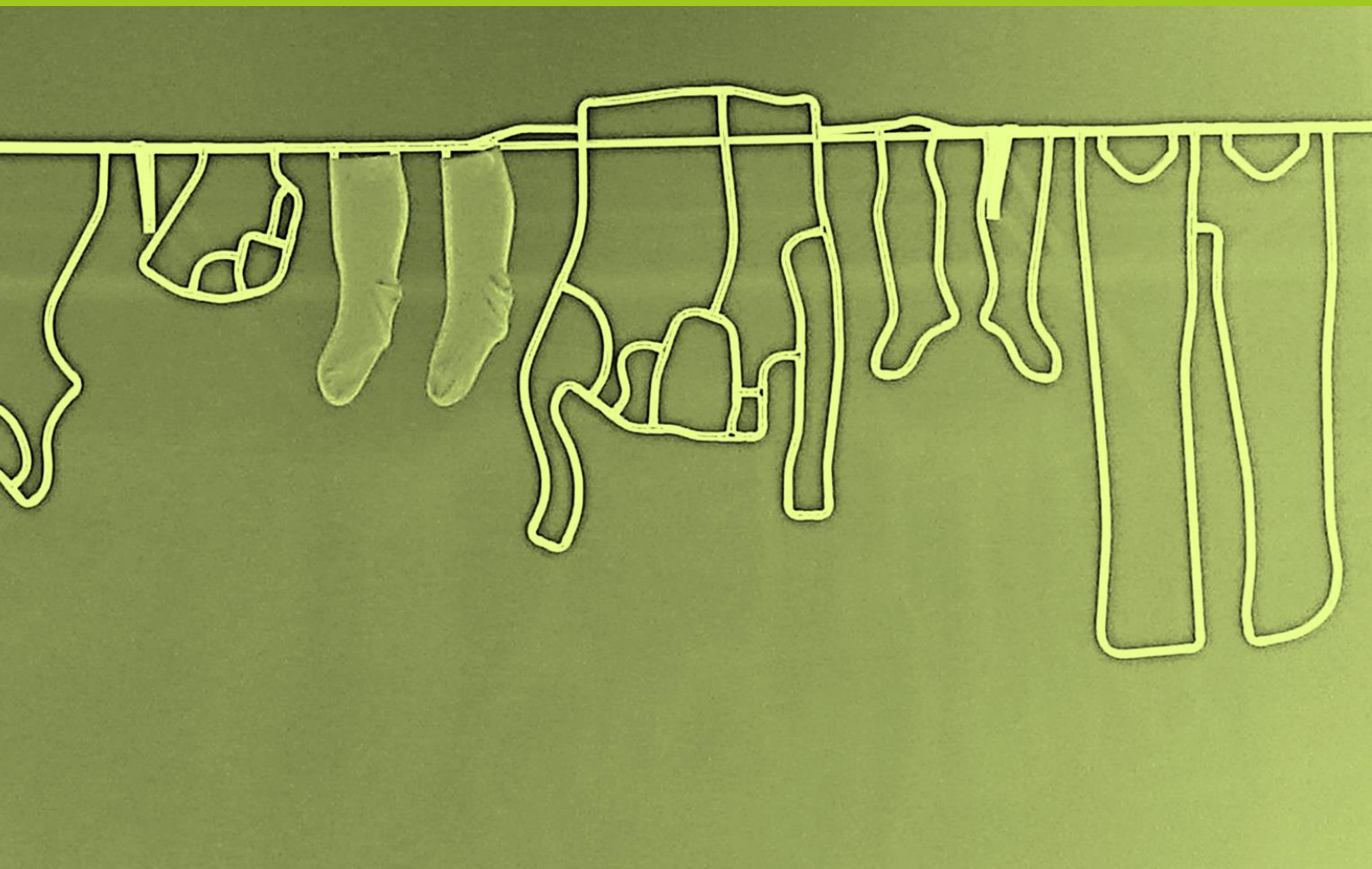
SMART TEXTILES SALON

Vol. 5

Prototypes on Stage, 14 October 2016
in TIO3 Ronse, Belgium



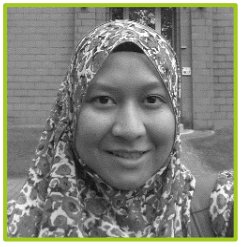
PROCEEDINGS

Welcome!

Carla
Hertleer

Lieva
Van Langenhove

Izabela
Ciesieleska-Wróbel



Atiyyah Haji
Musa

Welcome to the fifth edition of the Smart Textile Salon!

The first edition in 2009 evolved from the European Coordination Action SYSTEX as one of the solutions to foster the commercial breakthroughs of smart textiles.

Showing smart textile prototypes is the core aim of this event. We want to give designers, academics, researchers and industrialists the opportunity to experience working prototypes, to see and feel them and to discuss achievements and challenges. Furthermore, we want to create a dialogue between all of these disciplines dealing with and interested in smart textiles. Previous enthusiastic feedback has encouraged us to continue with this approach.

This edition is organised in the framework of the Flemish project SMARTPRO and exhibits some of the achievements of companies participating in this project.

The Smart Textiles Salon Vol.5 is organized by the Department of Textiles with the support of Centexbel and is hosted in this wonderful and inspiring location in TIO3, Ronse.

We appreciate your active participation and hope you enjoy this event!

Carla

Table of Contents

Keynote speakers

Tom Tourwé (Tom.Tourwe@sirris.be)

Tom works at Sirris where he initiates, manages and contributes to industry-driven research projects on intelligent data processing. His current topics of interest are recommender systems, condition monitoring, preventive maintenance, lifestyle pattern detection, etc. Tom is giving a speech about

Data can make your smart textiles really smart!

Karin Eufinger (ke@centexbel.be)

Karin works at Centexbel where she is Standards and Technical Regulations Manager. Karin talks about the work that has been done the last years on

Standardisation of Smart Textiles

Prototypes on Stage

Miniaturization of electronic components for embedding in Smart Textiles

CONNECT GROUP
INTEGRATED SUBCONTRACTORS

Bart Allaert

cgbp@connectgroup.com

Technology is a Service

The Connect Group is a leading certified supplier of electronic technology, production systems, Printed Circuit Boards and cable assembly services. We see a growing demand on miniaturization and integration of electronics on flexible and flex-rigid substrates. As a logical consequence we are convinced that, with the know-how we already have in these domains, integration in/on textiles will be a highly evolving market in which we will generate added value. In the SmartPro project the purpose is to develop new technologies onto textiles or into textiles.

