AACHEN DRESDEN DENKENDORF

INTERNATIONAL **TEXTILE** CONFERENCE

Dresden, November 24-25, 2016

Partner Countries: Austria & Switzerland

- **Fiber-reinforced Composite Materials**
- **Polymer Materials, and Functionalization of Textile Structures for Fibercomposite Materials, Safety Textiles and Megatrends**
- **Megatrends**
- **Protective and Functional Textiles**
- **Transfer Session „From Idea to Practice“**

Further Information:
www.aachen-dresden-denkendorf.de/en/itc/

PRESS INFORMATION

Local Organization 2016
Institute of Textile Machinery and
High Performance Material Technology
TU Dresden
01062 Dresden
Dipl.-Ing. Annett Dörfel
E-Mail: annett.doerfel@tu-dresden.de
phone +49 351-463-39321

CONTENT

Press release for the Aachen-Dresden-Denkendorf International Textile Conference 2016

As of November 22th, 2016, more than 650 attendees have registered to participate in this year's Aachen-Dresden-Denkendorf International Textile Conference 2016 at the International Congress Center in Dresden.

The international involvement in the conference will amount approx. 20 % (115 attendees from 27 countries). Approx. 45 % of the participants are representatives from various industries and industrial organizations.

Since 2007, the textile research institutes of the regions around Aachen and Dresden have jointly organized the Aachen-Dresden International Textile Conference. With more than 700 participants from Germany and abroad, the conference is one of the most important textile events in Europe and has well established itself as a national and international platform for the textile industry, textile machine construction, textile finishing, textile chemistry as well as for application oriented disciplines such as lightweight construction, bio- and medical technology, construction, electrical and information technology.

Last year, the organizers succeeded in expanding the textile conference by including a third conference venue in southern part of Germany. Thus, the existing east-west axis is now extended across Germany to form a triangle between Aachen-Dresden-Denkendorf.

Since 2016, the German Institute for Textile and Fiber Research Denkendorf (DITF), one of the leading textile research institutes in Southern Germany, has been integrated as our third major organizer. The Aachen-Dresden-Denkendorf International Textile Conference will now take place every year alternatively at one of these three locations. Parallel to the International Textile Conference, the organizers will also organize a German Colloquium on Textiles with changing special themes as a national pendant.

In addition, the institutes receive valuable support from representatives of well-known companies and associations in preparation of the program. Particularly noteworthy here are the Forschungskuratorium Textil e.V., the Gesamtverband Textil + Mode e.V. and the VDMA Fachverband Textilmaschinen. The responsibilities for the organization of the conference lie with the Institute for Textile Machinery and High Performance Material Technology at Technische Universität Dresden in Dresden, the DWI Leibniz Institute for Interactive Materials in Aachen, and the German Institute for Textile and Fiber Research in Denkendorf.

This year's partner countries are Austria and Switzerland. With the inclusion of different partner countries (2009: Netherlands and Belgium, 2010: Poland and Czech Republic, 2011: Australia and New Zealand, 2012: Japan, 2013: Turkey, 2014: South Korea and 2015: France) in the International Textile Conference, the Organizers have succeeded in creating a platform for new research co-operation and sustainable networks outside Germany, and thus providing an excellent opportunity for the international exchange of scientific expertises and informations between representatives from research and industry. Current developments and high-tech applications from our partner countries will again be the subject of many talks.

This year's conference will offer an ambitious program in three parallel sections with talks from top-class national and international speakers from industry and research. The following special symposia will be held for experts from the areas of material, chemistry, finishing and functionalization of materials and machines, processing and composites:

- **Fiber-reinforced Composite Materials**
- **Polymer Materials, and Functionalization of Textile Structures for Fibercomposite Materials, Safety Textiles and Megatrends**
- **Megatrends**
- **Protective and Functional Textiles**
- **Transfer Session „From Idea to Practice“**

For the plenary talks, the organizers were able to engage excellent, internationally renowned contributors, who will offer insights into industry visions, trends, and innovations from the areas of lightweight construction, polymer materials, and various textile-based spheres of life. Another outstanding part of the conference will be the poster presentation, in which young scientists will be presenting their academic research results to the audience, whetting their appetite for the accompanying poster session.

Prof. Hubert Jäger, Chairman of the Board, Carbon Composites e.V., Augsburg and Speaker of the Board, Institute for Lightweight Construction and Plastics Technology at Technische Universität Dresden, will present the hybrid construction of Carbon Composites that are predestined for diverse light-weight applications with their unique mechanical properties at lower material densities. In particular Prof. Jäger will analyze the importance and future prospects of fiber composite materials in hybrid lightweight construction using bionic structures.

Prof. Sebastian Koltzenburg, a material researcher at BASF, will present a wide range of methods for the targeted influencing of surface properties for different substances and objects using thin material layers, such as, the washability and soiling behavior of textile fibers, the antibacterial equipment of hospital textiles and instruments, or the easier combability Human hair.

The internationally successful architect and engineer **Prof. Werner Sobek** presents unimagined technical possibilities of construction with fabric in the façade area, which makes extremely light, multifunctional and adaptive building possible: they can radiate, breathe, adapt themselves to differently changing environmental conditions. A huge potential for the design of visual and haptic properties of facades has hitherto only been recognized and used. The aim of Sobek is therefore fiber-based construction, by which the design potential of the material can be fully utilized and the building physical properties with regard to light, acoustics, respiratory activity and the passage of moisture can be better understood.

Christian Leu from Ernst & Young GmbH Auditing society, Munich and a member of the strategy team at EY will speak about the challenges existing in traditional industries, such as the technical textile business in connection with the entry of digitalization. The themes are causes of the digital revolution and their consequences for companies. Digitization and the development towards Industry 4.0, pose new challenges for industry and society. The technologies continue to evolve faster, informations are better networked, and the industries understand their customers better due to the new data availability.

