Smart Textiles

What is a smart textile and how do we create a center for the development of smart textiles? With these two questions I would like to greet you welcome to the Nordic Textile Journal of 2008. In the 2008 edition of the Nordic Textile Journal we want to focus on design-driven research in smart textiles and present its opportunities starting in the events that are currently taking place at the Swedish School of Textiles and in connection to the school. I would also like to take this opportunity to highlight articles related to the smart textiles field in the Nordic Textile Journal of 2006/2007.

Smart textiles – the next generation of textile products

Smart textiles are defined as textiles that interact with their surroundings. One may study this definition further and debate its borders. The Smart Textiles initiative in Borås has focused on the environment around smart textiles and the ambition is to open up opportunities in the smart textiles field. The connections to technical textiles and portable technology are important. The ambition here is to create a smorgasbord for anyone who wants to work in the field or who wants to develop it further. We construct the initiative from knowledge in textile fibers and material connected to the textile processes. Starting in the textile core values we create opportunities for border-crossing experiments and development of ideas. Here, designers, engineers, and technicians meet with industry and entrepreneurs. This meeting place is at the center of the environment we have created through the Smart Textiles initiative.

The goal statement of the Smart Textiles initiative is found below and I would also like to take this opportunity to express my gratitude toward all the participants in the initiative for helping us reach as far as we have today. We owe our success to the amazing dedication, focus, professionalism, candor, and will to share among all participants. We have all accepted the challenge to create a center for Smart Textiles.

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The point of departure for the Smart Textiles initiative in Borås is to strengthen infrastructure surrounding the development of smart textiles and to create the prerequisites necessary to create the textiles of the future. This means that technical textiles, portable technology, and smart textiles complement one another to improve the final outcome. The main idea is that the interdisciplinary environment of the Swedish School of Textiles – design, handicraft, technology, and management – creates a meeting place for education, development, design, and specialized production of the next generation of textile products. Development of the entire environment are carried out with the regional actors gathered, a development where research and development resources are pooled, among others Swerea-IWF, SP Technical Research Institute of Sweden, Chalmers University of Technology, the University College of Borås, and the Interactive Institute. Development of smart textiles is design-driven research. The design idea generates demands in technical research and development which in turn generates demands for characterization. The process is divided in two parallel pedagogical processes. The first one is design and business oriented and runs from idea to store (idea to carrier bag), whereas the second one is technically oriented and runs from fiber to product. Our policy is always sustainable development. In sustainable development is included both environmental and ethical aspects as well as business and societal development for long-term sustainable development.

The connection between company-based projects and research at institutes and university colleges is of utmost importance. There are a dozen company-based projects in the Smart Textiles initiative today. The driving force behind the development projects is a will to strengthen the competitiveness and growth of the companies through close cooperation with scientists and closely related branches.

Presented below are a few examples of projects and possibilities within the smart textiles framework that are soon part of the Smart Textiles initiative.

Textiles as construction materials
During the past decade the development of the theory of the properties of materials in combination with rapid development in calculation capacity has created better ground for material design. Materials with higher knowledge content, new functions, and higher performance is ever more important in a competitive perspective, e.g. new functions of development toward controlling indoor comfort instead of sunburns.

Examples of future product areas for smart textiles
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Future results
The Smart Textiles initiative creates a number of new professional areas and fields of activity, the potential of which can only be verified through the future development of the industry. What will happen when the medical industry and textile research are even closer related? What will the future building trade look like after being integrated with textiles? What savings in energy will be generated by the cooperation between the automotive industry and textile research?

The textile materials are construction materials, building stones, in a greater whole and consist of polymers and fibers, nano-sized and up, and the textile processes are construction techniques such as knitting, weaving, non-woven, dyeing and finishing, and manufacturing. Using textile building stones and construction techniques we will be able e.g. to build houses, parts of the body, cars, and boats with more intelligence in the future. The textile is on its way of becoming a bearer of entirely new functions when properties that have not previously been discovered or made use of are forwarded. There is a potential for growth and also good development possibilities both in textile materials and textile processes.