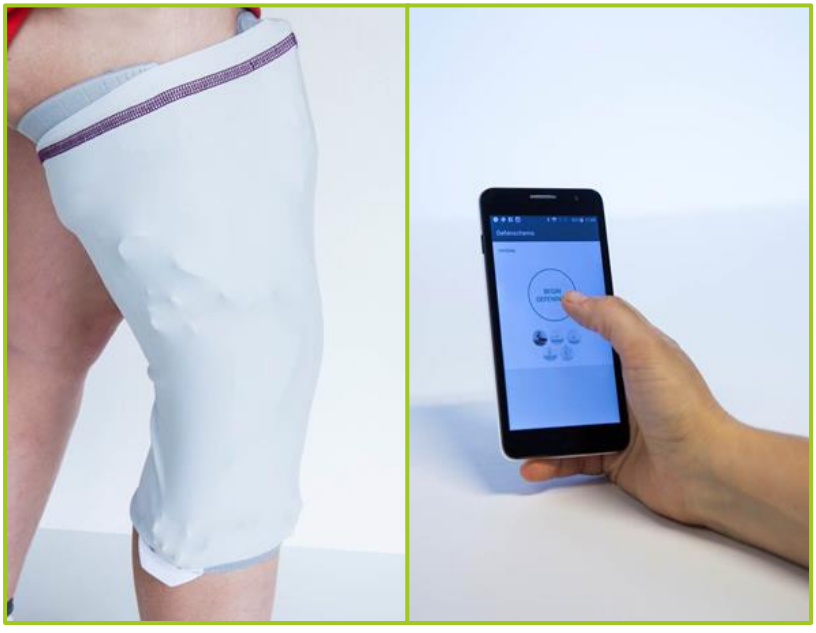
Connect Group performed the additive stencil printing tests in order to apply electrical conductive epoxies. Washability is a major concern which should be addressed. Special coating methods were developed by other consortium members in order to comply with this requirement. Electronic circuits are designed, manufactured and supplied by a consortium member. Connect Group integrated this electronic circuit on the textiles with different methods of interconnection techniques. Special attention has been paid to the manufacturability and the possibilities to use the available industrialization techniques in Connect Group. Reliability tests shall be performed in order to qualify the most reliable method.

Bart Allaert received his Master's degree in Physical Electronics from the State University of Ghent in June 1984. Since August 2010, he started in the Connect Group as Engineering Manager responsible for Test engineering, Process engineering, Component engineering and Product engineering. Since 2015, he is the head of the Technology Is A Service Group being responsible for New Technologies and supporting the company in research projects and advanced Technologies. He is Advanced Engineering Manager in reliability, life cycle management and hardware integration of electronics on Printed Circuit Board level and Computer Aided Design.

Motex

Bert Bonroy[1], Stijn Bukenbergs[1], Glen Debard[1], Lieven De Maesschalck[1], Malte von Krshiwoblozki[2], Philippe Lemaire[3], Marc Mertens[1], Bernard Paquet[3], Jakub Pawlikowski[2], Romy Sels[1], Roy Sevit[1*]

bert.bonroy@thomasmore.be



**Names of the authors are presented in alphabetical order.*

Gefördert durch:
Bundesministerium für Wirtschaft und Energie
aufgrund eines Beschlusses des Deutschen Bundestages

Motex is an intelligent knee brace and smartphone app that can be used in the rehabilitation of patients after total knee replacement. Personalized exercise programs are selected by physiotherapists and forwarded to the app on the smartphone of the patient. This Motex app communicates with the intelligent brace. Furthermore, the app allows the patient to follow up their own exercises or view an instructional video on how the exercises have to be performed. The brace records the exercises and gives immediate feedback on the execution of the exercises to the patient and the physiotherapist. In case exercises are skipped the patient may also explain why he doesn't execute this specific exercise. This way, patients are motivated to perform their exercise schedule correctly and the physiotherapist will get an objective indication of the evolution of the patient at home. This prototype is tested in a clinical study where 8 patients and their physiotherapist evaluated the usability of the Motex brace and app. Next to the objective and direct feedback which is very useful, the Motex device also worked as a motivator to perform their exercises.

Dr. **Bert Bonroy**[1] is a researcher at the research group Mobilab @ Thomas More Kempen University College. He is currently responsible for the research line Biomedical Technology within the Mobilab group. He obtained his PhD in Engineering Technology in 2015 at the KU Leuven in collaboration with Thomas More Kempen University College. His research interests lie in the field biomedical engineering.

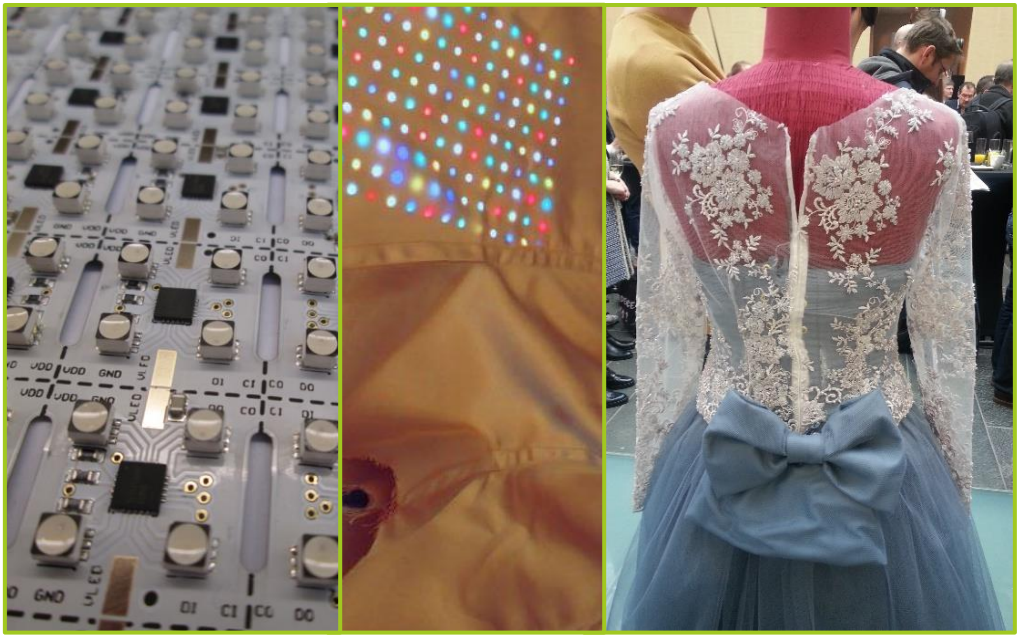
[1] Thomas More Campus Geel, Mobilab, Kleinhoefstraat 4, 2440 Geel, België
T: + 32 (0) 14 80 22 96, T: 3051 (intern)

[2] Fraunhofer IZM, Gustav-Meyer-Allee 25, 13355 Berlin, Germany.
[3] Centexbel, Rue du Travail 5, 4460 Grâce-Hollogne, Belgium.

DressCode – *the dress with moving images*

Kristof Buntinx

kristof@kristofbuntinx.com



The aim of the DressCode project was to make a dress that can show moving images with off-the-shelf components to be worn by a popular singer. DressCode is an outcome of the Call for Innovation by the Creative Industries (CiCi) project supported by VLAIO, Flanders Innovation & Entrepreneurship. Kristof Buntinx designed a dream dress for Flemish nightingale Dana Winner (on the picture with the dress) to celebrate her new album, Puur.

The dress is made from high-quality silk, lace and tulle and consists of a long, ample princess line skirt in smooth, dark-grey tulle, a silk bustier with transparent details and a see-through top in light-grey lace with boat neck, long sleeves and embroidered pearl appliqués. Hence a dream of a dress! But what makes this design extra special, is the brand-new, pioneering technology processed in the dress. The dress's bodice is dotted with 1,900 points of light, each containing three LEDs. By means of an innovative technological process each of these pixels can turn any colour.