As further highlights, the following 13 keynote lectures which offer future trends and innovations of the conference themes are integrated in the conference program.

- **Prof. Dr. Thomas Bechtold**; Universität Innsbruck, Dornbirn, Österreich
- **Dr. Thomas Behr**; Daimler AG, Sindelfingen
- **Prof. Dr. Manfred Curbach**; C³ - Carbon Concrete Composite e. V., Dresden, Institut für Massivbau, TU Dresden
- **Peter Egger**; ENGEL AUSTRIA GmbH, Schwertberg, Österreich
- **Prof. Dr. Paolo Ermanni**; Laboratory of Composite Materials and Adaptive Structures, ETH Zürich, Schweiz
- **Prof. Dr. Matthias Jarke**; Fraunhofer-Institut für Angewandte Informationstechnik FIT, Aachen
- **Franz-Jürgen Kümpers**; SGL Kümpers GmbH & Co. KG, Rheine
- **Prof. Dr. Christoph Leyens**; TU Dresden, Institut für Werkstoffwissenschaft, Dresden
- **Roland Lottenbach**; Schoeller Textil AG, Sevelen, Schweiz
- **Dr. Sylvia Monsheimer**; Evonik Industries AG, Marl

- **Prof. Dr. Gerold Schneider**; TU Hamburg, Institut für Keramische Hochleistungswerkstoffe, Hamburg
- **Boris Vetter**; SIEMENS Industry Software GmbH , München
- **Prof. Dr. Martin Wiedemann**; DLR, Institut für Faserverbundleichtbau und Adaptronik, Braunschweig

For the first time, one of the sessions of the International Textile Conference is specifically concerned with megatrends, in which textile innovations play a key part. Trends from six different fields which can be assumed to change the textile industry, textile engineering, textile refinement, textile chemistry, and related disciplines like lightweight engineering, biotechnology and medical technology, construction, and electrical or information technology fundamentally and in the long term, will be presented. To put a special focus on the wide variety of subjects in this session, all presentations will be keynote talks.

In the two-day section on “Polymer materials and functionalization of fiber-reinforced composite materials, safety textile and megatrends”, related polymer and fiber material developments, functionalization and finishing techniques will be presented. The development and modification of customized polymers, fiber materials, and materials for high-tech applications comes more and more into the focus of textile chemists, technicians and finishing specialists, as this is the only way to expediently, sustainably and resource-efficiently establish new developments in the industry.

Trends and recent developments for high-performance materials, textile 2D and 3D reinforcement structures, textile machinery modifications, simulation-assisted preforming/component production processes, testing technology, and for the recycling of fiber-reinforced plastic composites will be the subject of the two-day „Composites“ section. Attendees will be shown the future potential of customized composites for a variety of lightweight construction applications.

On the first day of the conference, the well-established IGF-ZIM transfer event “From Idea to Practice” will again be organized by the Forschungskuratorium Textil e.V. Attendants will be introduced to selected successful products and methods developed in co-operation between researchers and industry representatives, and effectively realized by the industry.

As is traditional for the Dresden iterations of the conference, the second day of the conference will be dedicated to current developments in (fiber) materials and product developments for personal and technical safety applications. These developments are used, for instance, in worker safety gear, heat and flame guard textiles, intelligent functional textiles with integrated sensors and actuators, and in textile blast containment devices.

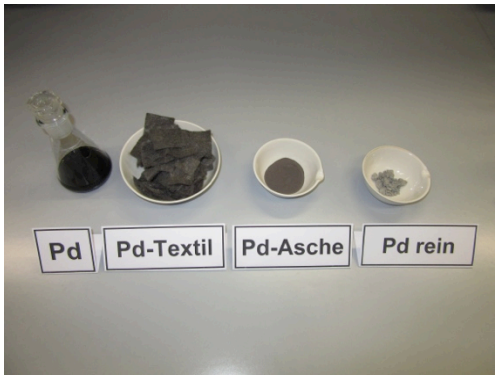
Further highlight are 8 short poster presentations, in which young academics present their research to the public, making them curious of their work in the accompanying poster session. The Aachen-Dresden-Denkendorf International Textile Conference 2016 will be rounded-off by an extensive poster presentation. Over 100 scientists and company representatives from Germany and abroad present their new research results. Three outstanding poster presentations will be awarded with the Posteraward 2016.

In addition to the Posteraward, special prizes of the Freundes- und Förderkreises des ITM der TU Dresden e.V. will be handed over to a research associate as well as a graduate of the Institute for Textile Machinery and High Performance Materials Technology for their excellent graduation thesis.

Textile Mining - Digging for noble metals from industrial process waters

Deutsches Textilforschungszentrum Nord-West gGmbH

The recycling and recovery of high-prized noble metals such as platinum, gold, palladium and silver or rare and strategic metals like indium, gallium, and rare earth metals from scrap metals and wastewaters will be from steadily increasing importance within the next years. Therefore, the focus has to be set on the detection of potentially usable secondary resources and the development of inexpensive and energy-saving processes to separate and recover the metals selectively (urban mining). Beside electronic scrap industrial process and wastewaters represent a considerable source for noble metals. Recently, we have successfully developed an innovative metal-adsorbing textile filter material based on polyvinylamine-coated polyester fibers. The surface modification of the fibrous material is easy to realize with common methods in textile finishing yielding a durable, high-performing and even cheap adsorbent for water-dissolved metal ions. We present results on the general textile finishing procedure and the pH-depending adsorption of noble metal ions. The feasibility of the overall process is demonstrated on palladium containing process waters obtained from a German producer of curcuit boards. Moreover, the same innovative adsorber material is useful for the decontamination of chromate-polluted ground waters and soils. Our latest investigations focus their use in the selective recovery of rare earth metals from large-scale FCC catalyst production for the petroleum refining industry.



