NEW TEXTILES - LOOKING INTO THE FUTURE

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Abstract: *The work presents new projects in the field of textiles. Considers new applications, materials and technologies for medicine, sports, defense industry. It is especially important to emphasize the positive impact on environmental protection. The increasing use of agricultural products in obtaining new fabrics contributes to the quality of life and environmental protection.*

Keywords: textiles, agriculture, environmental protection, medicine, defense.

NOVE TKANINE – POGLED U BUDUĆNOST

Apstrakt: *Rad predstavlja nove projekte na polju tekstila. Razmatra nove primene, materijale I tehnologije za medicinu, sport, odbrambenu industriju. Posebno je vazno naglasiti pozitivan uticaj na zaštitu životne sredine. Sve veća upotreba poljoprivrednih proizvoda u dobijanju novih tkanina doprinosi kvalitetu života i zaštiti životne sredine.*

Ključne reči: tekstil, poljoprivreda, zaštita životne sredine, medicina, odbrana.

1. INTRODUCTION

The increasing use of ecological fabrics in the fashion industry is a trend and an important part of the industrial system. One of the biggest polluters in the world is the fashion industry whose fashion production is burdened with potential impacts on the environment. Fibers and ingredients used in fashion have caused various forms of environmental pollution.

For example, the most common polyester fiber in our clothes, the production process not only consumes a lot of energy, but also requires a lot of oil and releases a lot of waste. Volatile monomers, solvents, and other byproducts of polyester production are released with the factory's wastewater, affecting water, air, and soil. More and more serious environmental problems are not only seen and felt by ordinary people, but attract the attention of more and more fashion manufacturers, and the importance of eco-fashion is gradually increasing. The use of environmentally friendly fabrics and recycled fabrics not only reflects the brand's responsibility to improve the environmental environment, but also an important trend in the development of the world's textile industry [1].

2. NEW INNOVATIVE PROJECTS

2.1 Reduction of emissions and energy savings through technological innovations

The use of high-quality equipment and technology has greatly improved production capacity and product quality, while reducing costs and promoting energy conservation and environmental protection. Dyeing through cylindrical packages can reduce the dye bath ratio and save dyeing materials; at the same time, through the intelligent operation of the manipulator, automatic filling of yarn, dehydration and unloading of yarn is achieved; the paint barrel uses pipelines to automatically transport chemicals, can

avoid environmental pollution. These industry-leading technologies can improve production efficiency, save water and electricity, reduce sewage discharge, and achieve the goal of environmental protection through intelligent production with a high degree of automation and good early warning performance.

2.2 Sustainable development and fashion

Fashion should be sustainable fashion. It should not only bring good looks and self-confidence to people, but it should be healthy, useful for the development of the country and sustainable. Natural fabrics, organic fabrics, vegetable fabrics, man-made biodegradable fiber fabrics, recycled fabrics, functional/innovative fabrics, green dyeing and finishing fabrics, these seven product series are eco-friendly fashion fabrics. For example, pineapple leaf fabric is extracted from discarded pineapple leaves, and after further processing it can be mixed with natural or synthetic fibers. Its production does not require soil, water, pesticides, fertilizers, and it also cannot create waste materials. Its woven fabric is easy to print and dye, sweat absorbent and breathable, crisp and wrinkle-free, and can replace leather products. Scientists from Australia added bacteria to wine and thus created a cotton-like material that can be used to make t-shirts, dresses, and swimwear. In addition to wine, beer, such as Guinness beer, can also be used for this type of production. A type of non-pathogenic bacteria (aceobacteria) is used for this fabric, which is added to the wine and turns it into a crust that floats on the surface. This layer is collected and dried on the model of the inflatable doll and thus slowly takes the desired shape of the dress, which during this process of creation does not have a single seam. When the doll is blown, a finished product is obtained that has the required shape of the dress. However, the material is like paper, tears easily, and should be damp while wearing, while still feeling like alcohol. Scientists hope to find a way to strengthen this type of material and eliminate defects.