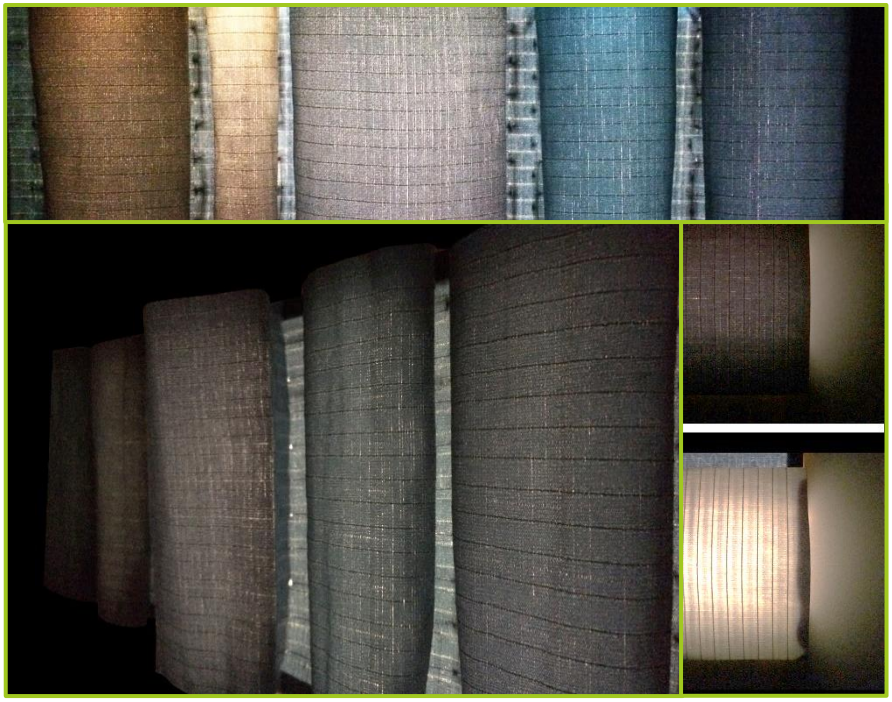
Brussels designer **Kristof Buntinx** has already created a furore with his God Save the Queens shirts and gained international fame with a boxer short collection with which he targeted Russian anti-gay laws. Protest and irony are therefore no strangers to Buntinx, but he also dresses Belgian celebrities in little bespoke gems just as much as he has children photographed as superstars. The exiled Sint-Truiden native has been working under his own label for more than a decade.

Kristof Buntinx certainly aims to let his designs speak for themselves.

Narratives of winter daylight

Isabel Cabral, António Pedro Souto, Linda Worbin and Cristiano Silva

diascabral@gmail.com



This prototype was developed under the concept ”Dynamic Light Filters: Smart Materials Applied to Textile Design“, a PhD research that proposes to explore smart textiles as a medium to enhance and involve physical and immaterial dimensions, with emphasis on design possibilities of smart textiles dynamic behaviour in interaction with light.

Focusing on colour change and shape memory materials integration in textile substrates, Narratives of winter daylight prototype researches functional and expressional possibilities of smart textiles structures to transform incident light that passes through them – light transmittance – without acting upon the light source.

It is inspired by the dynamic quality of natural daylight. Light intensity and colour tones of one winter day were observed and photos were recorded each hour from 6am to 7pm. Results set a framework to assist design decisions on colours, morphology and interaction. Perception of textile behaviour and light transmittance variation, established by diverse activation sequences, present visual narratives of dynamic lighting scenarios.

The prototype addresses research conducted on: development of paste recipes and screen-printing with thermochromic and conventional pigments to obtain defined colour ratio – from similar to different colours; integration of shape memory alloys in textile structures whose dynamic behaviour achieves geometrically defined shapes.

This work was supported by FEDER funds through the Operational Programme for Competitiveness Factors – COMPETE and National Funds through FCT – Foundation for Science and Technology (project SFRH/BD/87196/2012) and FCT and FEDER-COMPETE (project PEst-C/CTM/UI0264/2011).The authors also like to acknowledge Smart Textiles Design Lab for the support on the prototype development.

Isabel Cabral, Textile Engineering, PhD student at University of Minho, Portugal.
António Pedro Souto (souto@det.uminho.pt), Auxiliary Professor at University of Minho, Portugal.
Linda Worbin (linda.worbin@hb.se), Textile Design Professor at the Swedish School of Textile, Sweden.
Cristiano Silva (cristiano.c.s@gmail.com), Centro Algoritmi, Researcher at University of Minho, Portugal.

Smart Personal Protective Equipment for Fire Fighters - Smart@Fire

Steven Cleeren, Gilles Rossu

steven.cleeren@vlaio.be; gilles.rossu@vlaio.be

Rather than stand-alone products, Personal Protective Equipment (PPE) evolves more and more towards integrated systems and total solutions. The Smart@Fire project gives us a glimpse into how PPE for firefighters could look in the future. Firefighting remains a risky profession with regular casualties. Therefore Smart@Fire wants to develop an intelligent or 'smart' Personal Protective Equipment for firefighters. This intelligence is facilitated by integrating Information and communications technology solutions into the firefighter's suit. In this way, the suit can register critical bodily functions and localization data and communicate these to a central command post. Because such a suit is not yet available on the market, it was developed as a form of Pre-Commercial Procurement (PCP). This means that an organization does not find an adequate offer in the market for a certain demand, and therefore asks suitable suppliers to develop such a product. Smart@Fire is a European FP7 project. Flanders Innovation & Entrepreneurship acts as the coordinator of the project. Other partners are the Belgian Ministry of the Interior, Centexbel, Ghent University and innovation consultancy Addestino. The end-goal of the project is to raise the PCP methodology to a higher level within a European context.

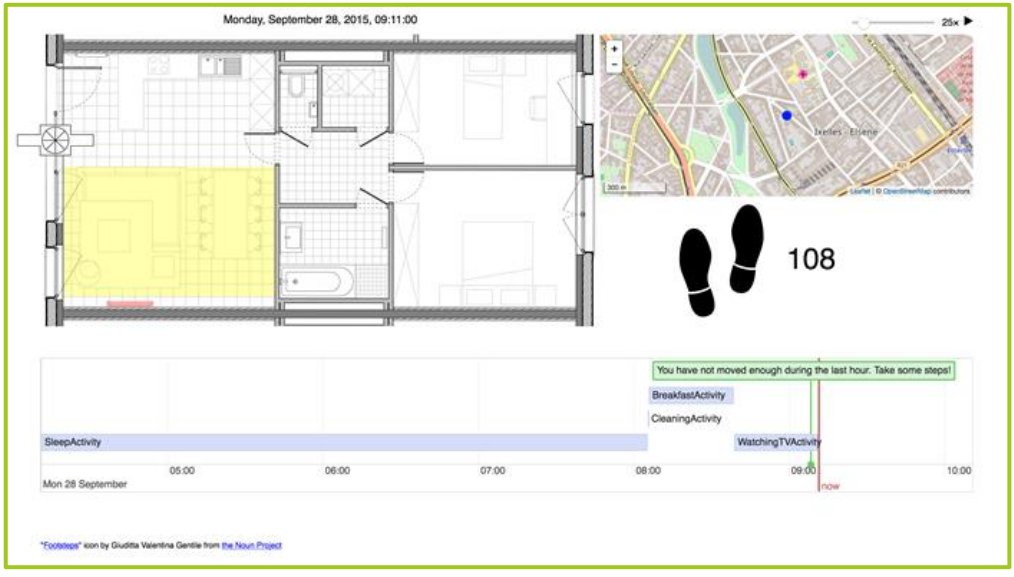
Steven Cleeren currently works as a Customer Experience specialist for Flanders Innovation & Entrepreneurship (VLAIO). He also assumes the role of project manager for the EU FP7 project Smart@fire. Previously, he worked for a design support organization as a project manager for several European projects that focused on design management, design policy, design-led innovation, and service design. Steven's main interest is in design and innovation as a driver of competitiveness, and as a tool in solving societal issues.