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Contact:
Dr. Klaus Opwis, opwis@dtnw.de, phone: +49 2151-843-2014

Further information:

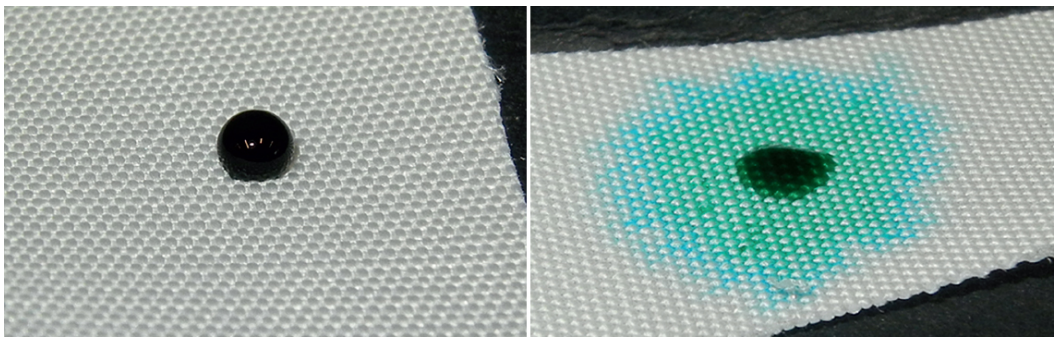
Lecture: Klaus Opwis et al.:
Textile Mining - Digging for noble metals from industrial process waters
Friday, 25.11.2016, Hall 1, „Polymer Materials“, 4:15 pm

Based on a decision of the German Bundestag the IGF project “Recovery of noble metals” (grant 17247 N) and the ZIM project “ChromaTex” (grant KF 3047703CJ4) are supported by the Federal Ministry of Economics and Technology (BMWi). The projects “r4-Lan-Tex” (grant 033R138A) and „r+Impuls - Edelmetalladsorber“ (grant 033R153B) are funded by the German Federal Ministry of Education and Research (BMBF).

Textile surfaces with soil-release properties

DWI – Leibniz Institute for Interactive Materials
Aachen

DWI scientists developed textile surfaces that can be switched from hydrophobic (dirt-repellant) to hydrophilic (easy cleaning) behavior by wetting. Dry fibers are hard to wet. However, once the textile is totally immersed in water, it becomes hydrophilic and dirt can easily be removed. As soon as the textile is dry again, it regains its hydrophobic, soil-repellant behavior.
Small and ultra-small silica particles covered by both hydrophilic and hydrophobic organic chains are able to switch their wetting behavior in dependence on the surrounding media. In contrast to the widely used “grafting-from” approach we applied highly branched polyalkoxysiloxane as a silica precursor, which is partially end group-modified by either hexadecyl or polyethylenglycol chains. Both kinds of precursors were co-hydrolyzed in various ratios to amphiphilic silica particles maintaining non-hydrolysable hydrophobic as well as hydrophilic chains. The mobile chains at the surface of the 100-300nm-sized nano particles act as binary brushes selective to hydrophobic or hydrophilic environment.
Once coated with formulations of these particles, the surface is hydrophobic after drying in a dry atmosphere and hydrophilic after complete immersion in water. Compared to brush-like surfaces, the hysteresis between advancing and receding contact angle is increased by particle-induced roughness.
Application of an aqueous formulation of amphiphilic silica particles on textiles using common technologies such as dip-coating, casting or spraying results in hydrophobic soil-repellant surfaces. Strong immersion in water switches the wettability from hydrophobic to hydrophilic. The hydrophilic surface is swelling and becomes soil-releasing. In this way, we are able to control the wettability of surfaces by altering the hydrophobicity of the coatings. This process can be repeated several times without loosing the function. Due to the good adhesion in the presence of an adhesion promoter or a binder, the function is retained also after applying mechanical stress.



Switchable wetting properties of a polyester textile coated with a dispersion of amphiphilic brush-like silica nano particles: Left: A dyed water droplet stays at the surface of the dried coated textile (hydrophobic surface). Right: A dyed water droplet wets a moistly coated textile.

Contact:
Dr. Karin Peter, peter@dwi.rwth-aachen.de, phone: +49 241 80 23340

Further information:

Lecture: Karin Peter et al.:
Textile coatings with switchable wetting properties: A combination of soil-repellency and easy soil-release
Friday, 25.11.2016, Hall 1, „Polymer Materials“, 11:05 am

Gefördert durch das Forschungskuratorium Textil e.V. über die AiF im Rahmen des Programms zur Förderung der industriellen Gemeinschaftsforschung und -entwicklung (IGF) des BMWi (IGF-Vorhaben 17862 N)

Sustainable finishing of natural fiber materials

Research Institute for Textile and Clothing
Niederrhein University of Applied Sciences

An increasing demand for the application of natural fibers is recorded worldwide even in the application field of technical textiles. Therefore the Research Institute for Textile and Clothing focusses its research on different topics in this field. A particular field of interest are cellulosic fibers as well as protein fibers, which offer attractive physiological properties hardly achievable by their synthetic counterparts. However, these materials exhibit some disadvantages, which should be overcome by sustainable pretreatments of the fibrous materials. Wool tends to felt, which is usually prevented by a chemical cocktail consisting of hypochlorite and an epichlorhydrine polymer. A more sustainable process was developed at the research institute without needing such harmful substances: By proper combination of different enzymes and favorable process-parameters an anti-felting pretreatment can be achieved.

