A New Test Method to Characterize Torsional Behavior Woven Fabrics

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ABSTRACT

In this research, the torsional force of worsted fabrics was investigated using a unique developed test method. In order to study the torsional force of worsted fabrics in a cylindrical model subjected to different torsional strains, an apparatus was designed and constructed and data acquisition and micro-controller systems were used. Different worsted fabric samples with different wool and polyester fiber compositions and fabric designs were prepared and then tangential force namely torsional force was continuously measured along two warp and weft directions while constant torsional strain (25.24≅25, 32.14≅32 and 60 degrees) imposed on the specimen. The results showed that the torsional force of worsted fabrics is significantly influenced by fiber viscoelastic properties and used spiral shaft type. It is shown that with increase of torsional strain, the torsional force is increased along weft and warp directions. The results indicates that with a spiral shaft of 60 degrees, the torsional force of all fabric samples are almost similar particularly for fabric samples tested along weft direction. The results of this research revealed that worsted fabric sample with a higher polyester fiber content exhibited a higher torsional force value. The result of this research suggests that using a spiral shaft of 32 degrees corresponding to AATCC wrinkle recovery tester [5] is preferable in measuring torsional behavior of worsted fabric.

KEYWORDS

Worsted fabric, torsional force , torsional strain, data acquisition, micro-controller.

1.INTRODUCTION

It has been considered that when a fabric undergoes the influence of external compression and torsional forces, the fabric will bend and buckle in different directions and hence wrinkle will be created into the fabric. Thus, torsional properties of fabric are important in clothing manufacturing, wear, washing and drycleaning processes.

There are little studies investigated the torsional behavior of worsted fabrics. Skelton and Freeston [1] investigated the shear deformation of a rectangular specimen formed into a cylinder subjected to an axial load. They related theoretically the shear stiffness of the fabric to the cylinder axial load, various geometrical parameters, angular rotating, and the tangential force. The authors designed an apparatus to measure the tangential force against shear deformation for loom state, heat-set and coated fabrics. Shinohara *et al.*,[2],[3] analyzed the garment wrinkling by deforming a fabric cylinder in axial compression. They found that the buckling pattern generated in knitted fabrics is different from that in woven fabrics. In their further theoretical work, they proposed a mathematical model to describe the buckling deformation of a woven fabric cylinder in axial compression. Basset *et al.*,[4] reviewed the experimental methods for measuring fabric mechanical properties and discussed the proposed test methods for cylindrical specimens of permeable fabrics. In AATCC wrinkle

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