained results are given in TABLE 1.

TABLE 1. Parameters of nonwovens surgical gowns.

Nonwovens	Raw material composition	Basis weight of nonwovens [g/m^2]	Thickness [mm]	Density [kg/m^3]
SL	40% PET / 60% viscose	65,6	0,6	110,8
SMS Company X	100% PP	38,6	0,4	97,4
SMS Company Y	100% PP	35,2	0,4	93,2
SB+F	80% PP+ 20& PE	42,4	0,3	148,4

Results an discussion

The obtained results the influence of manufacturing techniques on selected properties of surgical gowns made of nonwovens are given in TABLE 2 and illustrated on FIGURES 1-4.

TABLE 2. The results of measurements.

Parameter	SL	SMS		SB+F
		Company X	Company Y	
Water absorption [g/m^2]	31,6	92,3	69,6	41,60
Air permeability[dm^3/m^2•s] Δp=500Pa	1081	1452	2204	1,12
Pore size distribution [µm] -Bubble Point [µm] -Average Diameter [µm]	 376,6 39,5	 62,3 21,7	 663,2 86,8	 below 2

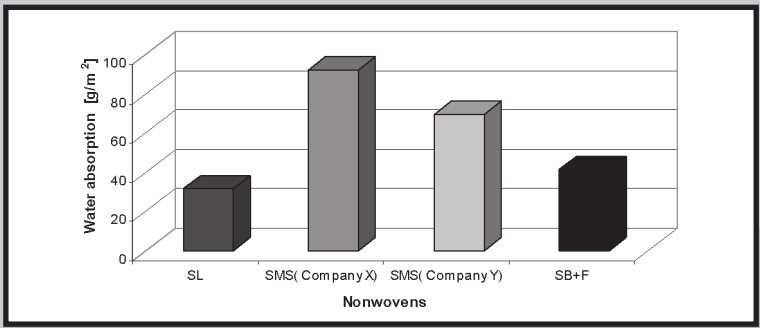

FIG.1. Influence of surgical gowns manufacturing technology on the water absorption.

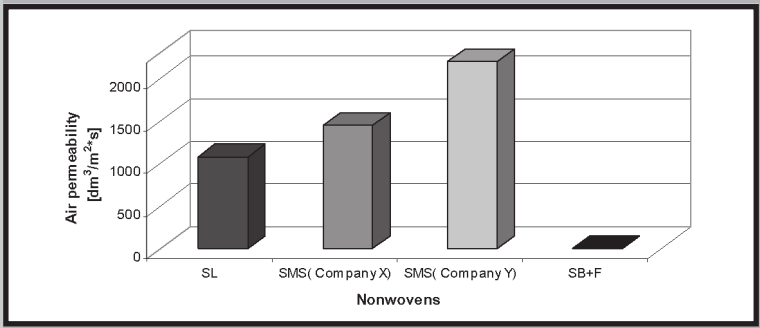

FIG.2. Influence of surgical gowns manufacturing technology on the air permeability.

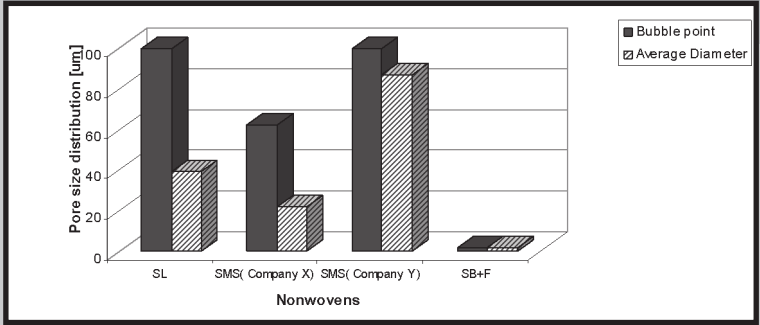

FIG.3. Influence of surgical gowns manufacturing technology on the pore size distribution

Conclusions

Investigations of nonwoven medical garments have shown that the technique of nonwovens production has an influence on the properties and its intended use.

Surface mass medical garment does not exceed 40 g/m^2, the exception is surgical gown received from technique spun-lace (65,6 g/m^2).

Analyzing the obtained results of surgical gowns produced by two companies (X and Y) received the SMS technology can be seen that these products having similar surface mass and thickness, have different air permeability as well as size pores. In the case of surgery gown from company Y such pore size (86,8 µm) does not guarantee protection against microorganisms (pathogens). The best protection agents the transmission of infectious is SMS nonwoven company X, which has pore sizes below 22 µm and the air permeability equal 1452 dm^3/m^2•s.

Preferably against the fluid protect nonwoven foiled, because they characterized low air permeability. However, this reduces the physiological comfort of use, which is why they are used as an additional element of gown in critical area of product. For urological gowns critical field is fixed only spot, in the case of reinforced surgical gowns the total insulation against microorganisms (pathogens) is achieved by full fusing a barrier element in the boxes on the sleeves and on the front of gown.

References

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[4] PN-EN 13795-1:2002 Obłożenia chirurgiczne, fartuchy chirurgiczne i odzież dla bloków operacyjnych, stosowane jako wyroby medyczne dla pacjentów

[5] PN-EN 13795-2. Obłożenia chirurgiczne, fartuchy chirurgiczne i odzież dla bloków operacyjnych, stosowane jako wyroby medyczne dla pacjentów- Część 2- Metody badania

[6] PN-EN 13795-3. Obłożenia chirurgiczne, fartuchy chirurgiczne i odzież dla bloków operacyjnych, stosowane jako wyroby medyczne dla pacjentów-Część 3; Wymagania użytkowe i poziomy ochrony