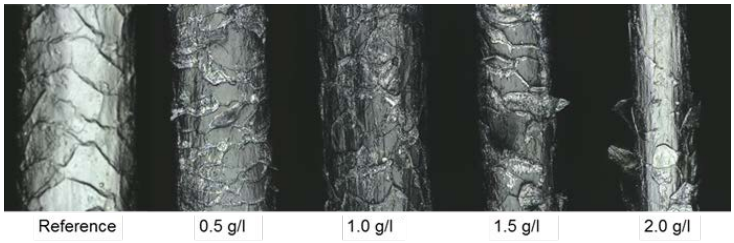


Figure 1: Confocal microscopy image of untreated wool (left) and treated samples (right)

Cellulosic fibers also gain more and more attention in the field of fiber reinforced materials. The lower energy demand during production of such materials and their significantly better recycling capability compared to glass fiber reinforced materials renders them highly attractive as reinforcing materials in composites. The Research Institute for textile and clothing cooperates with the Institute for Fiber Reinforced Materials at the TU Kaiserslautern to achieve new materials from renewable raw materials, eventually exhibiting mechanical properties closer to synthetic materials as it is possible today. For this, sustainable procedures and materials for pretreatment of flax and hemp fibers were developed, tailoring the polarity of the fibrous material to the demand of the resin matrix. Antimicrobial agents from renewable sources were developed additionally to prevent bio corrosion of these materials.

Figure 2: Nonwoven made from flax fibers, untreated (left) and treated with a hydrophobization agent from natural resources (right)

Contact:
Dr. Thomas Grethe, Thomas.Grethe@hsnr.de, phone: +49 2161 1866019

Further information:

Lecture: Thomas Grethe et al.:
Sustainable hydrophobic and antimicrobial finishing of natural fiber materials for the application in fiber reinforced composites
Friday, 25.11.2016, Hall 1, „Polymer Materials“, 11:55 am

Poster P36: Esther Rohleder et al.: **Enzymatic Treatment of Wool**

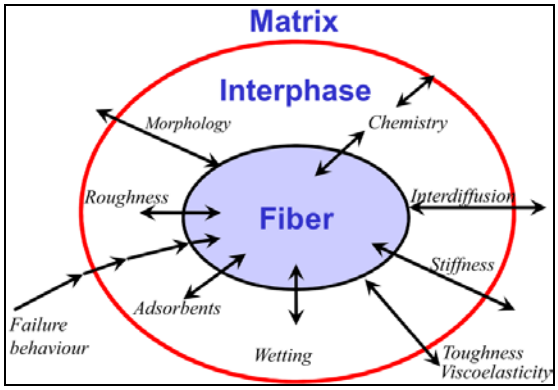
The projects are funded by the German Federal Ministry of Economics and Energy (BMWi) via „Zentrales Innovationsprogramm Mittelstand“ (ZIM), under grant number KF 2233816CJ4 and KF 2233818TA4).

Quantifying and understanding fiber-matrix interactions from nano- to macroscale

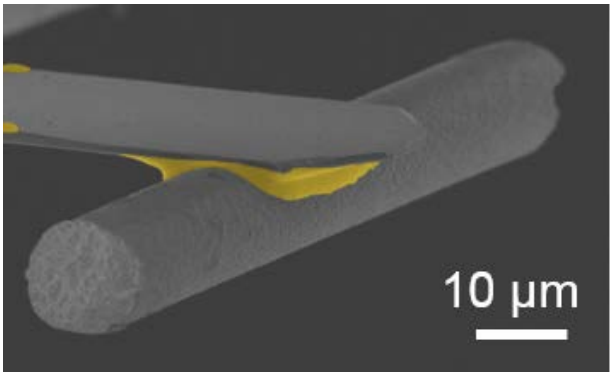
Leibniz-Institut für Polymerforschung Dresden e. V.

Leibniz-Institut für Polymerforschung Dresden e.V.

Scientists at the Leibniz-Institut für Polymerforschung Dresden e.V. (Leibniz Institute of Polymer Research Dresden, IPF) join forces to provide a coherent description of fiber-matrix interactions, from nanoscopic structures to the final macroscopic composite materials. This is essential for designing fiber reinforced composite materials.
Recent developments in atomic force microscopy allow to determine fiber interactions and to quantify, thus, changes upon fiber modification on the nanoscale. Additionally, mechanical properties and structures of the fiber-matrix interphase can be quantified. Correlation of the findings with streaming potential measurements, wetting experiments and advanced physical modelling, draws a complete picture of fiber interactions and embedding from a physico-chemical perspective. Due to the cooperation of the different scientific disciplines these findings will be transfered into the engineering world.



Properties and structure of interphases in composites differ from those of adjacent phases.



Fiber fragment connected to an AFM cantilever in a force spectroscopy experiment.

Contact:
Prof. Andreas Fery, fery@ipfdd.de, phone: +49 351 4658 225

Further information:

Lecture: Andreas Fery et al.:
Quantifying and Understanding Fiber-Matrix Interactions from Nano- to Macroscale
Thursday, 24.11.2016, Hall 1, „Polymer Materials“, 2:35 pm

Sponsored by the Federal Minstry of Education and Research (BMBF)

From lab to FIMATEST - Fibre/matrix adhesion as key factor for high performance composites

Leibniz-Institut für Polymerforschung Dresden e. V.

Leibniz-Institut für Polymerforschung Dresden e.V.

Key sectors of the continuously growing composites market such as automotive, aerospace and electronics require constant quality assurance methods and reliable testing equipment. The interphase between fibre and matrix is a key parameter for the quality of a composite material, both for thermoplastics and thermoset resins. A challenging research issue is the reliable determination of the interfacial bond strength and the relation of surface and interphase characteristics to the static and fatigue properties of the composite.
In order to make a versatile and reproducible single-fibre pull-out test available to institutes and industrial customers worldwide, Textechno together with the Leibniz-Institut für Polymerforschung Dresden (IPF) and the Faserinstitut Bremen (FIBRE) have developed the FIMATEST system. In this ZIM-funded project the IPF contributed its long-standing competence and experience in the field of fibre modification and characterization of fibre/matrix adhesion strength, FIBRE used its experience in image analysis and Textechno supplied its know-how in single-fibre handling and testing.

