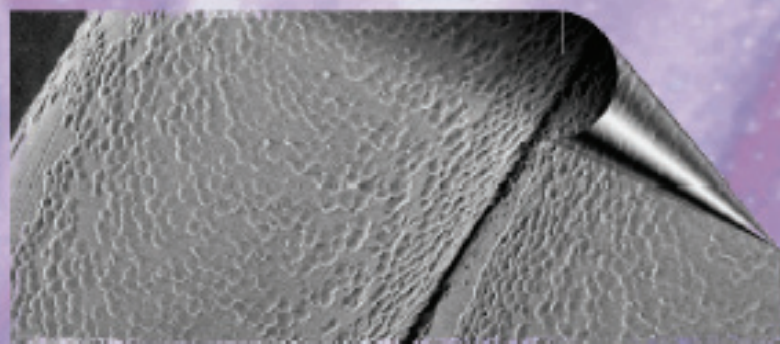


**SURFACE MODIFICATION
SYSTEMS
FOR CREATING
STIMULI RESPONSIVENESS
OF TEXTILES**



Workshop Proceedings

Chapter 1

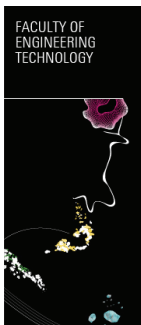
An Introduction to the Research Group Engineering of Fibrous Smart Materials

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1. Introduction

The Marie Curie Excellence programme Advanbiotex was hosted by the research group EFSM (Engineering of Fibrous Smart Materials). This group belongs since September 2007 to the Faculty of Engineering Technology of the University of Twente. Before that the name of the group was Textile Technology, TXT, and was hosted by the Faculty for Science and Technology until the reorganization of that Faculty in 2006.

The group as such has been established on the 1st of March 1991 by the Foundation STGM (Foundation for Technology of Structured Materials). After the move from the Faculty for Science and Technology to the Faculty of Engineering Technology the name of the group and of the foundation as well has been changed to EFSM and to the Foundation for EFSM respectively.



2. Foundation EFSM

The Foundation EFSM supports the research chair EFSM. By this chair the Foundation wants to support the industry in their need to develop a strong international position by funding the chair and by directing the long term research objectives of the chair. Building and extending necessary knowledge and expertise and strengthening the European position of the Chair are important strategic objectives. The current members of the foundation are:

- Christeys B.V. (detergents supplier for laundries)
- Colbond B.V. (non-wovens manufacturer)
- Federatie Textielbeheer Nederland (FTN) (branch organisation for Dutch laundries)
- Modint (branch organisation for Dutch textile and clothing companies)
- Saxion (University for Applied Sciences)
- Stork Prints B.V. (ink-jet technology)
- Tanatex Chemicals B.V. (textile chemicals supplier)
- Royal Ten Cate (textile company)
- TNO (materials science)
- Vlisco Helmond B.V. (wax printed fabrics)
- Gamma Holding (technical fabrics).

The driver for these companies to organize themselves in a foundation EFSM to support the academic chair was the loss of the textile industry in the Netherlands and consequently the loss of Dutch textile education and research facilities. As such the Netherlands was an important textile country with many textile mills in, for example, Enschede and Tilburg. However due to the move of these activities to the so called low-wage countries many mills were closed in the sixties and seventies. As a result of that also the polytechnic textile schools in Enschede and Tilburg were closed. At the University of Twente, the Faculty for Chemical Engineering, there was a research group of Prof. Groot Wassink active in the area of textile technology. The focus in that group was on wet textile processes. With the retirement of Prof. Groot Wassink the university decided also to stop this textile research. That meant for still existing textile companies that they finally also lost the possibilities for academic research and education in their area of interest. Therefore, they decided to establish and to maintain an industrial chair at the University of Twente. The first professor of the chair was Prof. Ir. Groot Wassink. His successor in 1995 was Prof. Dr. Ir. Warmoeskerken who is still leading the group.

3. Programme development

The initial programme of EFSM was focused on traditional textiles particularly on textile finishing processes like scouring, bleaching and dyeing. The topics studied were:

- Hydrodynamics in textile materials
- Ultrasonically boosted mass transfer
- Enzymatic treatment processes
- Catalytic bleaching
- Wetting dynamics

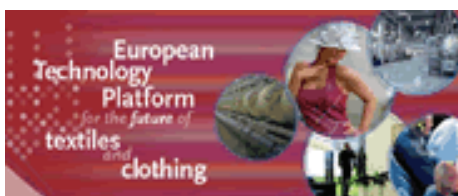


In these areas EFSM has built an international recognition. However, in 2006 the board of the EFSM-foundation decided to shift the focus of the programme from traditional textiles towards textiles with added functionality also called smart fabrics. The reason was the international developments on the global textile market with China as a new player. That forced the companies to review their business strategies. One leading theme here was to change their business from a labour intensive one to a knowledge intensive one.

In Europe this has led to the establishment of a Technology Platform for the Future of Textiles and Clothing. This platform aims at reinforcing the research power on textiles in Europe by creating opportunities for different European research groups to work closely together. Since EFSM did not really have expertise in the area of smart fabrics the strategy was to become involved in European projects in this area. The participation in two European projects, Digitex and Advanbiotex enabled EFSM to create a new science base on smart fabrics.