Gilles Rossu is a business engineer and master in Innovation and Entrepreneurship specialised in Project, process and change management. Currently he's working as Project manager within Addestino, Venture Spirit and Smart@Fire. **Addestino** is a Belgian management and technology consulting firm, with a unique blend of top talent and a track-record to deliver innovation to its customers, end-to-end, from idea to market. **Venture Spirit**: a young dynamic company specialized in engaging employees to overcome organizational hurdles through gamification.

Combining wearables and environmental sensors for improving people's quality of life

Nicolás González-Deleito

nicolas.gonzalez@sirris.be



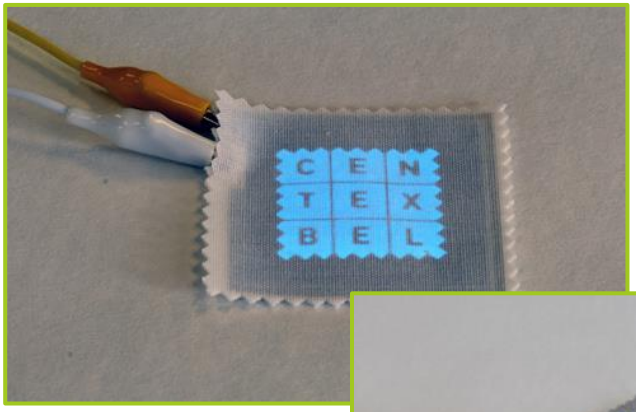
This prototype aims to demonstrate concrete applications and opportunities that are enabled by integrating sensors into textiles and wearables and by enhancing these with additional data sources such as sensors embedded in the environment. I illustrate it in the context of continuous monitoring of persons at home for improving these persons' quality of life, where we consider a user carrying a pedometer and a GPS sensor, living in an apartment equipped with presence sensors in different rooms, a bed sensor and a water consumption sensor. Based on the collected data, higher-level activities (e.g. sleeping, watching television, cooking, going for a walk) performed by the user are recognized and recommendations for improving this user's quality of life are provided. This work has been realized within the SMARTpro VIS-trajectory, an initiative to stimulate collaboration across textile, electronics and ICT sectors on smart textiles and wearable intelligence.

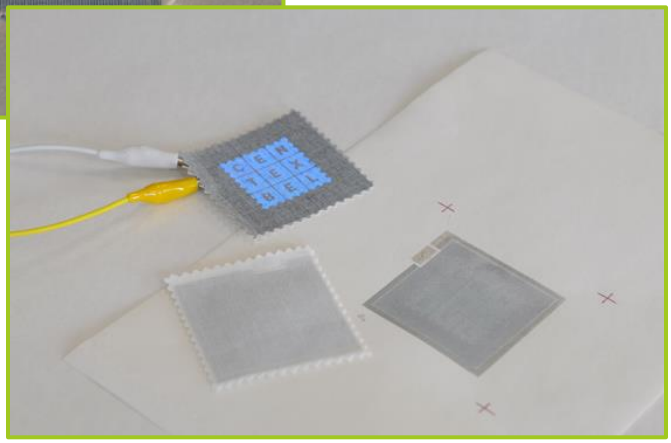
Nicolás González-Deleito is Data Innovation Project Leader at Sirris. The Data Innovation team helps companies to build new or improved products and services based on the data they possess or have access to. This is mainly done through short commercial trajectories, through the setting up and execution of industry-oriented R&D projects, and through building up technology demonstrators. I am currently contributing and/or coordinating several R&D projects related to the use of wearables in the domains of health/homecare and lifestyle: CareWare (http://www.careware-itea.eu/), WITH-ME (http://www.with-me-project.eu/) and SMARTpro (http://www.smart-pro.eu/).

Electroluminescence for light emitting textiles

Brecht Demedts, Frederik Goethals, Pieter Heyse, Myriam Vanneste

brecht.demedts@centexbel.be; myriam.vanneste@centexbel.be





The prototype is an electroluminescent logo that is printed directly onto textiles. It was achieved by coating a stretchable knitting followed by a series of screenprints. The prototype is more flexible than the current generation of flexible electronics and offers a promising insight to the next generation of flexible electronics.

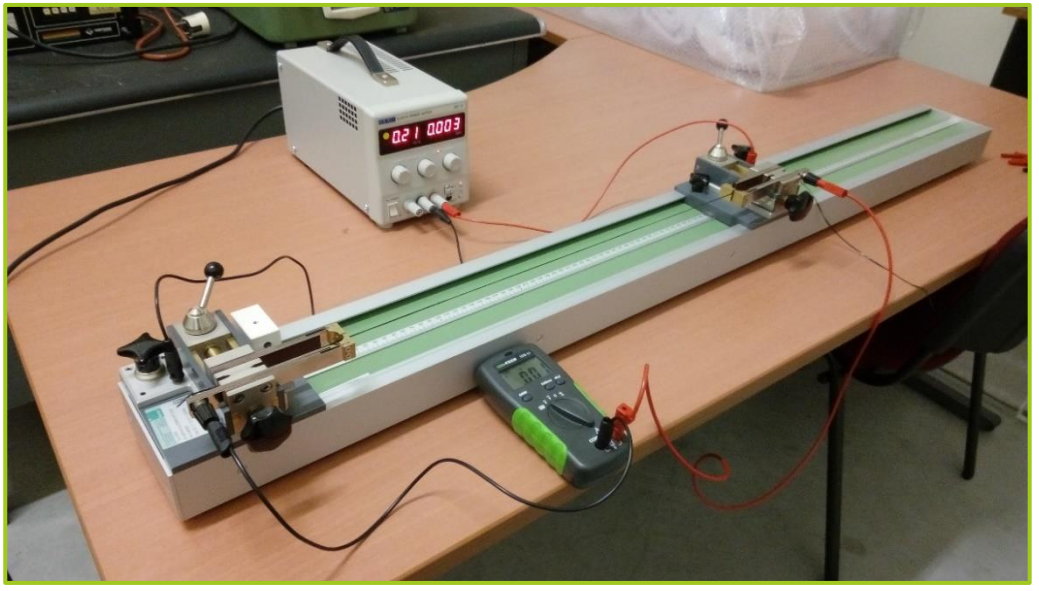
Brecht Demedts is working in the textile functionalization group of Centexbel, which has years of expertise in the field of smart textiles. Centexbel tries to develop prototypes of smart textiles and aims to develop technologies that can be implemented by the industry.

