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DEVELOPMENT OF TEXTILE COMPOSITE STRUCTURES FROM AMAZON LATEX . MECHANICAL AND THERMAL ANALYSIS

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ABSTRACT

This paper analyzes the mechanical and thermal behaviour of handmade and industrial composite fabric coated with natural rubber and wich aspect is similar to leather. They are produced in the Amazon forest and the industrial process will be developed in São Paulo State of Brasil. The thermal parameters, evaluated by ALAMBETA instrument, present small variations in the different materials, but is possible to conclude that these composite structures present good response when analyzing thermal behavior.

Keywords: natural rubber, textile composite, mechanical properties, thermal behavior.

INTRODUCTION

Science presents great advances in the research of new materials, methods, equipment and processes less harmful to the ecosystem. The composite fabrics made of natural rubber resin, from the Hevea brasiliensis, are very important to many families in their livelihood, and each tapper contributes to the preservation of 300 acres of forests.

This present investigation which aims to point out in the thermal properties wich are important to facilitate the commercialization of the composites, because the studies in bio-composites area are few. It is a new product, so all the scientific and technology production processes information are very important [1], [2]. Today's consumer wants to know their clothes and shoes, and the demand for new products should be established and managed by several aspects like comfort, durability, be attractive and sustainable [3]. So, it´s possible to say that the used materials must meet strictly specific and basic application to meet the market without losing the required performance for a particular function, or durable materials hindering the end of the life cycle.

This trial was conducted at the Department of Science and Textile Technologies, University of Beira Interior Portugal, (UBI). The composite fabrics analyzed are handmade and smoked by vulcanization, which are the smoked forest fabric (TFD or SFF), fabrics of the forest in an oven vulcanization (TFE of OFF), which samples provided by COOPFLORA - reserve of tappers of Machadinho d'Oeste in Rondonia, in the Amazon, and industrial laminated fabric (TLI or ILF) manufactured in the state of Sao Paulo by Ecologica Laminados S.A.

ALAMBETA is a device which measures the thermal comfort, using parameters such as thermal conductivity, heat resistance and physical thermal absorptive. It simulates the sensation of heat and cold in dry or wet tap that determine the so-called thermal comfort important for shoes and clothing. The test was performed in the Laboratory of Physical Testing and Laminated Textiles of UBI, following the guidelines for the use of the device,

including air conditioning anticipated to the specimens, being the tests divided in dry and wet state. Five test tubes of each structure are retired from different zones of the fabric (due to irregularity of the material) measuring 100 mm ² and properly weighed on precision scales.

In addition to the aforementioned properties, the thickness of each specimen was also measured. After testing in dry state, tests in the wet state were conducted, where with a syringe 3 ml of water, containing detergent solution, was dispersed for a period of two minutes, so it spread under the fabric. Following the tests in wet state, the values were reported and calculated the averages.

RESULTS AND CONCLUSIONS

The materials studied here consist all of a cotton base coated with polymer of natural rubber, which thermal variations were minimal compared to one another. The analysis of Table 1 show a better thermal performance in the fabric cured in the forest in dry state, and minor differences in wet state. It presentes slightly higher thermal resistance and thermal conductivity, but thermal absorptivity slightly lower, being synonymous of a better thermal performance. It is worth noting that in the wet state the smoked fabric offers the best thermal behavior of the three analyzed, although the differences are minimal. Thus the cured fabric presents a better thermal performance of the three investigated composites.

Table 1 - Thermal Analyses Results

Parameters	**Thermal Resistance m2ºK/W (r)**		**Thermal conductivity W/mº (λ)**		**Thermal absorptivity W.s1/2/m2ºK (b)**	
Fabrics	Dry state	Wet	Dry state	Wet state	Dry state	Wet state
T Industrial. Laminated	7,96	state	520.8	774.2	89,94	130
T. Forest Smoked	8,36	5.62	456.6	767.6	72.6	95.26
T. Oven Forest	6	6.38	568.4	781.6	90.76	101.68
		5.5				

We can state that the smoked fabric of the forest is the one that presents the best thermal performance in the dry state, among the three fabrics studied. However, in the wet state, regarding the thermal performance of the three main thermal properties analyzed, it was impossible to select the material that presented the best thermal performance, due to the similarity of thermal properties results values.

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