Australian scientists led by Dr. Gary Cass, in collaboration with artist Donna Franklin, designed several pieces of women's clothing made of red wine. Scientists have introduced bacteria into the wine that turns the wine into vinegar, and during this process foam is created on the surface, which is collected and dried on mannequins to get the desired shape. In this way, a material similar to cotton is obtained, which is not yet strong and durable enough, but scientists have still managed to make dresses, T-shirts and swimwear out of it. The wardrobe, scientists say, can be made from any other alcohol, which can also be used to make medical plasters [7].

2.3 Cellulose yarn technology

A global specialty materials company whose products are widely used in various areas of people's

Figure 1: Red wine dress [2]

daily lives (Eastman (China) Investment Management Co., Ltd). At the same time, they are also a sustainable fiber producer. The latest Naia™ bio-based cellulose yarn launched in 2022 demonstrates the brand's sustainable commitment and major advances in cellulose yarn technology.

2.4 Recycled fabrics from plastic bottles

In 2007, Unifi found its true mission with the development of REPREVE® recycled fiber, taking sustainability to a whole new level. REPREVE® is the world's leading brand of recycled fibers. To protect the air, land, sea and other natural resources that people depend on, they transformed more than 21 billion recycled plastic bottles into recycled fibers for clothing, shoes, household items and other consumer products. Using recycled polyester instead of virgin polyester can reduce carbon emissions, give otherwise-waste plastic bottles a second life and keep them out of oceans and landfills.

2.5 Products come from natural, environmentally friendly, biodegradable

Sateri is one of the global leaders in the cellulose fiber industry, able to provide a complete product line of carbon-free solutions. Its EcoCosi®, Sateri Liocell and FINEKS™ have all received carbon-neutral PAS2060 certification. and received the carbon neutral label from SGS, an internationally recognized independent testing organization, to meet the diverse needs of the product.

2.6 Biodegradable rare fibers

A Japanese chemical company (Asahi Kasei Co., Ltd.) that has developed in many fields, Bemberg is a brand of regenerated cellulose fibers produced by Asahi Kasei, which has a history of more than 90 years. The raw material of Bemberg is cotton linter, a by-product of the processing of cottonseed oil. This material can be biodegraded by nature and returned to the soil to make compost without harming the soil. At the same time, the company strictly manages the chemical substances used in the production process and continuously improves and improves the production process through its unique closed-loop copper and ammonia recycling system to better promote the sustainable development of society. The surface of Bemberg fibers is very smooth and does not tend to rub. From the moment of contact with the skin, you can feel continuous comfort, which can make the movement of body parts more free and unhindered. The beautiful dyeing performance, luster and unique feel also make it exude a full sense of presence, moreover, Bemberg fibers contain a lot of moisture, which can keep the inner environment of the clothes comfortable regardless of the season.

2.7 Build a zero-waste life cycle and promote sustainable development

Bossa Denim is one of the largest integrated textile companies in Turkey. Since 1951, Bossa has been actively engaged in the protection and preservation of the environment, human health and social conditions. They define "sustainability" as "continuous development that helps meet the needs of the present without compromising the ability of future generations to meet their own needs." To this end, Bossa has implemented a number of projects and initiatives such as on-site water pretreatment and full biological treatment, energy saving and recycling, separation and on-site use or offsite recycling of all solid waste, use of environmentally friendly waste raw materials, colors during the production cycle and processed substances.

2.8 Self-repairing fabrics

The most interesting are fabrics that are designed to repair themselves with a drop of water. Penn State University scientists have produced a special coating for treating textiles such as cotton, wool and silk, which enable "self-healing", protecting farmers from organophosphate pesticides, soldiers from biological weapons, and workers from toxic chemicals. The fabric treatment procedure is relatively simple. Textiles are dipped in multiple liquids to create layers of material that form a "self-healing" polyelectrolyte coating. "The coating is fabricated at low cost under ambient conditions in safe liquids such as water, and can be easily scaled," the scientists write in their study published in the journal ACS Applied Materials & Interfaces. "Polyelectrolytic covers are made of positively and negatively charged polymers, that is, in this case, polymers such as those found in the proteins of octopus jaws," say the experts.