Measuring electro-conductive textile tracks

GHENT UNIVERSITY

Gilbert De Mey, Carla Hertleer

Gilbert.DeMey@UGent.be



Nowadays the use of electrically conductive yarns/filaments in the textile field is growing. An important characteristic of these conductive materials is the electrical resistance.

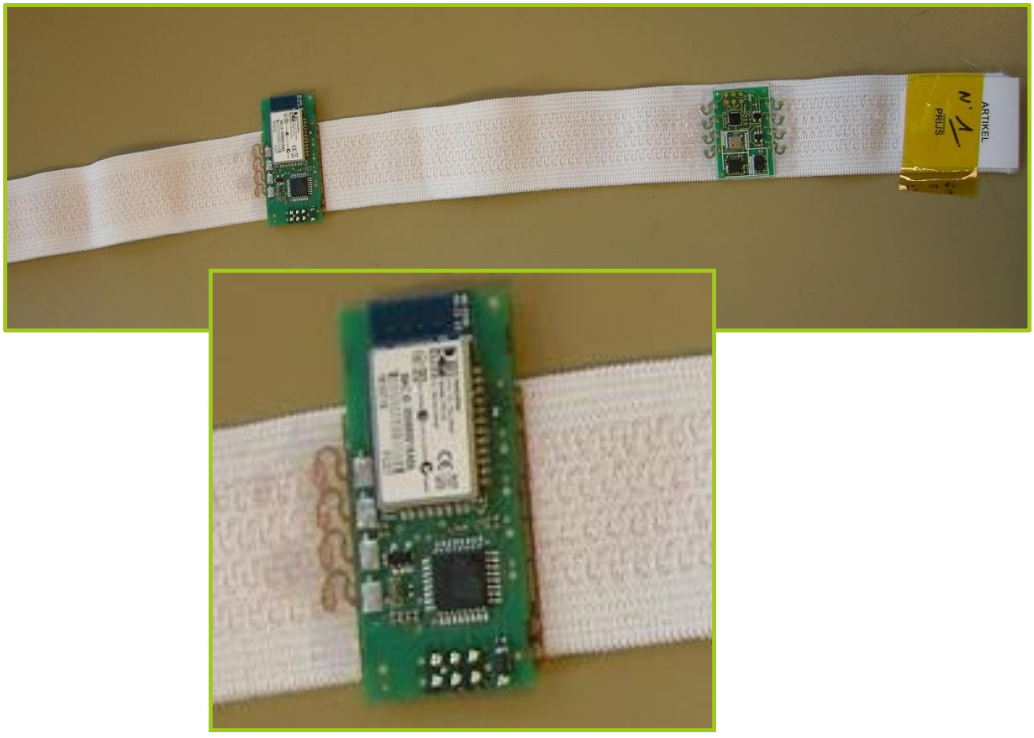
The most common term to measure the electrical resistance of conductive yarn which is Linear electrical resistance expressed in ohm/m and measured per unit length of a track. According to standard CEN/TC 248 EN 16812:2016 on "Determination of the linear electrical resistance of conductive tracks", the test method is based on a four wire measurement. For that purpose it is necessary to use a clamping device which can precisely measure the length of the test sample and with good clamping ability. The device must have a calibrated ruler integrated in it to measure the distance between the voltage electrodes. During testing it needs a DC current source and a volt meter to measure voltage in the range necessary for the measurement. The linear resistance is obtained from the slope of the distance (length) versus resistance curve plotted from different length of measurement.

Prof. dr. ir. **Gilbert De Mey –** Emeritus.
His professional life was related to Ghent University, Department of Electronics and Information Systems. Currently, he supports the Smart Textiles group at the Department of Textiles of Ghent University.

A Smart Narrow Fabric

Annick Depré and SmartPro partner Frederick Bossuyt

info@elasta.be



Elasta nv has a long experience in weaving, braiding and knitting narrow fabrics, ribbons and laces, elastic as well as non-elastic. Elasta also develops new and innovative products in close cooperation with its customers and with research institutes.

In this prototype, an electronic module including movement sensors has been integrated on the textile. The textile is a knitted narrow fabric, where electro-conductive yarns from Bekaert have been integrated. Four conductive yarns form a bus system, capable of transmitting sensor data and providing power to the sensor module. Besides the sensor module, a Bluetooth module has been added, in order to wirelessly capture the sensor data.

This demonstrator shows the feasibility of using conductive yarns to connect different electronic modules electrically with each other. In this way, the stretchable properties of the narrow fabric can be maximally maintained while adding sensing functionality on dedicated places. The prototype can be used for activity monitoring of people or location detection inside a building which is equipped with Bluetooth communication infrastructure. In a straightforward way, other sensors or actuators can be added to the knitted narrow fabric.

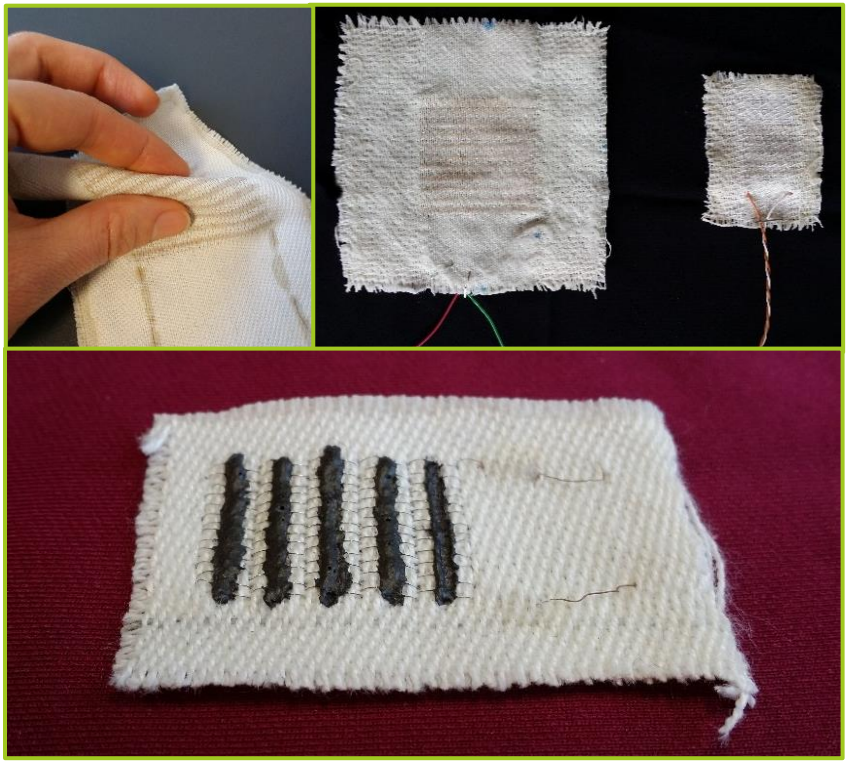
Annick Depré is the owner of Elasta nv located in Textielstraat 15, 8790 Waregem, Belgium.

