APPLICATION OF MICROENCAPSULATION TECHNOLOGY IN THE FIELD OF TEXTILES

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Abstract. Another area of application of the microencapsulation technique in the textile industry is fire resistance. Diammonium phosphate compounds, which have been used for many years to add flame retardant properties to cotton products, are coated with polyurethane (PU) and polyvinyl alcohol (PVA) and applied to textile materials with successful results.

Key words: microcapsule, textile, proteins, hormones, cell, durability, color, polyurethane (PU), polyvinyl alcohol (PVA).

Nowadays, various proteins, bacteria, hormones, cells, dyes, pigments, catalysts, adhesives, nutrients, polyelectrolytes, vitamins, agricultural chemicals can be microencapsulated.

Microencapsulation is the storage of various chemicals commonly used in daily life, such as proteins, dyes, drugs or cosmetics, in a suitable shell in liquid, gas or solid form.

The appearance of microcapsules is characteristic of the core material, the physicochemical properties, the composition of the wall material and the microencapsulation technique differ accordingly. The development of microencapsulation products began in the 1950s as a result of research into the production of pressure-sensitive carbonless copy paper.

Suitable chemicals, physicochemical and biological methods are used to give functional properties to textile products. It remains the most important alternative approach to developing these features. Physico-chemical methods using high energy are now being replaced by classical wet processes. Improving the properties of a fabric or fiber is achieved by improving performance by physical, chemical and biological methods. This gives the product features such as comfort, softness, aesthetics and ease of use. Major improvements; properties such as wrinkle-free, flame-resistant, dirt- and water-proof, resistance to microorganisms, insects, moths and fungi, light and heat resistance, non-shrinkage, weather resistance. New techniques used to obtain these properties include coating, plasma techniques, microencapsulation, grafting or homopolymerization, crosslinking agents, or treatment with resins.

Microencapsulation technology is widely used in food, medicine, cosmetics, agriculture and other fields. Microencapsulation, attracting attention with the new properties and values it brings to medical and technical textiles, provides the effects of finishing processes that cannot be achieved by other methods or, even if possible, are too expensive. With the microencapsulation technique, it is fragrant, changes color depending on the temperature, has an insect repellent effect, does not burn, moisturizes and relaxes the body, and prevents the appearance of cellulite.

In the early 1990s, apart from a few commercial applications that remained at the research and development level, it can be said that the textile industry has been very slow to take advantage of the possibilities of microencapsulation. However, by the year 2000, significant changes were observed in the textile industry in Western Europe, Japan, and North America. The interest in developing countries is to provide medical and technical textiles as a one-stop solution with new features and added value, or is much cheaper than other methods. The most interesting topic in this area is applications in durable fragrances and humidifiers. Other applications are insecticides, dyes, vitamins, antimicrobials, phase change materials, antibiotics, hormones and other drugs.

Microencapsulation technology was first investigated by the US National Aeronautics and Space Administration (NASA) in the 1980s. Microencapsulation in phase change materials (PCM) was used to reduce the clothing's exposure to additional temperature changes encountered by astronauts during their space missions. These phase change capsules are especially used for outerwear (shirts, vests, snowsuits) and in homes for carpets, blankets and pillows. Studies on the synthesis of microcapsules containing phase change materials have been carried out at the Polymer Research Institute in Korea. There are many studies to determine the temperature regulation factors of textile structures containing phase change material, to determine their performance and to apply them in multilayer fabric systems.

Since 1979, Ronald T. Dodge has been manufacturing and developing microcapsules for a wide range of industries. Its main lines of business are clothes and socks. 8-20 times for clothes and 10 times for socks. Matsui Shikiso Chemical Co. developed a method of attaching aromatic compounds to fabric using microcapsules. Encapsulated compounds usually include musk, amber, pineapple, fruity scents. LJ Specialties manufactures microcapsules in England and other countries to add a cool feeling to products such as bed linen, towels and clothing, as well as cologne, fruity scents such as apple and orange, as well as pizza or cola. In 1989, T-shirts made of photochromic printed fabric were launched by the Kanebo company. A group of researchers in France applied glycerin stearate and silk protein moisturizers encapsulated in bandages and socks. Convenience is ensured if the resulting material is in direct contact with the skin.

There are many studies on microencapsulation of aromatic and fragrance oils in melamine formaldehyde, poly(L-lactide) and cyclodextrin, application in textile materials, characterization and washing resistance. Menthol is one of the main ingredients used in encapsulation due to its calming effect.

Another area of application of the microencapsulation technique in the textile industry is fire resistance. Diammonium phosphate compounds, which have been used for many years to add flame retardant properties to cotton products, are coated with polyurethane (PU) and polyvinyl alcohol (PVA) and applied to textile materials with successful results. Fibers that change color with heat, light, and pH and coatings with optical, magnetic, and electrical properties are also used in military and commercial applications. In addition, there are many studies on the application of liposomes obtained by microencapsulation of dyes in dyeing processes, especially in wool dyeing.

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