During layering, enzymes can be incorporated into the coating, and the scientists used urease, an enzyme that breaks down urea into ammonia and carbon dioxide, but in commercial use, enzymes that match the target chemical could be used. "If you want enzymes for biological and chemical effects, you can use an encapsulated enzyme with self-healing properties that degrades the toxin before it comes into contact with the skin," say the scientists, noting that the coatings are thinner than microns in size, making them invisible on

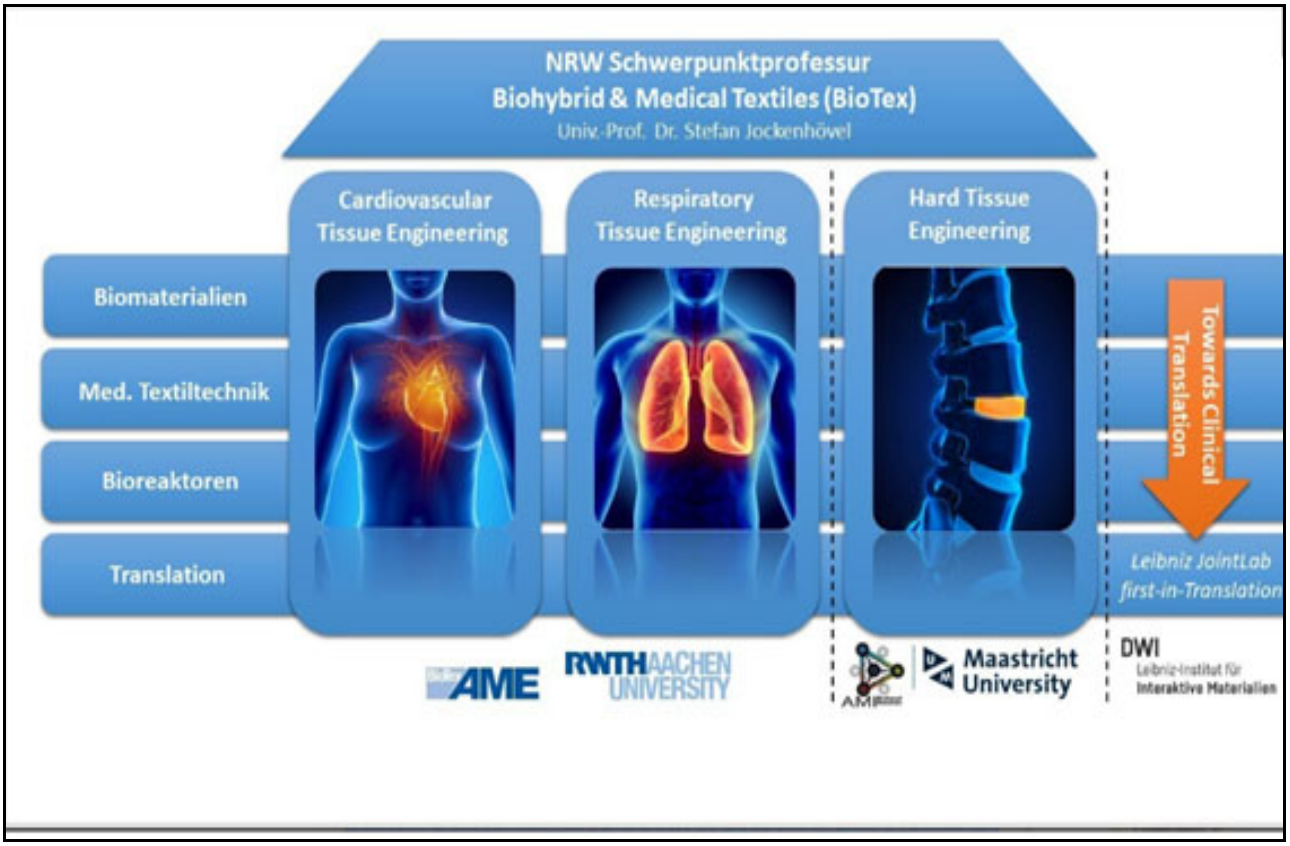

Figure 2: BioTex-medical textiles [4]

everyday clothing, but nevertheless, they can significantly increase the strength of the material [9,10].

