

RESEARCH REGARDING TEXTILE ARTICLES WITH THERMO-REGULATING PROPERTIES

Marius BUTUC¹, Costea BUDULAN², Gabriela BOHM³

¹ *Technical University Gh. Asachi - Iasi, Faculty of Textiles - Leather and Industrial Management, Romania*

² *Technical University Gh. Asachi - Iasi, Faculty of Textiles - Leather and Industrial Management, Romania*

³ *University of Oradea, Faculty of Textiles and Leather, Romania*

E-mail: marius.butuc@yahoo.com

Abstract

Phase change materials are tiny paraffin-filled microcapsules that store and release energy according to the temperature of the environment. During the period of activity these materials store or release the excess heat generated by the body. Thermo-regulating materials like knitted fabrics can be obtained by using yarns with PCM's or by finishing a normal knitted fabric with PCM. A short description of the processes that can be made to obtain thermo-regulating knitted fabrics will be presented on this paper.

Key words: phase change materials, heat, thermo – regulating fabrics, microcapsules

1. Introduction

The application field of micro-encapsulation process is now focused on different areas. Nowadays this process is used to make: fragrance finishes, cosmeo-textiles, phase change materials, aroma therapy, thermo-chromic or photo-chromic dyes, flame retardant fabrics, etc. Our intend in this paper is to present the developments and innovations of the micro-encapsulation process in field of thermo regulating fabrics.

2. Micro-encapsulation

Micro-encapsulation is an upcoming technology that textile manufacturers are looking to keep ahead of the competition. Companies in this sector are challenged to find innovative materials to provide benefits. Proprieties like easy-care, anti-microbial, anti-static, flame-retardant, thermal and moisture control are now ubiquitous as consumers come to expect high performance from their everyday wear. The race is now to find new ways of adding performance features and value to textile products.

This procedure is used to trap solids, liquids or gases within a barrier layer made from plastic, gelatine, starch or other materials which protect and isolates them from evaporation, oxidation or contamination. The encapsulated core product can be released either by breaking the barrier layer or it can be stored inside the microcapsule to provide a long term benefit.

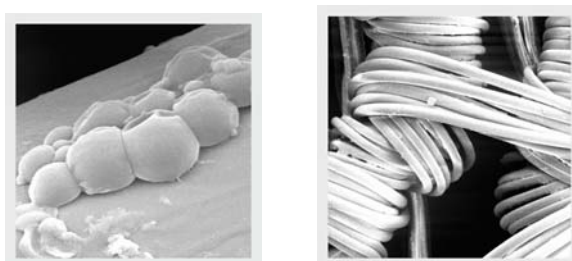


Figure 1. Microcapsules

3. Phase change materials

Phase change materials (PCM's) are tiny paraffin-filled microcapsules that store and release energy according to the temperature of the environment. During the period of activity these materials store or release the excess heat generated by the body. For example in cold weather, PCM's act like a thermostat, automatically returning the stored heat to the body, or in warm weather pull the heat away from the skin, providing cooling comfort.

Textile materials with PCM's or with other words textile materials with thermo-regulating properties can be classified in three categories:

- Fibres – with PCM's as a staple in the admixture composition (a)
- Textile support (fibres, yarns, knitted – woven – non-woven fabrics) – which is covered with PCM's film after a finishing process (b)
- Composites materials – textiles materials made by several layers of different textile with PCM's used as a staple and/or with PCM's film (c)

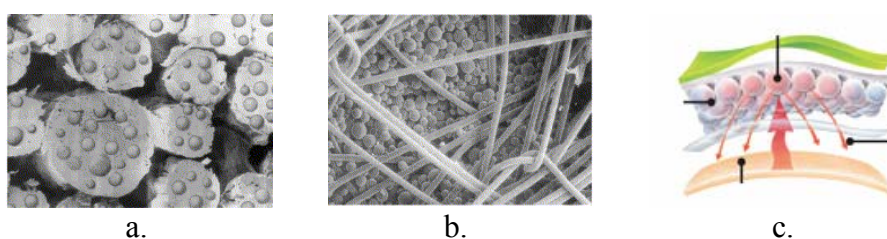


Figure 2. Textile supports with PCM's

4. Yarns with thermo – regulating properties

Yarns with thermo-regulating properties can be obtained by using two methods. The first one is by using fibers with PCM and the second one is by using a finishing process to apply PCM on the yarn.