Frederick Bossuyt works at the Center for Microsystems Technology, which is part of Ghent University and IMEC, Leuven, Belgium, where he is involved in research on stretchable electronics and textile integration technologies.

Textile heat flux meter

Hayriye Gidik, Daniel Dupont, Gauthier Bedek

hayriye.gidik@yncrea.fr



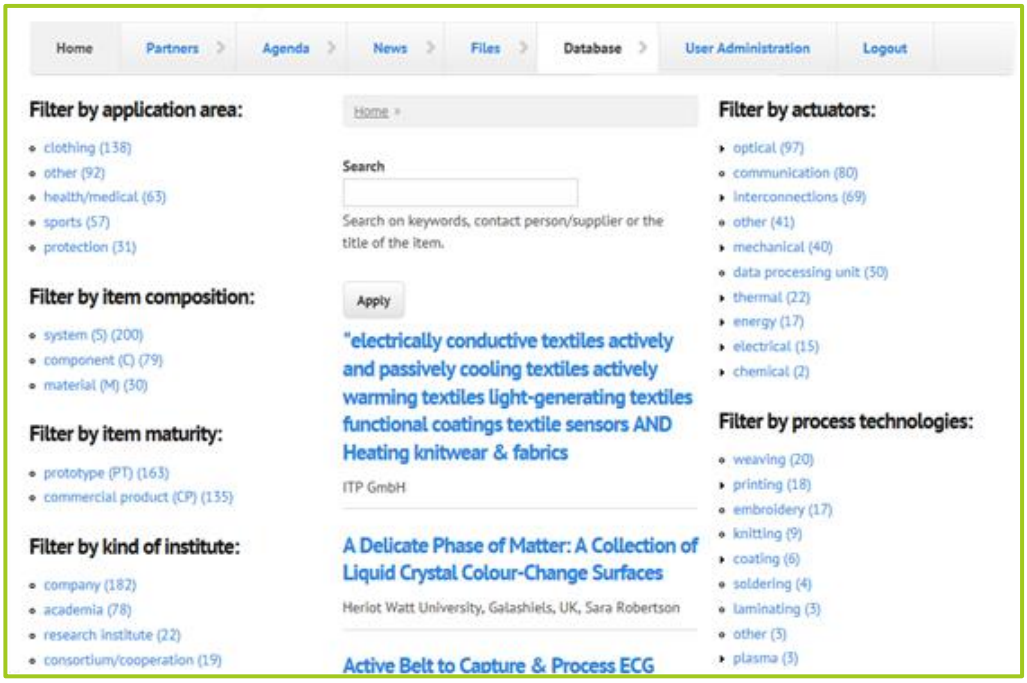
There are various countermeasures and strategies to manage heat injuries. One of them is to use a physiological status monitoring system to monitor the heat strain status. In doing this early symptoms of heat illness can be detected and necessary interventions can be taken before injury occurs. Several scientists use heat flux meters in thermo-physiological studies to measure body heat exchange with the environment. However, the non-permeability of such heat flux meters gives an inaccurate result when a measurement of heat flux is carried out in wet conditions. Moreover, they can only be used for semi-flat surfaces because of their semi-rigidity as these heat flux meters need to have a good contact with the support surface. Thus, we propose an innovative smart textile: a heat flux meter with a textile substrate also called textile heat flux meter (THF) which can detect, analyse and monitor the heat and mass transfers with minimum disturbance due to its porosity. It is a yarn based sensor which can be defined as the yarn itself as a sensing element and thus it is easier to be used by conventional knitting and weaving processes. Moreover, it is desirable to use flexible electronics and this is especially true when they need to be in contact with the human body, in which case the flexibility and non-irritability requirements are of utmost importance.

Hayriye Gidik is currently an Associate Professor at HEI, France, and member of the GEMTEX Laboratory (France). Her main research interests are smart textiles, more specifically the textile heat flux meters for heat and mass transfers, and thermoelectricity.
Daniel Dupont (daniel.dupont@yncrea.fr) is a Professor at the HEI, Lille, France. His current research interest is in instrumentation and modelling. Since 1999, he has been head research team on systems and microsystems control, Lille, France.
Gauthier Bedek (gauthier.bedek@up-tex.fr) is a project manager in a competitiveness cluster specialized in Textile (UP-tex). He specializes in characterizing and modelling of thermal and mass transfers.

SmartPro Database

Frederik Goethals, Lina Rambausek, Carla Hertleer

frg@centexbel.be



The SMARTpro Database is a tool helping you in your search of existing types of smart textiles. You can look for a product by entering a key-word in the search field or by applying a filter, e.g. type of sensor and application area. Besides end products the tool includes a list of building blocks (such as sensors, batteries or conductive tracks) to produce smart textiles with. This can help you to develop your own smart textiles.

SMARTpro is a VIStraject supported by Flanders Innovation & Entrepreneurship.

Frederik Goethals, Researcher Textile Functionalisation & Surface Modification, Centexbel, Technologiepark 7, 9052 Zwijnaarde Belgium.

Knowledge4All

Lisa Heirman, Jana Becelaere, Eva Loccufier, Dorien Reynders, Sander Rijckaert

GHENT UNIVERSITY

Knowledge4all and Co-creation are two innovation in education projects at Ghent University whereby students from different disciplines jointly develop products and services for people's special needs, for instance because of a temporary disability and for everyday life or for specific activities such as sports. The students contribute within their own discipline, e.g. rehabilitation, remedial education, law, economy, computer science, industrial design and textiles. This learns them to observe problems from a much broader perspective.

The presented prototypes were relate to

- monitoring of movement of new-borns to diagnose asymmetric behavior

- untearable textiles for a person with specific needs

Lisa Heirman is a Master student in Sustainable Materials Engineering at the Department of Textiles of Ghent University

Woven electro-conductive contacts – WINTEX

Benny Malengier, Carla Hertleer, Thomas Ellegiers, Simona Vasile

benny-malengier@ugent.be

This prototype was developed within the framework of the TETRA project WINTEX. The woven hybrid fabric has electro-conductive yarns that enable transportation of electrical current. The contact resistance in the interconnections should be as low as possible, so that the contacts do not heat up and only few energy gets lost. During the WINTEX project several types of conductive yarns in different weave structures were explored. An adequate selection of these yarns and weaves resulted in fabrics with low contact resistance and temperature at the level of the interconnection and in a high robustness.

The presented prototype has multifilament stainless steel yarns Bekinox VN woven into it to make the interconnections that light up the LEDs. Energy is provided by a 9 Volt battery.

These companies were member of the user committee of the project:

BAAV – Bekintex – Bivolino – DesleeClama – DTA –Elasta – Helioscreen – Seyntex – Sioen - VdSweaving

Benny Malengier is a post-doctoral researcher at the Department of Textiles. His main research focus is mathematical modelling of physical processes. Past research involved convection-diffusion-reaction problems; developments in FEM, FVM and MOL numerical methods; and multi-scale methods for Fabrics. He also works on STEM promotion, and the application of state of the art research in practical prototypes.

Department of Textiles, Technologiepark 907, 9052 Zwijnaarde (Gent), Belgium.