FIMATEST-System consisting of FIMABOND (left) for reliable preparation of single-fiber model composites and the pull-out accessory (middle) to the tensile-tester FAVIMAT+ (right)

Contact:
Prof. Edith Mäder, emaeder@ipfdd.de, phone: +49 351 4658 305
Stefan Fliescher, s.fliescher@textechno.com, phone: +49 2161 6599-0

Further information:

Lecture: Edith Mäder, Ulrich Mörschel et al.:
From lab to FIMATEST - Fibre/matrix adhesion as key factor for high performance composites
Thursday, 24.11.2016, Hall 3 „IGF-ZIM-Transfer“, 5:20 pm

Sponsored by the Federal Ministry for Economic Affairs and Energy (BMWi)/ German Federation of Industrial Research Associations (AiF)/ within the Central Innovation Programme for SMEs (ZIM)

Mechanical evaluation of a braided composite structure use as a textile reinforced artificial anterior cruciate ligament

Institut für Textiltechnik der RWTH Aachen University

The rupture of the anterior cruciate ligament (ACL) is the most frequent ligament injury of the knee and considered the most common sports injury. The most commonly used and accepted way of treating an ACL rupture is the replacement using other ligaments or tendons of the patient. This however involves the risk of complications and functional deficits for the patient at the extraction site. Artificial textile ligaments are an alternative for the treatment of ACL ruptures. They however have a stress-strain behaviour that does not match that of human ligaments, have no reversible elasticity and are inferior in long-term stability.

The aim of the research project “TeLBa - Untersuchung von Textil-LSR-Verbundstrukturen als künstlichen Kreuzbandersatz“ is an artificial ACL, that is adapted to the biomechanics of the human ACL. Furthermore increased long-term stability compared to commercially available products is striven for. The concept is based on the combination of a braided reinforcing structure surrounding a core of liquid silicone rubber (LSR) with an additional LSR coating..

Uncoated artificial ligament structure comprised of a liquid silicone rubber core and overbraided with PET

Contact:
Florian Eggert, florian.eggert@ita.rwth-aachen.de, phone: +49 (0)241 – 80 23447

Further information:

The research project (Nr. 18526 N) is funded by the AiF and the Federal Ministry of Economics and Technology. We would like to thank the research association Kunststoffverarbeitung as well as all participating research institutes.

SozioTex – New sociotechnical systems in the textile industry

Institut für Textiltechnik und Institut für Soziologie der RWTH Aachen University

SozioTex, an interdisciplinary working research group, develops adaptive, learnability improving support systems, while concentrating on the needs and the knowledge of the staff, to earn acceptance and to decrease the wariness towards new technologies. The central part is a participative design process, including the users, who use e.g. an assistance application for tablets or a data glass.
The technological and demographic chance implement changes in working structure, processes and exercises: On the one hand advanced production techniques are being implemented in working processes, which require extended and complex competencies. On the other hand the staff, especially in the Textile industry, gets more heterogeneous and older, having a different base in knowledge and experiences. Simultaneously there is a general wariness and fears towards new technologies, concerning loss of autonomy and control. The challenge is to design user oriented systems, not only taking into consideration the innovation in techniques but also the social part: But how can we design holistic social technical systems, in context of innovative, connected production structures (key word: digitalization, industry 4.0) and a increasing heterogeneous staff (key word: demographic change, skill shortage)?

Process control using Assistance Systems on Smart Mobile Devices (source: ITA)

Contact:
Adjunct-Prof. (Clemson-Univ.) Dr.-Ing. Yves Gloy; yves.gloy@ita.rwth-aachen.de,
phone: +49 0241/80234 70

Further information:

Poster P66: Mario Löhrer et al.: **SozioTex: Sociotechnical systems in the textile industry - Assistance systems for industrial textile work enviroment**

http://www.soziotex.de
https://www.youtube.com/watch?v=9DR8-8S_uSM

supported by BMBF, Duration: 1.11.2014-31.10.2019

Carbon fibers – new precursors based on cellulose

ITCF Denkendorf

Today, carbon fibers (CF) are mostly produced from petroleum-based polyacrylonitrile (PAN) copolymers; however, this precursor has two major drawbacks: the precursor itself causes more than half of the costs of CF production and during carbonization, large amounts of toxic gases are formed, which require an extensive exhaust aftertreatment. An alternative precursor type is cellulose, which is available inexpensively from biogenic resources. Processing cellulose from ionic liquids (IL) opens new possibilities in the chemical and physical modification of fibers and, via IL-based multifilament dry wet spinning technique, it allows for the production of new cellulose (derivative) man-made fibers as promising precursors for CFs. The process of carbonization was studied by TGA hyphenation techniques. We could show that, depending on the carbonization agent and functional groups present in the precursor, the amount of carbon-containing gaseous products leaving the fiber could be reduced, leading to a significant increase of the carbonization yield. Precursor fibers were processed to CFs, both in batch and continuous processes. Structural and mechanical properties of the precursor fibers as well as the resulting CFs were investigated. Subsequently, CF properties could be correlated with the precursor type and with different processing parameters.

Figure 1: IL-spun precursor fiber based on cellulose

Figure 2: Cellulose-based CF

Contact:
Dr. rer. nat. Johanna Spörl, johanna.spoerl@itcf-denkendorf.de, phone: +49 711 / 93 40 – 274

Further information:

Lecture: Johanna Spörl et al.:
Carbon fibers – new precursors based on cellulose,
Thursday, 24.11.2016, Hall 2 "Composites", 3:25 pm

[1] J. M. Spörl, *Dissertation Universität Stuttgart*, Göttingen: Cuvillier Verlag, **2016**, ISBN 978-3-7369-9328-0.

[2] J. M. Spörl, A. Ota, S. Son, K. Massonne, F. Hermanutz, M. R. Buchmeiser, *Mater. Today Commun.* **2016**, *7*, 1-10.

