INVESTIGATION OF MICROWAVE TREATMENT EFFECTS IN THE JUTE TENACITY

Felicia Syrén, Nawar Kadi, Joel Peterson
Department of Textile Technology, Faculty of Textiles, Engineering and Business, University of Borås (Sweden)

Abstract

Jute is a suistanble cellulose fiber, it is limited for use in some applications due to its low spinnability. Microwave treatment for jute yarn has been used in this reseach, where the jute was subjected to microwave treatment in two different states: unfastened, and fastened. The effects in mechanical properties depend on the state during treatment. The higher tenacity and elongation resulting from the treatment makes it possible for jute yarn to be used in a broader range of applications.

Introduction

Jute is a biodegradable material made from cellulose. Such a raw material enables an opportunity of producing sustainable products. It is not enough however, to use an environmentally friendly material, but the process of the material must also be considered. When the material properties suit the product demands, not much of processing is needed. The properties of jute are well suited for the traditional uses such as packaging materials and ropes. But for jute to be used in other applications than the traditional ones the properties need to be modified.

Microwave treatment has been used for several reasons on different materials. It is rapid and can be used without any chemicals. Some examples of areas where microwave treatment has been used are: for extraction of natural fibers, for enhanced coloring, and for composites where microwave treatment is used for surface modification of the fibers aiming at better adhesion between matrix and fiber reinforcement. There has been no or little previous research on microwave treatment of jute aiming at increasing the tenacity for enhanced spinnability

Materials and Methods

A jute yarn was chosen to be subjected to the microwave treatment where the jute yarn was soaked in tap water 24 h before the treatment in microwave (Figure 1).

The microwave treatment was done with a microwave capable of 800 W output. After treatment, the samples were dried at room temperature for one week.

The tensile properties of the yarn was measured by a tensile tester from Mesdan Lab with 0.1 kN load cell. ISO standard 2062 was chosen with sample length 250mm.

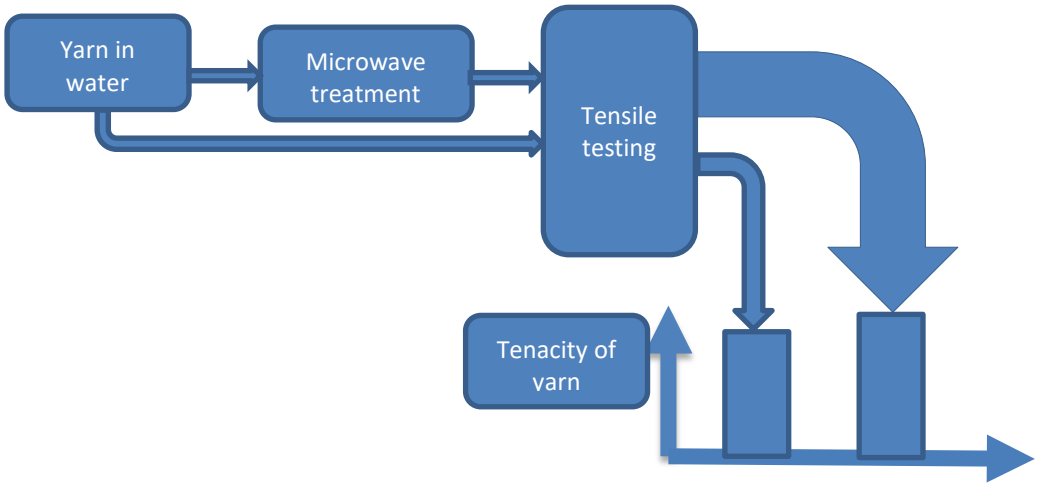

Figure 1: Treatment method and testing.

Results

The results from tensile testing can be seen in Table 1. The table summarises several treatment combinations where both time and effect are varied.

Table 2: Tensile test results.

State	***Tenacity CN/Tex***		***Elongation%***	
	Before	***After***	***Before***	***After***
Fastened	*12*	*16*	*2.8%*	*3.3%*
Unfastened	*13*	*14*	*4.5%*	*5.3%*

Discussion

Improvements in tensile properties can be seen with tensile testing of treated samples. FTIR reveals that no change in the molecular bonding has occurred due to the treatment. In fastened state a tenacity increase of 35 % has been achieved through the microwave treatment. The elongation has been increased by 20 % for the unfastened state compared to the fastened.

Summary

The jute was subjected to microwave treatments in two different states: unfastened, and fastened. The effects in mechanical properties depend on the state during treatment. The unfastened state increases the elongation of the jute yarn. For the fastened state, the treatment increases the tenacity. The higher tenacity resulting from the treatment makes it possible for jute yarn to be used in a broader range of applications.

Literature

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