Textile Temperature Sensor

Riccardo Marchesi

plug@plugandwear.com

Soft textile sensor able to measure temperature even if placed on uneven surfaces. Its all-fabric single layer guarantees flexibility, breathability, comfortability and stetchability. It can be placed in direct contact with the skin. In this Resistance Temperature Detector principle, temperature is averaged on the whole surface of the sensor. It gives a very low thermal inertia and hysteresis. It is the perfect instrument to measure temperature between the human body and a soft surface like a mattress or a cushion. Patent pending.

Just after his graduation, **Riccardo Marchesi** joins the family company, SCOMAR srl producing flat knitting machines, as International Sales Manager. From 1987 to 1999 he develops the sales in the US market bringing the company to become the first supplier of collar flat knitting machines in America. From 1992 he is also responsible for new developments on machines. With the repositioning of the textile industry in the Far East and the consequent closure of the knitting manufacturing plants in Europe and the US starting from 2000 he transforms the company from a producer of flat knitting machines to a producer of high performance technical textiles, such as metal fabrics for shielding electromagnetic interferences (EMI) and smart fabrics. The deep knowledge of textile technologies and his expertise of textile industrial processes allow him to develop highly innovative solutions for EMI shielding and smart fabrics. His current research activities are in the field of interactive textiles for HCI and robotics. He is the co-founder of Plug&Wear Srl.

INGA Wellbeing Smart Patient Wear

INGA staff members in collaboration with Frederick Bossuyt

frederick.bossuyt@elis.ugent.be

In this prototype, an electronic module including movement sensors has been integrated on the textile. The textile is a regular cotton fabric, where conductive yarns from Bekaert have been sewn on. The four conductive yarns form a bus system, capable of transmitting sensor data and providing power to the sensor module. Besides the sensor module, a Bluetooth module has been added, in order to wirelessly capture the sensor data.

This demonstrator shows the feasibility of using conductive yarns to connect different electronic modules electrically with each other. In this way, we can maximally maintain the textile properties of the garment while adding sensing functionality on dedicated places. The prototype can be used for activity monitoring of patients or location detection inside a building which is equipped with Bluetooth communication infrastructure. In a straightforward way, other sensors can be added to the garment.

Dr. ir. **Frederick Bossuyt** (male) works at the Center for Microsystems Technology, which is part of Ghent University and IMEC, Leuven, Belgium, where he is involved in research on stretchable electronics and textile integration technologies.

Palpitations

Galina Mihaleva

gmihaleva@ntu.edu.sg

Project Palpitations is a dress designed with the purpose of projecting internal reactions externally onto the dress. The proposed concept was that the butterfly headdress, symbolic of dreams and thoughts, is programmed to flutter in response to brainwaves detected from a sensor, in conjunction with the pulsation of rippling light down the front of the dress that reacts to the pulse sensor. The two sensors express the idea of rationality versus emotional response, and plays with the supposed notion that females are more emotionally inclined. Here, it is demonstrated how Nth-Light®, a revolutionary flexible LED is used with sensors to create a dress that questions the socially perceived idea of female temperament, and it shows how technology is used to provide an insight to the body's internal workings. This design would not have been possible if companies did not develop flexible LED compared to what were once rigid bulbs of lights.

Galina Mihaleva is an Assistant Professor at ADM; Nanyang Technological University in Singapore She holds graduate degrees in Textile and Fashion Design and a Ph.D. from the Academy of Fine Art in Sofia.
Her interest in fashion lies in exploring the extent to which we experience fashion (emotional, intellectual and sensual aspects) and how we might be able to accomplish a higher state of connectivity between the body and our clothing.
Her interdisciplinary work has been shown in galleries and museums across United States, Asia, Central and South America and Europe. She was nominated for the design award at the Cooper Hewitt Museum in New York in 2009. Beyond in-depth analysis of cultural values she combines traditional tailoring methods while developing and using new materials and innovative construction proses. Unbounded by the old rules, Galina now offers her work as a testimony to the power of beauty and expression, and to the transcendent human spirit. She regards her works as being timeless.

Optical Fibers Hat

Lena Daniela Kovacevic Milivojevic

Lenathemil@gmail.com

This year, as a realisation of my model, I present a hat that is combining design and Smart technology in accordance with the possibilities of the Serbian market.
The materials used for this model of woman's hat are green muslin with tinsels in the upper part of the hat, and a green satin strip around the hat. Rim of the hat is made of blue taffeta, both on the inside and the outside and in the upper part that covers woman's head, a blue lining material is used. On the hat brim, a blue diagonal piece of tape is sawed on, whereas I manualy produced bushy woolen yarn balls that are applied.

As to technology, the optical fibers are placed in the background of the hat and are joined by a flexible neonwire that is approximately 8mm in diameter. The flexible neonwire collects the fibers in a single bundle which has a light source at its beginning – a green high bright LED (20 mA). The LED is powered by a 3V coin – cell battery. The fibers can radiate around 12h by means of a fully charged battery.

Fibers like this are often called multi – mode fibers (MMF).

Lena Daniela Kovacevic Milivojevic (LENA DKM), born 1985.
Education at The College of Textile – design, Technology and Management – DTM, Belgrade, Serbia;
-Specialised vocational engineer in technology - 2nd level (2014. - 2015.);
-Vocational designer of textile and clothing – 1st level (2009. – 2014.);
I would like to work in research and teaching about textile technology and materials for special purposes, especialy in field of Smart textiles.
In my spare time I enjoy music, singing, painting, photography, reading, writing, physics, astrology, numerology and many more.

Textile Piano

Hochschule Niederrhein
University of Applied Sciences

Marina Normann

marina.normann@hs-niederrhein.de

The prototype I like to present is a textile piano. It is made of a combination of conductive materials and small electronic components. As a base controller an Arduino compatible microcontroller was used. With the software Arduino provides to their devices, a program was written to play tunes when a certain key on the keyboard is touched. For an easier scripting procedure and less connections on the main controller, a capacitive sensor was implemented, which allow to connect 12 individual keys, each sending out a different tune on touch. The tune is defined by a frequency in the program. The piano keys are made out of silver coated yarn by Amberstrand®, sewed onto a carrier fabric in shape of one octave of a piano. The pins of the microcontroller and the conductive keys were connected with conventional isolated wires to ensure the functionality. The wire was soldered to the processor and sensor, as well to the conductive yarn. On touch of one key, a defined note can be heard through a connected little speaker.

Marina Normann studied at the Faculty of Textile and Clothing Technology at Hochschule Niederrhein in Germany and achieved her master's degree in august 2016. During her studies she worked on several smart textiles projects. In her first project she build a 5x9 LED-Matrix into a textile application, controlled via an Arduino Lilypad. Other projects contained the use of thermochromic ink or the development of textile energy sources. She is now working at the Hochschule Niederrhein as scientific associate, working further on smart textile projects and improving the development of textile batteries.

Textile Battery

Ida Nuramdhani, Gilbert De Mey, Sheilla Atieno Odhiambo, Carla Hertleer, Lieva Van Langenhove

Ida.Nuramdhani@UGent.be

The prototype presented here is the second generation of a PEDOT-PSS textile battery made in our group of smart textiles in Ghent University. It is composed of a three layered 5x5 cm2 polyester/cotton fabric laminated with hydrophobic film of thermoplastic polyurethane. The battery was developed using stainless steel filament yarns as electrodes and the electro-active PEDOT:PSS polymer dispersion as electrolyte. The generation of electricity in this device is believed to be due to charge separation and involve transport of ions in the electrolyte.