[3] E. Frank, D. Ingildeev, L. M. Steudle, J. M. Spörl, M. R. Buchmeiser, *Angew. Chem.* **2014**, *126*, 5364-5403*; Angew. Chem. Int. Ed.* **2014**, *53*, 5262-5298.

Bilateral research project with BASF SE

Structure-property relationships in the development of zirconia toughened alumina fibers for ceramic matrix composites

ITCF Denkendorf

Ceramic Matrix Composites (CMCs), being composed of ceramic fibers embedded in a ceramic matrix, combine the heat resistance of usual ceramics with a high damage tolerance. They are thermal shock resistant and long term stable, even at high temperatures and under mechanical load. However, the technical processing of ceramic fibers into woven fabrics serving as initial stage for CMCs is challenging as the fibers tend to break during the weaving process. Therefore, the development of a new fiber type should improve the processability of the fibers. ZTA fibers (zirconia toughened alumina), which have been produced in Denkendorf on a laboratory scale so far, were studied intensively concerning the structure-property relationships. It was possible to prove that the fibers exhibit an enhanced high temperature resistance compared to pure alumina fibers. Relating to industrial applications, especially for the use in stationary gas turbines and aero engines, ZTA fibers provide a supplement to the commercially available Al_2O_3 und Al_2O_3/SiO_2 fibers.

Fig.1: preceramic fibers on spool

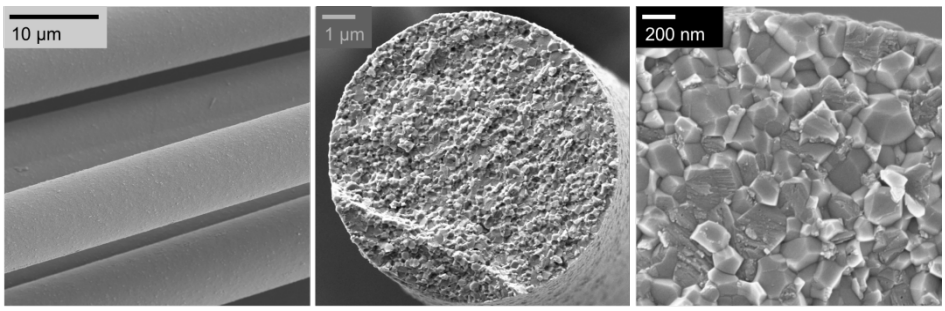


Fig. 2: scanning electron micrographs of ZTA ceramic fibers (left: surfaces, middle and right: fracture surface)

Contact:
Dr. Stephanie Pfeifer, stephanie.pfeifer@itcf-denkendorf.de, phone: +49 711/9340-131

Further information:

Poster P79: Stephanie Pfeifer et al.: **Structure-property relationships in the development of zirconia toughened alumina fibers for ceramic matrix composites**

- S. Pfeifer, P. Demirci, R. Duran, H. Stolpmann, A. Renfftlen, S. Nemrava, R. Niewa, B. Clauß, M. R. Buchmeiser: Synthesis of zirconia toughened alumina (ZTA) fibers for high performance materials; J. Eur. Ceram. Soc. 2016;36:725–731.
- Internetpublikation: S. Pfeifer, B. Clauß; „Herstellung von Zirkoniumoxid verstärkten Aluminiumoxidfasern für Hochleistungsverbundwerkstoffe (IGF 18214 N)“; *http://www.itcf-denkendorf.de/de/forschung/kurzveroeffentlichungen.htm*
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We thank the AiF, who founded the project 18214 N of the Association for Research and Textiles, Reinhardtstraße 14-16, 10117 Berlin, as part of the program for the promotion of industrial, co-operated research and development (IGF) by the Federal Ministry of Economics and Technology based on a decision by the German Bundestag.

Tailor-made carbon fibers made in Dresden

Institute of Textile Machinery and High Performance Material Technology (ITM), TU Dresden

The production of customized carbon fibers for innovative functional and structural materials, and the related research of continuous development chains from the fiber raw materials to the finished component are at the focus of the current research efforts at the ITM of TU Dresden (TUD). As of April 2016, the ITM and the Institute of Lightweight Engineering and Polymer Technology (ILK) at TUD are bundling their skills and experience in the field of carbon fibers in the new **Research Center Carbon Fibers Saxony (RCCF)**. The foundation of the RCCF further expands the leading position of Dresden as a lightweight construction location by focusing on the market-dominating technology of custom-made composites with polymer, ceramic or metal matrix. The carbon fibers produced with machines at the ITM will feature excellent, adjustable mechanical, thermal, and electrical properties. The resulting enormous lightweight construction potential will infuse a new, promising generation of tailor-made composite materials.

Dr. Martin Kirsten, Research Group Head at the ITM, and the institute's Stabilization and Carbonization Unit for the production of carbon fibers
(©: ITM/TU Dresden)

Contact:
Dr. rer. nat. Martin Kirsten, ITM, martin.kirsten@tu-dresden.de, phone: +49 (0)351-20250175

Further information:

ITM - exhibition stand

Lectures: Hubert Jäger:
Lightweight material future is hybride … are carbon composites out now? '
Thursday, 24.11.2016, Hall 1/2, „Plenary session", 9:40 am

Martin Kirsten et al.:
Process and material requirements for the manufacturing of carbon fibers with adjustable properties
Thursday, 24.11.2016, Hall 2, „Composites", 3:00 pm

Poster P99: Iris Kruppke et al.: **Surface modification and functionalisation of carbon fibres**

