PRESS RELEASE

DEUTSCHE INSTITUTE FÜR TEXTIL+FASERFORSCHUNG

March 29, 2023

SMART TEXTILES user forum in Switzerland for the first time

Living smart with smart textiles: timely detection and treatment of sleep apnea and atrial fibrillation. Optimize breathing and microcirculation. Analyze and stimulate muscle activity. Sitting and standing perfectly. Smart heating, lighting and building. These were the topics of the SMART TEXTILES user forum on March 15 and 16, 2023, at the Switzerland Innovation Park Ost in St. Gallen. On the first day of the event, Empa opened its laboratories and pilot plants and offered insights into its research. The Swiss materials research institute combines application-oriented research with the practical implementation of new ideas in the fields of nanostructured materials, environmental, energy and sustainable building technologies - as well as biotechnology and medical technology.

When textiles are equipped with electronic components, conductive yarns and tiny sensors, the potential applications are almost unlimited. These high-tech textiles are a global growth market. In St. Gallen, manufacturers and users presented amazing examples.

Making life easier and saving lives

In Western countries, one in four people lose their breath during sleep. Sleep apnea endangers the cardiovascular system and the brain. Diagnosis in sleep laboratories is time-consuming and capacities are limited. Intelligent textiles can be used to monitor patients' sleep in their familiar environment at home and accompany them during subsequent therapy. For this purpose, Empa is developing fiber-based sensor technology for the long-term measurement of body signals. The success of the treatment also depends on whether the textile is comfortable to wear, emphasizes Dr. Simon Annaheim. "A sweater that scratches also stays in the closet".

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Like sleep apnea, atrial fibrillation poses health risks. The risk of stroke is increased by three to five times with this cardiac arrhythmia. Long-term ECG recording via smart textile eliminates the need for complex cabling and is comfortable to wear. 24sens has launched the smartcorCONTROL project for this purpose in 2020.

Correct breathing can lower blood pressure, reduce stress and thus promote well-being and health. To this end, Nanoleq is equipping a T-shirt with a breathing trainer that activates by pressing a button on the fabric. A smartphone app accompanies the person through various exercises that have a relaxing or stimulating effect.

Microcirculation means the inflow and outflow of nutrients in the cells. BEMER has developed textile applicators that improve this circulation in the smallest blood vessels. This works for both humans and animals. For horses, a smart blanket is even used during operations. By optimally supplying the cells with the active ingredient, the anesthetic drug can be dosed lower. This reduces the risk of the horse falling and injuring itself when it stands up after waking up.

Other developments presented in St. Gallen include chairs equipped with sensor technology. The smart textile support not only protects people in wheelchairs from pressure sores, but also optimizes sitting behavior at the workplace with its feedback functions. Intelligent office furniture increases performance and well-being during sedentary work. The pelvic floor trainer from the same manufacturer shows that preventive health care can also be fun. "Gamification" is the keyword. Muscle power is used to control a video game that motivates users to exercise.

Measuring muscle activity, however, still poses challenges for smart textiles that could only be overcome with interdisciplinary collaboration. Measuring EMG signals is relatively easy, but there are major difficulties with interpreting the signals correctly, as they represent an overlay of many

individual biological processes, explained Marius Neugschwender of Noxon.

The field of health technology is growing rapidly and offers many potential applications for smart textiles. Many companies from the textile industry are therefore interested in entering this market. José Näf from Nahtlos AG explained how to enter this highly regulated industry. The company has been successfully marketing an ECG sensor technology developed at Empa, the host of this year's user forum, for several years.

Optimal lighting, smart heating and intelligent climate-friendly building

Forster Rohner Textile Innovations presented lights that can be folded and draped, are extremely lightweight and can be used in a variety of ways. On film sets, they provide optimal, pinpoint illumination without having to transport bulky spotlights and getting in the way. For military and police operations, the textile can be stuck into the tent and removed again exactly where the light is needed. Even medical interventions in disaster situations become possible at night or in twilight. Julia Fleischer showed how robust these luminous cloths are by crumpling it into a small ball in front of the audience and unfolding it again.

"PowerHeat" is the name given by the Sefar company to a heating fabric that adapts flexibly to difficult conditions to suit all processes and needs.For this purpose, a heating yarn was developed that regulates itself and saves energy.

If induction coils are used for textile heating, the heat does not have to be transferred by thermal conduction. The so-called FlexIn Heat © technology from the Stuttgart-based company msquare can also heat curved and complex surfaces.

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Smart textiles are becoming increasingly popular. As components become smaller, smart electronics can be incorporated into textiles without losing the advantages of the material, such as washability, drapability and light weight. To optimally bond electronics and textiles, the Fraunhofer Institute for Reliability and Microintegration has developed E-Textile Bonding. Printed circuit boards specially adapted to the textile bonding process ensure particularly reliable connections with textile-integrated conductors. This method does not require the usual soldering or crimping during contacting.

At the end of the lecture day, architect Ulrich Thierling broadened the view from the technical details to looking outside the box.
Slowing down global warming is the greatest challenge of this century, he said. The construction industry produces a particularly large amount of greenhouse gases and consumes a large amount of resources. The solution is "reduced construction": use less material flexibly, reuse it later or recycle it in other ways. Lightweight construction with fiber composite structures is the key technology here, offering an inexhaustible field of application for intelligent textiles.

The event was accompanied by an exhibition where participants could try out numerous smart products.

The annual user forum is organized by the German Institutes of Textile and Fiber Research Denkendorf (DITF), the Textile Research Institute Thüringen-Vogtland e.V. (TITV Greiz) and the Forschungskuratorium Textil e. V. This year's cooperation partner was Swiss Textiles.

The next SMART TEXTILES user forum will take place on February 27/28, 2024.

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Professor Götz T. Gresser, Chairman of the Board of the DITF, welcomes participants to the 11th SMART TEXTILES User Forum. Photo: DITF

Dr. Dirk Hegemann (Empa) explains current Empa research work in the field of plasma technology. Photo: DITF

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Lectures, exhibition and tour of Empa's laboratories and pilot plants - the concept attracted more than 100 manufacturers and users of smart textiles again this year. Photo: DITF

Small, foldable, bright, flexible, lightweight: a luminous textile like this can replace a bulky spotlight on a film set. Photo: DITF

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The program committee of the SMART TEXTILES user forum (from right): Götz T. Gresser (DITF), Johannes Diebel (FKT), Sabine Anton-Katzenbach (Textilberatung Hamburg), Fabian Schreiber (TITV Greiz), René Rossi (Empa), Günter Grabher (Grabher Group), Peter Flückiger (Cooperation Partner Swiss Textiles). Photo: DITF
Not shown in the photo: Thomas Gries (ITA), Michael Haupt (DITF), Christine Kallmayer (Fraunhofer IZM).

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