

## Soil-release Finish of Ramie Fabric with Pre-treatments

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### 1. INTRODUCTION

Recent developments of soil-release finish are required to keep performance of material. Consumers prefer soil-release finish with convenience pursuit, because particulate soils can be easily removed during the wash and fabric can reduce damage.

Soil-release finish methods have two ways. First, the finish is enable to bury the particulate soils. This way has been mainly used for fluorochemicals. Second, when the clothes are stained with soil, it makes the soil easily depart from the clothes. This finish should be hydrophilic.

Traditionally, there are lots of the finishing processes of synthetic fibers. However, nowadays, the demands about the finishing of natural fiber are increasing. Therefore, natural fiber soil-release finish method and soil-release finish agent development are absolutely necessary.

Attachment and removal of soils(contaminants) depend on the type of the fiber and characteristics of the fabrics. They are mainly affected by physical properties, such as thickness of the fabric density, thickness of the thread, twist, and section type. Indeed, they are affected by chemical properties such as type of fiber and surface energy.

Ultra-violet(UV) irradiation is known as a practical surface treatment method. The UV irradiation method takes lower price and smaller equipment to treat the surface than the cold plasma treatment, corona discharge method and so on. In the case of UV irradiation treatment, the fiber surface is modified by ozone and UV. Thus, the surfaces of fiber polymers are etched and oxidized. After the bonding of oxygen in the etched area, the fabric surface is modified hydrophilic by induction of polarity functional group such as carboxyl acid and carbonyl. UV irradiation may alter the performance of the fabric through changes in the physical form such as creating bubbles and cracking on the fabric surface.

High temperature mercerization by sodium hydroxide is enable to make an uniform alkali treatment, because the alkali is saturated into the inside of the fabric. Thus, the handle, tensile

strength, tear strength, wear strength and drape of the fabric became superior than the untreated things.

In this study, we observed the effect of the pre-treatment of the ramie fabric by the UV irradiation and mercerization, and measured the degree of soil-release efficiency. After treatment, soil-release performance is improved, maintaining the characteristics of the ramie fabric.

### 2. EXPERIMENTALS

#### Materials

Ramie fabric, used in this experiment, was a plain woven, supplied from Hansan-mosi shown in the Fig. 1. The weaving density of warp/weft was 60/54 bundles on square inches. The basic weight of fabric was about 120g/m<sup>2</sup>. The fabric was scoured before soil-release finish.

The reagent grade of soil-release finish agent PM-930(3M), sodium hydroxide (NaOH, 20% solution in water), and acetic acid (CH<sub>3</sub>COOH, 1% solution in water) were used. Soil-release finish was conducted after pre-treatments.



Fig. 1. Korean traditional ramie fabric 'Hansan-mosi'

#### Mercerization

The fabric was fixed on the pin frame and dipped into the sodium hydroxide solution, 85°C. The fabric was soaked in the water for 5 minutes and washed with the cold water enough. After neutralization with 1% acetic acid solution, it was washed in the water.

#### UV treatment

The UV treatment equipment is completely blocking the light and free flow of air. So that was cooled

during the heating occurs. The distance between the sample and the lamp was fixed at 4cm. Processing time was fixed for 60 minutes.

#### Soil-release finish

The fabrics were dipped in the PM-930 solution in 10 minutes and squeezed up to 50wt% pick-up by a laboratory type padder. Then they were dried at 90°C for 3 minutes and cured at 150°C for 2 minutes in oven. Treated fabric was washed by warm water of 40°C~50°C.

#### Characterization

Mechanical properties of treated fabric, such as tensile strength, tear strength and soil release-oily stain release were measured under ASTM and AATCC specifications. Tensile strength measured by flat bundle method using an Instron tensile tester (ASTM D1445). Soil-release property was measured by a Oily Stain Release Method tester (AATCC 130).

### 3. RESULTS AND DISCUSSION

When the ramie fabrics are pre-treated, the soil-release performance was improved and when combined finish processing of mercerization and UV irradiation was conducted, the soil-release performance was improved largely.

Contaminants attached area was reduced by mercerization and UV irradiation treatment. Furthermore, contaminants resistance increased due to hydrophilic surface of the fabric.

In case of the mercerization treatment was performed on the ramie fabrics, the tensile strength was improved. The number of inter-molecular hydrogen bonds increased because of the contraction of filaments by mercerization.

### 4. CONCLUSION

In this paper, we investigated the effects of soil-release finish of the ramie fabric with mercerization and UV irradiation.

Due to pre-treatments, polar functional group in the surface of the fabric increased and therefore both physical and chemical properties were changed.

We could expect a soil-release performance improvement with mercerization and UV irradiation, because the internal structure of fiber was changed into more hydrophilic.

### 5. REFERENCES

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