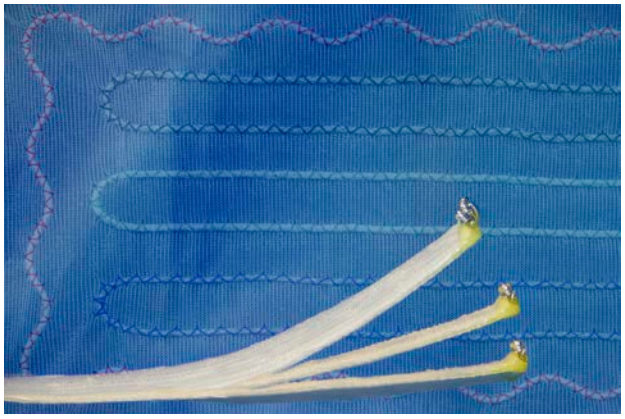
Adaptive fiber-reinforced plastic composites with structurally integrated actuator networks

Institute of Textile Machinery and High Performance Material Technology (ITM), TU Dresden

An interdisciplinary team of 500 scientists, engineers and technicians from five Dresden-based research facilities with significant ITM contribution, will be co-operating on current issues of fiber research and textile technology, pooling the unique resources of Dresden as a research location in the field of fiber- and textile-based high-performance materials. To achieve this, scientists from Dresden founded the **Research Center for High-performance Fibres and Structures and Textile Machine Development (HP Fibre Structures)** in 2016. It is the world's most extensive research platform for fiber-based high-tech materials. The HP Fibre Structures research center aims to develop additive-generatively produced and functionally integrated textile constructions manufactured by means of individual or large series-scale technologies, depending on the application.

At the ITM, considerable research has been conducted in the field of functionalized fiber-reinforced plastic composites (FRPC). Structurally integrated shape-memory alloy (SMA)-based actuators for the realization of adaptive FRPCs in one-piece, i.e. joint-less, actuating components have been at the center of attention. The results of this experience will contribute to projects with new partners of the research center.

The adaptive FRPCs consist of a glass-fiber-reinforced, woven reinforcement semi-finished product, an application-adapted, thermoset matrix system and function-adapted, SMA-based hybrid yarns. The maximum determined releasable forces per SMA actuator are ca. 50 N, proving the considerable actuating potential for a scalable realization of adaptive FRPCs. The thermal activation of the shape memory effect is triggered by the JOULE heat input via an electric current. Plane and curved adaptive FRPC structures are consolidated by various methods at the ITM, and characterized regarding their actuating, dynamic and thermal properties using a custom-developed measuring station.



Adaptive FRPCs with structurally integrated actuators (© ITM/TU Dresden)

Contact:
Dr.-Ing. Andreas Nocke, andreas.nocke@tu-dresden.de, phone: +49 351-463 35244

Further information:

ITM - exhibition stand

Poster P101: Moniruddoza Ashir et al.: **Adaptive hinged fiber reinforced plastics**

Innovative textile fabrics made out of recycled carbon fibers

Institute of Textile Technology and Process Engineering (ITV)
Institute for Composite Materials (IVW)

With rising application of carbon reinforced parts the amount of raw material waste increases especially for the valuable carbon fibers (c-fiber). This topic will be intensified during the next years because of the additionally produced end of life parts (e. g. from the automotive section).
Up-to-date there are efforts to recycle the rising mass of c-fiber waste. They all have in common to produce a final product out of finite, random oriented recycled c-fibers. That's the reason why until now these recycled c-fibers can only be applied in semi-structural parts.
At this topic the project InTeKS joins with the goal to produce thermoplastic fiber reinforced plastics (FRP) out of recycled c-fibers (rCF). The rCF hybrid yarn used in the project offers the possibility to produce an aligned, continuous reinforcement structure with a homogeneous blend of 50 % rCF and 50 % polyamide 6 by volume.
The development is performed by a consortium representing the whole process chain from the treatment of the rCF to the thermoforming of a demonstrator component. Additionally a model to simulate the drapability of the FRP on the base of rCF is developed (see fig. 1).

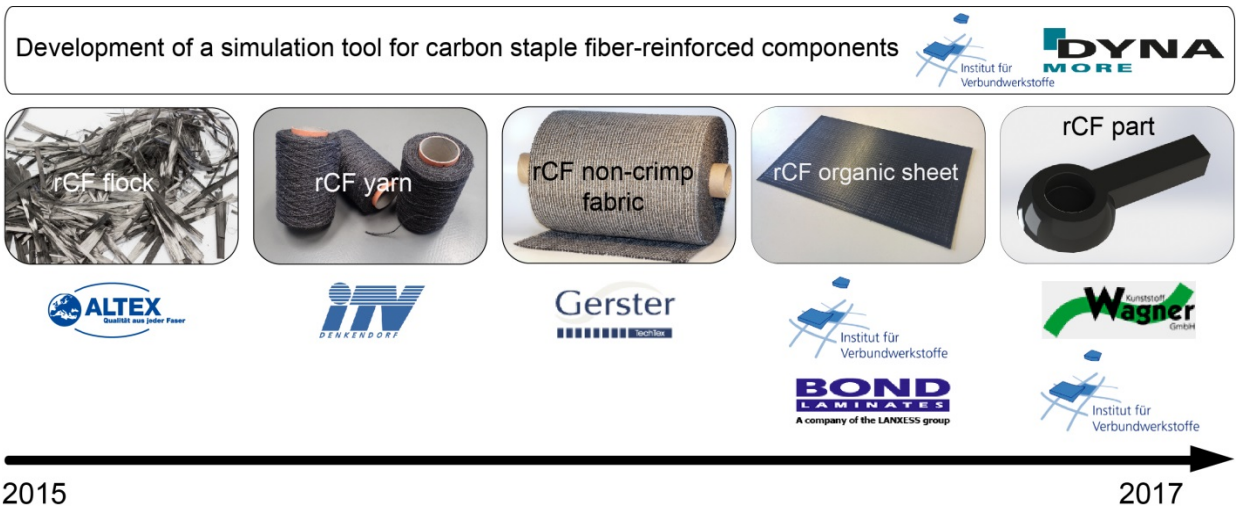


Fig. 1: InTeKS project – process chain and responsible partners

Contact:
Stephan Baz, Stephan.Baz@itv-denkendorf.de, phone:+49 711 9340 457
Christian Goergen, Christian.Goergen@ivw.uni-kl.de, phone:+49 631 2017-269

