

# Study on Influences of Linen Fiber Modification Treatment on Dressing Prickle Sensation<sup>\*</sup>

Caiyuan Kuang<sup>a,b,c,\*</sup>, Guolian Liu<sup>a,c</sup>, Xin Lu<sup>a,\*</sup>

<sup>a</sup>*Liaoning Key Laboratory of Functional Textile Materials, Eastern Liaoning University  
Dandong 118003, China*

<sup>b</sup>*College of Art, Jinling Institute of Technology, Nanjing 211169, China*

<sup>c</sup>*College of Textile and Clothing Engineering, Soochow University, Suzhou 215021, China*

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## Abstract

Prickle sensation is a key factor influencing the comfort of dressing. In this paper, the diameter, quantity and fiber bending property of hairiness on the surface of linen fabrics are measured after modification treatment of linen fiber. Meanwhile, the prickle sensation of linen clothing is evaluated by dressing experiments. And the changes of surface hairiness, fiber bending performance and their influences on the dressing prickle sensation of linen clothing are analyzed before or after the modification treatment of linen fiber. The results show that the diameter of the surface hairiness becomes thinner and much more in quantity after modification treatment, but the bending rigidity decreases. Furthermore, the perception value of prickle sensation of linen clothing after modification treatment decreases whether it is under sweating condition or not.

*Keywords:* Prickle Sensation; Linen; Dressing; Modification Treatment

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## 1 Introduction

As one kind of natural fiber, linen has excellent properties, such as moisture absorption, breathability and cool, etc. In such an era advocating environment protection, linen has extensive market prospect. Because of the streak flaws, cracks and high crystallinity on its microcosmic surface, the fabric owns certain prickle sensation and hard to meet the requirements of consumers, which limits the development of high-end application of linen. Therefore, it is necessary to improve the property of linen fiber and its fabric via modification treatment.

As seen from the studies that, prickle sensation is caused by the mechanical stimulation of coarse and hard hairiness to the nerve terminals of epidermis. Prickle sensation often occurs on the fabrics of fur and linen fabric or those with coarse, short and hard fibers [1]. At present, scholars at home and abroad have paid much more attention to the prickle sensation of wool

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\*Corresponding author.

*Email addresses:* kcy@jit.edu.cn (Caiyuan Kuang), luxin66cn@163.com (Xin Lu).

fabrics, including its generation mechanism and influence factors. The studies show that fiber diameter is the main factor for the generation of prickle sensation in wool fabrics [2,3]. However, the study on prickle sensation of linen fabric is relative rarely focused.

With linen fabric after modification treatment made by the research group from Jiangsu Sulong Textile Technology (Group) Co., LTD as experimental material [4], in this paper, the influences of the changes on the surface hairiness diameter, hairiness quantity, and the fiber bending performance of the linen fabrics before and after modification treatment on prickle sensation of linen clothing are discussed.

## 2 Experiments

### 2.1 Modification Treatment of Linen Fiber

Most of the researches at home and abroad paid attention to the liquid ammonia treatment of cotton or linen fabrics, while not focused on the liquid ammonia treatment of linen fiber or yarn. In this paper, modification medium (liquid ammonia) is employed to treat with the linen fiber or yarn. The research group [4] has developed the modification equipment for fibers and yarns independently, which comprises the modification medium transmission and recovery part, gaseous medium transmission and recovery part, modification treatment part and microwave heating part.

The developed modification equipment is employed to conduct modification treatment. The modification treatment process of linen fiber is as follow: drying the moisture, immersing it into liquid modification medium for modification treatment, removing the modification medium, pumping in air and removing the linen fiber. Through the treatment, the physical and chemical properties of linen fiber are improved.

### 2.2 Linen Fiber Property Test

The experimental materials are three pure linen plain woven fabrics designed by the company, among which, sample 1 is the linen fabric not going through modification treatment, sample 2 is that going through preliminary modification treatment, and sample 3 is that going through refined modification treatment.

The experiment is carried out in a laboratory with constant temperature and humidity (temperature:  $20 \pm 2^\circ$ , humidity:  $65 \pm 3\%$ ).

#### 2.2.1 Test of the Hairiness form on the Surface of Linen Fabric

10 small samples of  $3 \text{ cm} \times 3 \text{ cm}$  are clipped from each sample fabric and the yarns around the four sides are unweave to turn into the size of  $2 \text{ cm} \times 2 \text{ cm}$ . The fabrics are folded along the same yarn and covered with glass slides, then are placed on the loading platform of optical microscope. The protruding hairiness on the head of folded yarn is observed with the magnification of 200 x. The diameters of the upper, middle and lower parts of each hairiness is measured by using CAE measuring software in the optical microscope, and the mean value is calculated as the diameter of hairiness, then count the quantity of the protruding hairiness on the yarn per 2 cm.