The first method for obtaining yarns with PCM is a spinning process adapted to every type of the yarn that must to be produced. The only thing that needs to be considered is the spinning temperature which must be kept in the normal parameters so that the PCM properties can remain the same.

For the second method the yarn with thermo-regulating properties is obtained after a finishing process in which is applied the PCM. This finishing process can be made by using a mix of PCM microcapsules, surfactants, dispersants, anti-foam agents, thickeners.

The finishing process with PCM microcapsules can be realized in several ways like:

- Reverse roll coating – figure 3.a
- Gravure coating – figure 3.b
- Immersion coating – figure 3.c
- Slot die coating – figure 3.d
- Air knife coating – figure 3.e

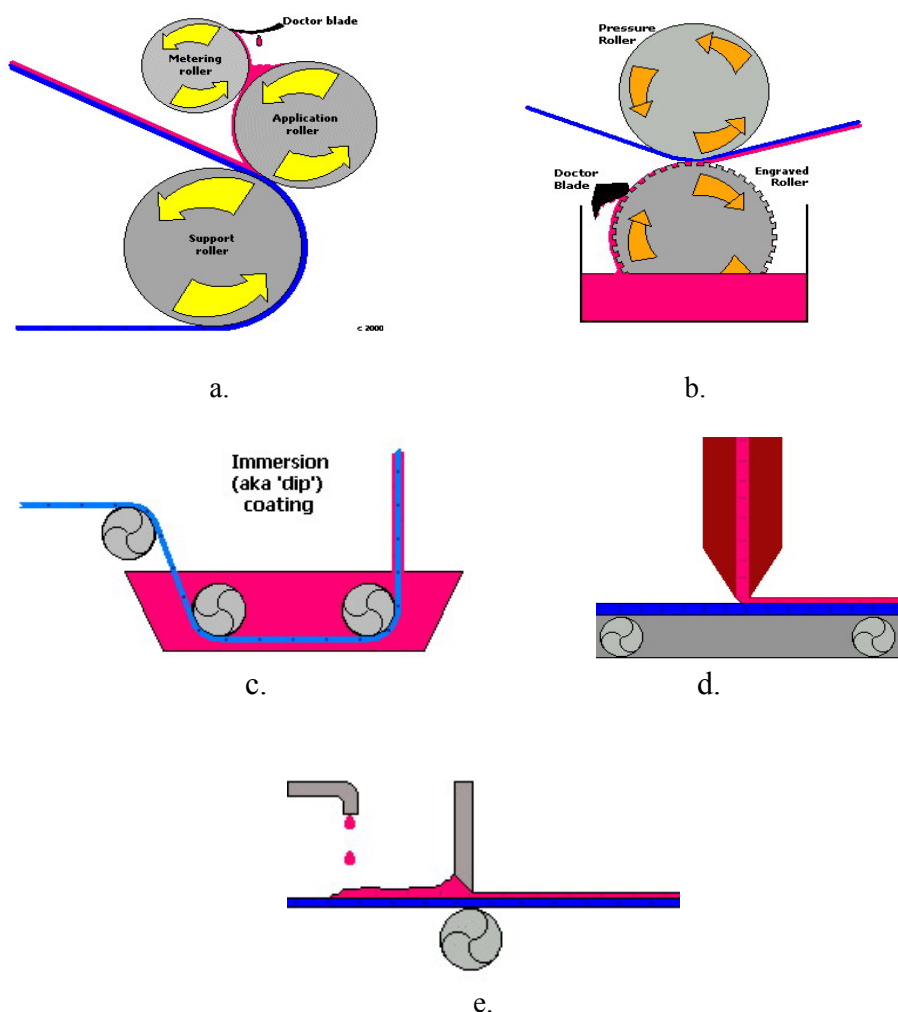


Figure 3. Methods for finishing the yarns to obtain yarns with thermo-regulating properties

4. Conclusion

This new technology promotes development of high-tech textiles, characterized by unprecedented functions and effects. The example of combining tradition with innovation is represented by fabrics that have skin care activity, which are able to release on the wearer's skin cosmetics and perfumes agents. Widely spreaded are microcapsules containing active substances grafted onto the textile material or spinned into fibres, which can be released as a consequence of the human body heat and friction. Otherwise, the active agent can be transferred thanks to the humidity exchange between skin and fibers surface.

Good results of the micro-encapsulation products encourage further investigations to promote a low-priced technology for using these fabrics in mass production.

5. References

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