Evaluation of functional textiles: conditions for functionalization.

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Abstract
The study of conditions for the impregnation of microparticles, produced by complex coacervation, in textile fibers is the main step to confer new properties to fabrics via microtechnology. Aspects of durability of the new function and preservation of the properties of active cores may be ensured in the impregnation process. The purpose of this study is to evaluate the impregnation of microcapsules in different textile fibers, using binders and natural alternatives to improve their fixation.

Key words: Textiles, Impregnation, Microencapsulation.

Introduction
The Brazilian textile industry accounts for about 20% of the national manufacturing industry and its main pole is located in Americana, São Paulo. Traditionally familiar, this sector has suffered, in recent years, with the entry of Asian fabrics in the market. This crisis encourages to the pursuit of alternatives that offer competitive advantage to national fabrics. Thus, the concept of microencapsulation gains space in the textile industry, as it can revolutionize the utilities of fabrics, which may give them new functions such as thermoregulation, repellents, aromatization, and antibacterial, among others. The purpose of this study was to evaluate different fixation conditions of thermoregulatory microparticles in textile fibers, through impregnation. The microparticles were produced by complex coacervation and different concentrations of microparticles, types of fibers and binders were evaluated for impregnation.

Results and Discussion
To optimize the production method, the particles were thoroughly produced with different combinations of polymeric materials (Gum Arabic, Gelatin and Chitosan) and containing as active ingredient an essential oil (D-Limonene).

Before testing thermoregulatory particles, the Foulard impregnation tests were conducted to determine the most relevant variables. We evaluated raw cotton and polyester (directly taken from the loom, without any treatment), concentration of particles in solution and the type of binder used - alginate (natural) and Rolflex ZB/7 (synthetic).

From the visual assessment (Scanning Electron Microscopy) of these fabrics, it was observed that cotton has greater capacity for absorbing particles, being more suitable for functionalization. The concentration of particles in the bath was found to be irrelevant and the natural binder was shown to be as effective as the synthetic one. To get a more quantitative measure of the particles’ fixation, thermogravimetric tests will be performed on the tissue containing the thermoregulatory particles. These particles were made with the three polymer combinations and using, as active material, paraffin 140 (FP = 50 ° C). The particles without cross-linking could not resist to temperatures above 90 ° C and were cross-linked with a chemical agent (glutaraldehyde).

The thermogravimetric tests are underway and, with them, we intend to reach definitive conclusions regarding the best conditions of this process.

Conclusions
So far, it was concluded that the cotton fibers have better conditions for the impregnation of particles and the concentration of the bath used is irrelevant to the outcome of the process. Furthermore, it was discovered that the natural binder resembles synthetic ones, once their results are compared. It was found that the particles need to be crosslinked for the impregnation to be efficient and for the active material’s characteristics to be preserved.

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