JUTE FABRICS WITH PHASE CHANGE MATERIALS USED FOR DECORATION.

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EXTENDED ABSTRACT

Key Words: Jute, Microcapsules, Thermal, PCM.

1. INTRODUCTION

Natural fibers have been used since anciently. Regarding fibers for clothing there are some traditional fibers which have been disdained due to their toughness and hard touch. However, nowadays due to the increase on environmental concerning, their importance is increasing as they are considered as suitable ones for different purposes such as composites, construction, automotion, etc. [1]. Among those fibers is the jute one. It has been used for carpets, sacks or bags and they can be considered for use in alternative uses such as decorative elements in construction. Fabrics made with jute can be used as a rustic decoration on walls. Nowadays fabrics are not dedicated to coverage aspects and they can even include new properties by means of functionalization. Functionalization can be conferred by the application of some finishing process which allow to add on the fiber surface some chemicals. The use of microcapsules [2] for real purposes, micro and nanoparticles [3], is increasing in the last years.

The objective of the project was to study the fiber density influence on the thermal behavior when treated with PCMs. Two jute fabrics with different densities of fibers were treated with PCM microcapsules and their thermal behavior is analyzed.

2. EXPERIMANTAL

2.1 Materials

In this study, two jute fabrics with different densities of fibers (220 g/m2 and 300 g/m2) were treated with microcapsules Fabrics were supplied by Antonio Ferre, S.L. Spain. Phase Change Materials (PCMs), CENTERFINISH C-25, were supplied by Color-Center. Spain, were applied by coating on the back side of the fabric in order to improve the fabric properties and not only confer decorative function but thermal insulation as well. The coating paste was made of Lutexal CSFN as a thickener and Resina center STK-100 supplied by Color Center- Spain as binder.

2.2 Methods

Lutexal CSFN liq from Archroma in a ratio of 30 g/kg was used to give viscosity to the paste. This viscosity is needed to print the fabrics. Resina center STK-100 was used in a ratio of 10 g/kg. The products were thoroughly mixed with a mixer. In the end microencapsulated PCMs CENTERFINISH C-25 were added to the paste in a ratio of 100 g/kg. The paste was calmly but thoroughly mixed with a spatula. Once no microcapsules were mixed in, the paste was mixed with the mixer again.

Phase Change Materials (PCMs), were applied onto fibers by coating on the back side of the fabric in order to improve the fabric properties and not modifying the decorative function. Once the coating was finished, fabrics were dried by an infrared heater at 150º C.

For every fabric, the untreated fabric, treated fabric with PCM and treated fabric without PCM was tested. Every fabric was heated for 2 minutes and cooled for 2 minutes. A TESTO 865 thermal imager was used to precisely measure the temperature of the fabric every 15 seconds. Every measurement was also repeated three times and eventually the average was taken.

Samples were gold coated in order to berve them by means of aScanning Electron Microscope (SEM) Phenom Microscope (FEI Company, Hillsboro, OR, USA)a JEOL.

3. RESULTS

Once the microcapsules were applied on the fabric, it was observed with the SEM. Figure 1 shows the presence of the microcapsules on the fabric, concisely it is the fabric with jute 220 g/m^2. Figure 2a shows the original fabric with a region containing Microcapsules and a region where they were not applied. Figure 2b shows the thermochromic camera during the test. Table 1 shows the maximum temperature the fabric reaches after 135 seconds of heating.

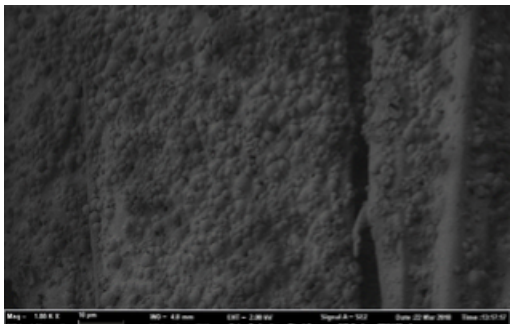
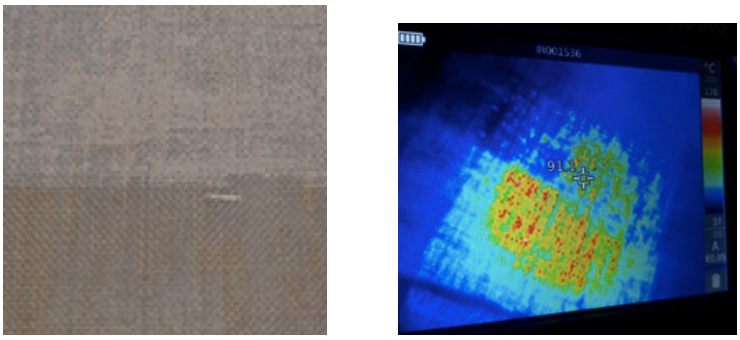


Figure 1. Microcapsules presence on the fabric.

Table 1. Temperature (º C) on the fabric at 120 seconds

SAMPLE	JUTE 220	JUTE 230
UNTREATED	96,5	89,6
COATED WITHOUT PCM	90,4	87,3
COATED WITH PCM	80,6	78,5



a) b)

Figure 2. Jute fabric a) partially coated. b) During thermal test.

Results showed, as it was expected, there was a difference on the thermal behavior when microcapsules were on the fabric. However, it was demonstrated the fabric with more fibers could keep the temperature better than the fabric with less fibers. It is due to the heat transmission across the air remaining on the fabric, as it can be clearly observed in figure 2b.

4. CONCLUSIONS

Jute fabric shows a rustic appearance what makes it suitable for some decoration on walls or any other decorative element. However walls and window imply a wide area to exchange heat and saving energy is an important issue. With this results, we have demonstrated PCM can improve the efficiency on the buildings heating when included on decorative elements. Moreover, the higher density of fiber, the higher efficiency on the thermal insulation. Thus, fabrics should be selected with the highest density and further work should be done to determine the PCM concentration to be optimized.

5. REFERENCES

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