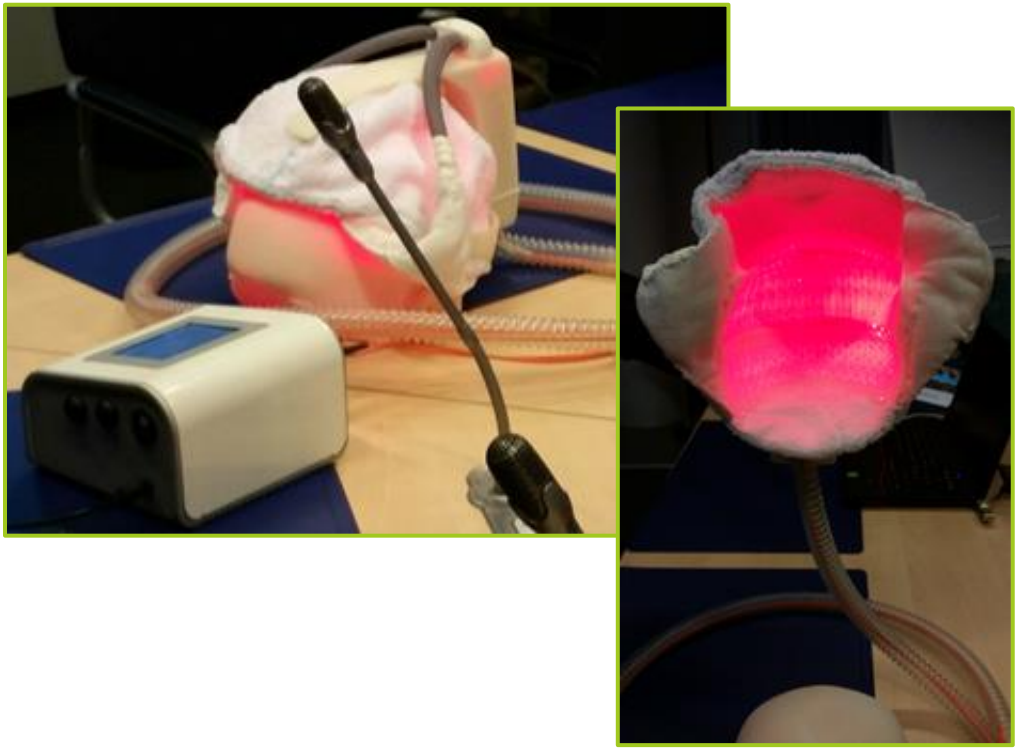
The main goal of this study is to develop an energy generating and storage device which is flexible, lightweight, non-obtrusive and integrated with the textile structure. Our textile battery is still in the early stage of development, but we have been quite successful in producing a series of devices with consistent results and capable of powering simple apparatus like pocket calculator. Therefore, one of the central themes in the development of this device is to obtain an understanding of the working principles and mechanisms of charge generation. This will allow us to find the best configuration of the device that gives its maximum performance and applicability.

Ida Nuramdhani obtained her Master of Science in Chemistry from University of Canterbury, New Zealand, after holding a Bachelor of Applied Science in Textile Chemistry from School of Textile Technology in Indonesia. She has been working as lecturer and researcher in her alma mater in Indonesia since 2002, teaching some subjects mainly Chemistry of Dyes, Technology of Dyeing, Color Technology, and Organic Chemistry. She started working in the area of smart textiles since her commencement of Phd study in November 2015 in Ghent University under the group of Professor Lieva Van Langenhove. It is a relatively new field for her, but she believes that bringing along her expertise and experience as a textile chemist will allow her to open more rooms of study and exploration in the field.

Light Emitting Fabric for the Treatment of Skin Diseases with Photodynamic Therapy

Yesim Oguz, Cedric Cochrane, Vladan Koncar, Serge Mordon

yesim.oguz@ensait.fr



Medical textiles offer more reliability and comfort for specific treatments. In this work we propose a more effective and less painful alternative method of Photo Dynamic Therapy (PDT) to treat skin diseases such as Actinic Keratosis (AK). As part of project PHOS ISTOS, we have developed a flexible support which emits light through PMMA optical fibers embedded in the fabric structure. Today PDT is applied with panels of light emitting diodes (LEDs) (Chen et al. 2012; Heinzelmann, 2007). This is an effective method without side effects with good cosmetic results. However, LEDs panels do not allow for homogeneous illumination because of the human body irregularities. Therefore for effective treatment, use high light output which makes this method painful due to the dose of pure light (Kuonen & Gaide 2014). In addition, the total treatment takes about 5 hours for a single patient, so it is not possible to treat more patients per day. The light emitting fabrics (LEF) give the opportunity to treat several patients at the same time and are painless. Thanks to the flexibility of LEF, the light may be distributed homogenously on precancerous or cancerous lesions. A lower light output is therefore sufficient to treat this helps to significantly reduce the pain caused by the treatment.

Chen, D. et al., 2012. Light-Emitting Diode-Based Illumination System for In Vitro Photodynamic Therapy. International Journal of Photoenergy, 2012, pp. 1–6. Heinzelmann, E., 2007. Textiles Simplify Cancer Therapie, pp. 38–40.
Kuonen, F. & Gaide, O., 2014. Nouvelle lumière sur la thérapie photodynamique cutanée. Revue Médicale Suisse, 10, pp.754–759.

Yesim Oguz is at her last year of PhD programme and she is currently working in the frame of European project called Phos-istos in Gemtex laboratory, France.
She is developing and optimizing a LEF to treat the skin diseases with PDT).
Vladan Koncar is a Professor at ENSAIT / GEMTEX Laboratory, vladan.koncar@ensait.fr
Cedric Cochrane is an Associate Research Professor, cedric.cochrane@ensait.fr
Serge R. Mordon is a Professor French National Institute of Health and Medical Research, serge.mordon@inserm.fr

LED Galloon

Ilse Muysewinkel, Jo Vanhauwermeiren (Vamutex)

vamutex@skynet.be

A galloon is an element of haberdashery (*fr. passementerie*) is a decorative woven trim sometimes in the form of a braid usually made of metallic gold or silver thread, lace, or embroidery. Galloon is used in the trim of military and police uniforms, ecclesiastical dress, and as trim on textiles, drapery, and upholstery.

The LED Galloon presented here has been developed by Vamutex. It is a galloon with an operational LED strip in it, made by a patent pending process. Vamutex was challenged to make the galloon washable, stitchable and keep it flexible, which Vamutex succeeded in doing. The main goal for the LED Galloon is to be used in (festivity) clothing and other confectioning applications.

The galloon is nowaday's available on the market.

Ilse Muysewinkel and **Jo Vanhauwermeiren** have together more than 40 years' of experience in the world of textiles. They started with Vamutex more than 20 years ago, focusing on the production of webbing. They are an experienced partners in developing special products.

GHENT UNIVERSITY

CENTEXBEL

FLANDERS INNOVATION & ENTREPRENEURSHIP

Flanders State of the Art

SMART pro