Available online at www.sciencedirect.com

ScienceDirect

Procedia Engineering 200 (2017) 45–52

Procedia Engineering

www.elsevier.com/locate/procedia

3rd International Conference on Natural Fibers: Advanced Materials for a Greener World, ICNF 2017, 21-23 June 2017, Braga, Portugal

PHYSICAL PROPERTIES OF ECO-FRIENDLY KENAF FIBER IMBEDDED NONWOVEN FOR AUTOMOTIVE PILLAR TRIM

Hye Rin Gu[a], Seung Jin Kim[b*], Hyun Ah Kim[b]

[a]*Dept. of Textile Eng., Yeungnam Univ., Gyeongsan (Korea)*
[b]*Korea Research Institute for Fashion Industry, Deagu (Korea)*

Abstract

This study investigated the physical properties including the sound absorption property of Kenaf natural fiber imbedded nonwoven for automotive pillar trim. Seven kinds of Kenaf imbedded nonwoven specimens mixed with polypropylene and low melting PET fibers were prepared through needle punching nonwoven process. Physical properties such as air permeability, water absorption, sound absorption coefficient, and porosity were measured and compared with different processing factors of needle punching nonwoven. High blend percentage of low melt PET fibers made pore size lower and smaller, which resulted in low air permeability and water absorption. Sound absorption coefficient of nonwoven specimen was highly dependent upon weight and thickness of the nonwoven and correlation coefficient was above 0.83, respectively. It was also affected by pore diameter, i.e. low pore sized nonwoven showed high sound absorption coefficient, which was caused by the high needle depth and high blend ratio of low melt PET.

Peer-review under responsibility of the scientific committee of the 3rd International Conference on Natural Fibers: Advanced Materials for a Greener World.

Keywords: Type your keywords here, separated by semicolons ;

* Corresponding author.
E-mail address: sjkim@ynu.ac.kr

1877-7058
Peer-review under responsibility of the scientific committee of the 3rd International Conference on Natural Fibers: Advanced Materials for a Greener World
10.1016/j.proeng.2017.07.008

1. Introduction

Nonwoven has been used in the automotive industry for different parts because of its advantages such as short process and competitive price. The nonwoven fabrics which have been applied to the automobile materials have been required by the emotional quality and reliability. Advanced functions with light weight, VOC-FREE and good abrasion resistance have nowdays been needed for eco-friendly automobile materials. Recently, nonwovens have become one of the most common textile products in the automotive industry and have been used as an important sound absorption material. Many studies have been carried out to investigate the sound absorption properties including physical properties such as air permeability and wicking of the nonwovens. Nick et al.[1] investigated the sound absorption properties using three different composites materials such as (1) cotton, bicomponent PET and polypropylene fibers(2) flax, kemp and polypropylene fibers(3) lyocell, bicomponent PET and polypropylene fibers. Lou et al.[2] studied the sound absorption property of the nonwoven composed of low melting PET and recycled PET particles mixed with polypropylene fibers. High sound absorption coefficient of the nonwovens was observed at the high thickness and low density specimen at low and mid-frequency ranges. The studies using natural jute[3] and coconut coir[4] fibers yielded good sound absorption properties. Kenaf, jute and cotton fibers imbedded nonwovens in the PET and polypropylene fibers were used as industrial automotive padding materials, in their study in which resulted in a significant improvement in sound absorption properties.[5] Kucuk et al.[6] investigated the effects of the physical parameters on the sound absorption properties of natural fiber mixed nonwoven fabrics. They concluded that the increase of thickness and the decrease of air permeability resulted in an increase in sound absorption properties. In addition, the increase in the amount of fiber per unit area resulted in an increase in sound absorption. Lee et al.[7] examined the relationship between the acoustic absorption values of the recycled polyester nonwovens and the nonwoven process parameters including fibre and web properties. Byun et al.[8] investigated sound absorption property of the PET nonwoven for automotive with variation of the fiber fineness, density and thickness of the 3 layers nonwoven for substituting the glass wool for improving the environmental and recycled capability. Das et al.[9] and Tascan and Vaughn[10] investigated the influence of fibre cross-sectional shape on air permeability of nonwoven. According to Das et al.'s study, the air permeability was found to decrease with a higher proportion of non-circular fibers in the nonwoven fabrics, which was similar to Tascan and Vaughn's results. On the other hand, Dubrovski and Brezocnik[11] investigated the effects of the content of viscose and PET fibers and porosity of nonwoven structure on the vertical wicking rate of nonwovens. The results showed that higher volume porosity gives higher vertical wicking rate. Soukupova et al.[12] studied the effect of the blend ratio of viscose and PET fibers on the wicking of the nonwoven and found that the capillary rise was higher for nonwoven fabrics containing more viscose fibers. Dubrovski and Brezocnik[13] predicted the model for the vertical wicking rate using the fibre density, fiber fineness and nonwoven fabric density. In this study, nonwoven specimens were produced with different processing conditions such as number of carding treatment, web layers, needle depth and content ratio of low melt PET. And their physical properties such as air permeability, water absorption and sound absorption coefficient were measured and compared with different process factors for obtaining optimal process conditions for automotive pillar trim.

2. Experimental

2.1. Specimen preparation

Kenaf, polypropylene(PP) and low melting PET(LM PET) were used as raw materials of nonwovens. Seven kinds of Kenaf imbedded nonwovens were made with different processing factors as shown in Table 1. Fig. 1 shows needle punching nonwoven process to prepare the specimens. Fig. 2 shows the image of nonwoven machinery used in this study.