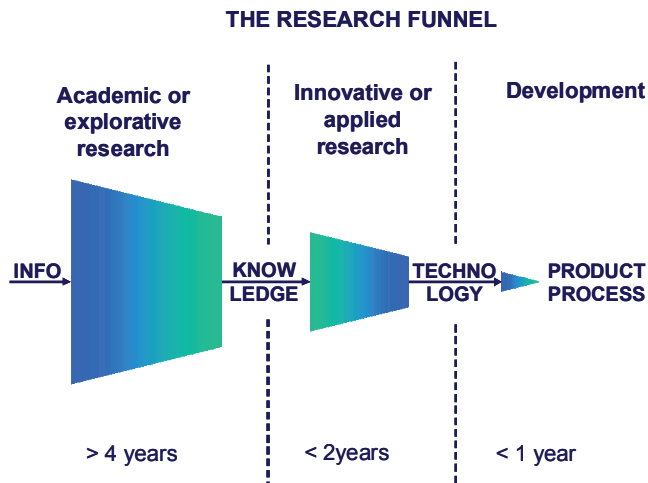
4. Internationalisation

The group EFSM operates in a strong international network. This network has been created by a membership of the European Technology Platform and of the Autex - Association of Universities on Textiles. EFSM has now contacts and collaborations with many universities in Europe. With the board of the EFSM-foundation a strategy is now under development to invite also international companies and research-institutes to become a member of EFSM. Recently a covenant has been arranged with the Leibniz Institute of Polymer Research (IPF) in Dresden (Germany) for scientific collaboration in the field of polymer and related research.



5. Innovative power

For EFSM as an industrial research group it is important that the new knowledge generated by the group is implemented in the industry. However due to the innovation paradox this is not an easy task. The innovation paradox means that there is a gap between the long term academic research at the universities and the short term process and product development in the industry. This gap concerns the development of new technology on basis of academic knowledge.



Big companies, owning their own R&D departments, do this technology development themselves. Therefore many multinationals have science brokers that monitor the latest developments in the academic world to see if a particular university has specific knowledge that could form an input for the company's future key technology. However in the world of fibres and textiles most companies belong to the so called small and medium enterprises, SME-s, that do not have research facilities to develop new technologies. Therefore EFSM has a close collaboration with Saxion University for Applied Science for technology development and to increase the innovation power for the industrial partners.

A good example is the work of G. Bouwhuis. He is employed by Saxion and is allowed to spend two days per week in our group to prepare his PhD-thesis. He works on the industrial implementation of the enzyme-technology that has been developed within EFSM. Recently he has performed successfully full scale experiments in two textile companies. These companies have decided now to implement the EFSM technology in their processes.

Further EFSM do short term bilateral projects for the industrial partners to apply the specific knowledge and expertise to solve particular problems in their company or to develop a proof of concept.

6. Current research programme

The research mission of EFSM is Product Driven Fibre Surface Engineering. This means that the research projects are always directed on a future product or process application.

The current research programme is based on the two European projects mentioned. The first is project Digitex. This project aims at the development of special textile materials applying the principles of inkjets. Our contribution is to study the possibility of slow release systems using cyclodextrin and to study the treatment of single fibres in a fabric by inkjets.

The second project is the Advanbiotex project. In this work the aim is to study biopolymer hydrogels attached to fibres to act as response system to external stimuli.

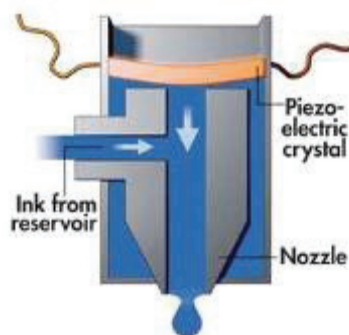
As a result of these efforts in creating a new science base EFSM started recently a new AIO project on anti bacterial finishing systems for the textile service industries.

EFSM participates also in a STW project in collaboration with the TU-Delft and the LU-Wageningen. The aim is to study the fabric cleaning process with dense CO₂ and ultrasound. Since EFSM was in the transition period from TNW to CTW during the time that the STW-proposal for this project was prepared we could unfortunately not apply for an AIO in this work.

As a result of the “old” programme there is also a project on enzymatic treatment of fabrics. In July this year a PhD started her work on the development of antibacterial fabrics for the textile service industries. In September this year a new PhD started his work in EFSM on a generic project initiated by the EFSM-foundation. This work will be focussed totally on the re-engineering of fibre surfaces.

7. Outlook

Nowadays, high performance textile products are demanding, even in the ‘traditional’ clothing and home textiles areas. Functional properties can be defined as all the effects beyond the pure aesthetic, protection and decorative functions. They include a large range of properties that can be also classified as ‘smart properties’ granting to textile materials a capacity to act upon external



stimulations. Multiple functions are often required, leading to multifunctional textile materials, one of the five key technologies at present.

EFSM wants to become an expertise centre in this science area with international recognition. In the next five years a strong science base for fibre surface modification technologies will be developed that can act as a source for new challenging projects. Together

with the board of the EFSM-foundation a strategy will be developed for internationalisation of EFSM.

