18B05

Effect of Layer Conditions on Structural Behavior and Pore Distribution of Multiple Layered Nonwovens

복 진 선, 주 창 환, 이 래 연
충남대학교 공과대학 섬유공학과

INTRODUCTION

The geometrical structure of nonwovens is different from not only processing conditions, but the layer types of web. These parameters have influenced on the physical and mechanical properties of nonwoven fabrics.

In general, the movement of fluids into and through nonwoven structures often has significant the technical impact. particularly, the filter performance of nonwoven fabrics depends to a large extent on the web structures of the fabrics, such as the porosity, thickness, permeability and the spaces between the fibers[1-5].

Therefore, we have to study the effect on the structural behavior and pore size distribution of needle punched fabrics of changing thickness and punching density for the individual layers.

EXPERIMENTAL

The multi-layered needle punched nonwoven fabrics used in this study are made with blended web of polyester staple fiber(1.4denier, 2.5denier) and produced by using different number of layers of blended webs and different punching density(100~600punches/cm^2). The blended polyester web of basis weight 120g/m^2 is preneedled with the Asselin needling machine.

The weight per unit area, thickness, air permeability and pore size of the fabrics were subsequently measured. The basis weight(ASTM D3776-79) and thickness(ASTM D1777-64) are measured with electronic balance and thickness gauge, respectively. Air permeability was measured by Frazier air permeometer with a pressure drop of 0.5inches of water according to ASTM D737-75 and pore size distribution was determined by the bubble point test with ethylalcohol according to ASTM F316-86.

RESULTS AND DISCUSSION

Fig. 1 shows the effect of different number of layers and punching density on

the mean flow pore diameter of multi-layered fabrics. The mean flow pore diameter is decreased with increasing the number of layers. Also, mean flow pore diameter for the individual layers is decreased with increasing the level of 200-400 punching density. It is considered that fiber breakage influenced on pore size is occurred over 200-400 punches/cm^2 for the each layers.

The relationship between average pore diameter and CUM. pore area with changing of number of layers and punching density is shown in Fig. 2 and Fig. 3. For the number of layers, average pore diameter is decreased with increasing number of layers and for the punching density, it is decreased with increasing the level of 200-300 punches/cm^2.

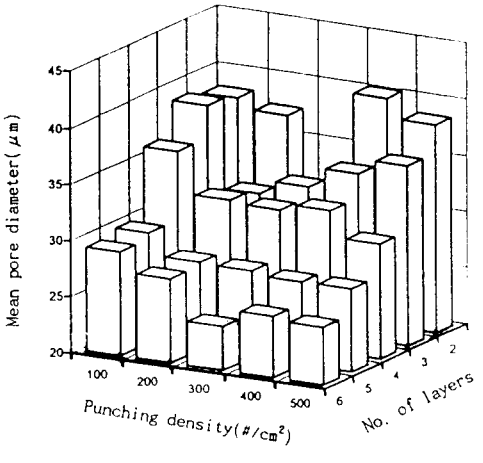

Fig. 1. The effect of different No. of layers and punching density on the mean pore diameter.

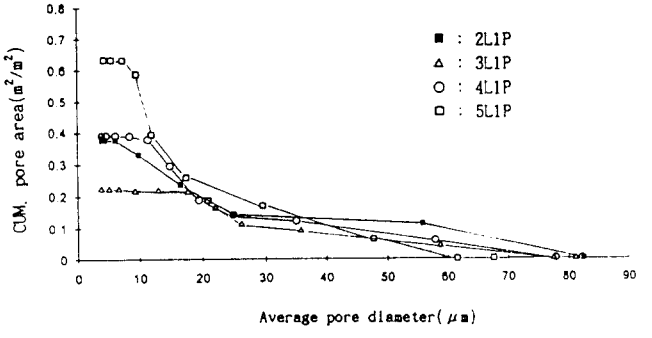

Fig. 2. Relationship between average pore dia. and CUM. pore area according to No. of layers.

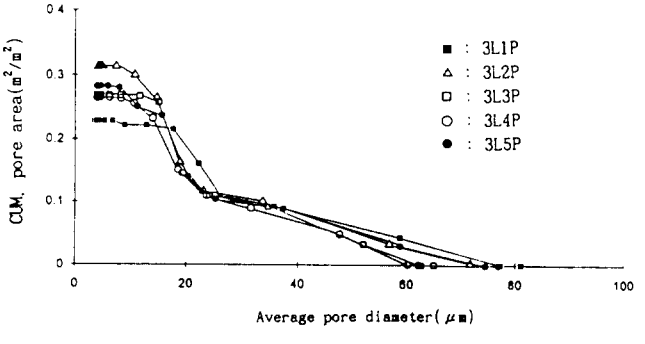

Fig. 3. Relationship between average pore dia. and CUM. pore area according to punching density.

CONCLUSION

We have studied the effect on the structural behavior and pore size

distribution of needle punched fabrics of changing thickness and punching density for the individual layers. The results obtained in this study are as follows:

1. The mean flow pore diameter is decreased with increasing number of layers. Also, mean flow pore diameter for the individual layers is decreased and increased with 200-400 punching density in the center.
2. The average pore diameter is decreased with increasing number of layers, and for the punching density is decreased and increased with 200-300 punches/cm^2 in the center.

REFERENCES

1. M.S.Atwal, *T. R. J.*, 57(10), 574-579(1987).
2. G.J.I.Igwe and P.A.Smith, *J. Tex. Inst.*, 77(4), 263-266(1986).
3. E.C.Homonoff and C.A.Rodman, *INDA J. Non. Res.*, 2(1), 51-57(1990).
4. B.Miller and I.Tyomkin, *T. R. J.*, 56(1), 35-40(1986).
5. L.C.Wadsworth and S.D.Barboza, *INDA J. Non. Res.*, 2(1), 43-48(1990).