Materials
Phase changing materials (PCM)
Today there are fibers with phase changing properties which open up for temperature control. Within the framework of Smart Textiles research is conducted at Swerea IVF on phase changing fibers with greater phase changing concentration in the final fiber. The expected result is to gain better effect and efficiency in refined manufacturing of different types of polymers.

Conductive polymers
Polymers with conductive properties means electricity may be lead out of them (antistatic) or electric signals may be conducted through them. Conductive polymers may be used in manufacturing fibers for use in nonwoven constructions or in yam manufacturing. Conductive polymers may also be used in different kinds of coatings.

Nanofibers
One of the most interesting and most rapidly growing fields today is taking place in nano-fiber technology with applications in several fields.
Fields of application

Electro-active textiles

Curtains that react interact with their surroundings where conductive fibers are used in manufacturing and provide opportunities for enhanced functions of the weave.

Conductive polymers

Increased performance in filter products where conductive properties mean electricity may be lead out of them (anti-static) or electric signals may be conducted through them. Protection against burglary in the shape of a curtain and a curtain that may also gain glowing patterns and become a decorative product.

Personal portable electronics/textile microphone elements

Demographic changes toward an aging population make new demands on health care services through increased use of technical aids in hospital care and home nursing. Implementation of textile-based electronics, both personal and integrated into the surroundings, such as in mattresses and furniture, will become reality in the future.

Needs for new textile-based solutions have also been stated by the Swedish Armed Forces and the rescue services. Protective clothing with sensors for analysis of smoke and decreasing the risk of poisoning is another example of fields of application for smart textiles.

Elasticity sensors

It is possible to apply elasticity sensors in many different products. Today, a company within Smart Textiles runs a research project on breathing alarms for infants. The goal for the project is to develop a flexible portable system that increases chances to monitor the breathing of infants. The product will be introduced on the market in 2008. The product that is today developed for infants may be directly applied in home nursing.

Environment

Access to environmentally sound energy is a global need in increasing demand. By integrating energy generation into textiles the production of power may be carried out in direct connection to the place of use instead of at gigantic plants, scattered and consuming large amounts of capital. Through use of climate-smart textiles the need for fossil fuels decreases. “Energy Saving” is an area with great potential for textile solutions and products.

Filters

The filter market is today a growing market and the fields of application range from home environments and industrial environments to more specific environments and coupe blankets for cars.

A filter material that works both as particle filter and gas absorption filter has unique properties because of the combination of particle filter and gas filter in one product. The gas filters that are available on the market today are often too costly to be installed on a grand scale and must be combined with particle filters.

Products with antistatic properties, textile materials with sensor properties, filters with an extremely small surface and with low fall in air pressure, dust divider, insulation with electromagnetic screening properties (for people allergic to electricity) are other filter media products that are forecasted to be available on the market in three years time.

Geotechnical weave

The weaves control the climate and saves energy in all kinds of green houses and plantations. When in use during the night in a green house air humidity is to be increased as little as possible without diminishing energy saving. Within the Smart Textiles framework a research project has been initiated together with a company to further develop the weave.

Concrete constructions. Use of textile reinforcements may drastically reduce the weight of the complete concrete product. The Smart Textile initiative is part of a project that aims to substitute traditional steel armaments with textile materials either partly or entirely. Also under development are textile molds for concrete casting where the advanced textile becomes part of the concrete in order to greatly enhance the surface of the completed concrete shape.

Wound treatment products

Demand for environmentally sound and effective wound treatment products increase. Using nano-fiber technology we can come up with highly efficient plasters and bactericidal nano-fiber cloths for treatment of wounds. Products that both heal the skin and have properties that are so like to the body’s own that they are entirely absorbed by the skin when the healing process is complete.

Skin

The demand and need for implants such as skin, joints, and bone increases when progress in medical science allows more illnesses and wounds to be treated. Today, Swerea IVF can produce “scaffolds” in nano-fibers on which cells can grow. This enables us to grow living tissue outside the body and thus grow bodily organs. These advances open new paths to health care and to surgical science.

Wishing you pleasant reading

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Ambience 08

INTERNATIONAL SCIENTIFIC CONFERENCE

June 2-3, 2008

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