2. 9 Fabrics from the BIOTEX project

NRV-Schverpunktprofessur Biohybrids & Medical Tektiles, BioTek for short, focuses on the development of sustainable biohybrid implants with the potential for remodeling, regeneration and self-repair. BioTex wants to make a significant contribution to the progress of (regenerative) medicine. We follow the mission of developing bioengineered solutions for clinical needs by combining functional materials and biological components towards biohybrid systems. Therefore, we set up the institute along the value chain from material development and processing to the development of biohybrid implants and biofunctionalization to (pre)clinical trials. The BioTek Institute is in strong cooperation with the Institute for Biobased Materials Aachen-Maastricht, director: Prof. Jockenhovel and DVI Leibniz Institute for Interactive Materials [2].

Textile-based sensors offer an unobtrusive method of continuous monitoring of physiological parameters during daily activities. Chemical analysis of body fluids, non-invasively, is a new and exciting area of personalized wearable health systems. Biotex was an EU-funded project aimed at developing textile sensors for measuring the physiological parameters and chemical composition of body fluids, with a particular interest in sweat. A wearable sensor system has been developed that integrates a textile-based liquid handling system for sample collection and transport with a number of sensors including sodium, conductivity, and pH sensors. Sensors for sweat rate, ECG, breathing and blood oxygenation have also been developed. For the first time, it was possible to monitor a number of physiological parameters together with the composition of sweat in real time. This is accomplished through a network of wearable sensors distributed across the body of the user subject. This has huge implications for sports and human performance and opens up a whole new field of research in the clinical setting.

In close cooperation with DVI, we were able to make a significant contribution to collecting the necessary third-party funds for the construction of the Leibniz Joint - Lab first-in-translation (fiT) at the DVI Leibniz Institute. In the autumn of 2020, the construction of the fiT began, which will allow us to manufacture our current pre-developments under GMP and GLP compliant conditions and validate them in the first clinical trials from 2022.

2.10 Intelligent clothing

European scientists, participating in the Biotex program, are developing clothing that will be able to monitor the health of the person wearing it. So-called "intelligent textiles" contain sensors that can monitor the composition of body fluids, such as blood and sweat. According to the researchers, such clothing will find its application in monitoring the health of patients who have just left the hospital, injured athletes or people suffering from chronic diseases. In the future, sensors capable of monitoring the wound healing process will be used, and with the help of detecting abnormalities in metabolism and early detection of diseases and infections. In the project, in which eight scientific institutions participate, a prototype of new clothing was developed, and the next step is to test it on a group of volunteers. Scientists note that such clothing will not be able to replace traditional diagnostic methods. Along with European, American scientists have developed clothing that protects against toxins, viruses and bacteria present in the air. The protective effect of the clothing is based on the invisible layer of nanoparticles with which it is covered. These particles are designed to "trap" viruses, bacteria and toxins present in smog.

2.11 Bio materials in the textile industry as protection against bacteria

According to research by the Economic Commission of the United Nations (UNECE), about 85 percent of all textiles produced in the same year end up as waste. The fashion and textile industry ranks high among polluters, just behind the oil and gas sector. The textile industry, according to today's business methods, is responsible for soil, water and air pollution. I hope we will change the system significantly, it is a good start to include the issue of ethics within these two industries. Biodesigners are already working on it, because we have to follow the rule that we must not hurt any being while working. And we also offer biomaterials from mycelium, bacteria, algae... which can be a new, healthy, exciting alternative" [3,6,8].

2.12 Rapid decomposition that feeds the soil

The characteristics of this biomaterial are resistance to water and temperature to a certain degree, as well as resistance to moisture. The main feature of biomaterials is rapid decomposition, which nourishes the soil. "When we combine the waste and the biobinder, we need to wait for the biomaterial to dry in the air, up to seven days, depending on the thickness. After drying, we can use the material for objects that will respect its characteristics," emphasizes Halilović [5].

3. CONCLUSION

New biomaterials have found a very important role in our future. The characteristics are good and the possibilities are great and significant, especially in the field of medicine, sports, defense, and climate change. Investing in this type of textile has already proven to be justified because the antiseptic properties of biomaterials have reached very high levels, where the principle of asepticity is realized in a high percentage. Further development of this type of textile is expected in the possible industry in the form of fabrics made from wine and other natural agricultural products [1,2,3,4].

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