Further information:

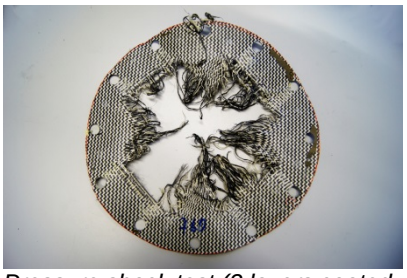
Lecture: Stephan Baz, Christian Goergen et al.:
Innovative textile fabrics made out of recycled carbon fibers
Friday, 25.11.2016, Hall 2 "Composites", 3:50 pm

ZIM project, support code: VP2088343TA4
Project partner: ALTEX Textil-Recycling GmbH & Co. KG, ITV Denkendorf, Gustav Gerster GmbH & Co. KG, Institut für Verbundwerkstoffe GmbH, Bond-Laminates GmbH, Kunststoff Wagner GmbH, DYNAmore GmbH

Blast proof textiles – New production-ready joining technologies for textile multi-layered structures

Sächsisches Textilforschungsinstitut e. V. (STFI)

Result of numerous textile product developments over the last decade is the availability of new, significantly lighter, high-strength textile materials. These materials can provide completely new danger preventive measure relating to blast events (e.g. protection against explosive charges, which are smuggled with the hand luggage in means of transport of the public passenger transport; letter or parcel bombs, and protection against potentially explosive goods in transit). The preventive packaging of such improvised explosive devices and goods in transit in textile-based bags, which can encapsulate the impact of the detonating medium and prevent the destruction of the environment, offers an effective protection of man and the environment. Until now, the seams and joints were mechanical and thus functional weaknesses.
In the project, concepts for flame retardant airtight coatings for textile-based high-performance materials based on para-aramid or Vectran® and concepts for ready-made solutions for textile multi-layered structures such as new seams solutions and the integration of suitable closure systems were developed.
The high-strength seams for two layers of coated fabric are resistant to a strain of about 5 000 N. Three layers woven fabric withstand an increase in pressure of about 60 bar in the pressure shock test. Therefore, the manufacture of textile based explosion-proof bags in sizes from 0.25 m^3 which can withstand a blasting power of a letter bomb is technologically realisable. Larger bag volumes from 3 m^3 can enclose blasting powers of priming charges airbag igniter and small gas cylinders.



Pressure shock test (3 layers coated Vectran®; burst pressure: 70,1 bar)

Designs of a blast resistant textile based bags (reference: ITM, Dresden)

Contact:
Dr. Yvette Dietzel, yvette.dietzel@stfi.de, phone: +49 371/5274-223

Further information:

Lecture: Yvette Dietzel et al.:
Flame-proof coatings and new production-ready joining technologies for textile multi-layered structures for applications in explosion protection
Friday, 25.11.2016, Hall 3 " Protective and functional textiles", 4:15 pm

The IGF research project 17541 BR/1 of the research association Textile Research Curatorium e.V., Reinhardtstraße 12-14, 10117 Berlin was supported via AiF within the framework of the program for "Industrial Cooperative Research Associations (IGF)" by the Federal Ministry Economics and Technology on the basis of a resolution of the German Parliament.

Center for Textile Lightweight Engineering

Sächsisches Textilforschungsinstitut e. V. (STFI)

As a non-profit research institution in the Free State of Saxony the institute's work covers a wide range of research and development in technical textiles and nonwovens. One possible field of application is textile lightweight engineering in all of its varieties. For processing (recycled) carbon and further high performance fibres in a semi-industrial scale, the newly built "Center for Textile Lightweight Engineering" offers carding and random laid nonwoven technologies for producing nonwovens. Furthermore, the formation of ribbon-like or thread-like structures from carbon fibres with unidirectional single fibre orientation is feasible. In addition, the "Center for Textile Lightweight Engineering" has access to STFI's resources to process component-specific preforms using knitting and weaving technologies as well as technical embroidering for Tailored Fibre Placement. The subsequent manufacturing of test specimen and elements of fibre components on thermoplastic and thermoset basis can be realized by injection or press processes. An integrated testing laboratory completes the "Center for Textile Lightweight Engineering".

Nonwoven line during start-up phase (left: Airlay process, right: carding process (source: STFI))

Contact:
Marcel Hofmann, marcel.hofmann@stfi.de, phone: +49 371 5274-205

Erosion protection mat for drainage channel

Textilforschungsinstitut Thüringen-Vogtland e. V.

Das Institut für Spezialtextilien und flexible Materialien

A geotextile with suitable structuring was developed to minimize the effort to stabilize drainage ditches by using enrockments. Pockets and zigzag structures, respectively, were embroidered on the geotextile made from of polyester. Their raising will work as a resistance. This depends on the shear force and the intensity of the flow. The flow velocity is reduced and therefore, the erosion will be delayed. The mat can be used as a suitable alternative to common enrockments especially for rough terrain, because the transport and the laying as well are much more easier are facilitated.

Fig. 1: pocket structure

Fig. 2: Zigzag structure

Contact:
Dipl.-Des. (FH) Nora Grawitter, n.grawitter@titv-greiz.de, phone: +49 (0)3661/611 311

Further information:

Lecture: Nora Grawitter et al.:
Reducing flow velocity with textile-based barrier structures in drainage channels
Friday, 25.11.2016, Hall 3 "Protective and Functional Textiles", 4:40 pm

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  - Market opportunities through new fiber types, processes and equipment (polymer synthesis, primary spinning, …)
  - Secondary spinning – new approaches for production
  - New impulses from the clothing industry, engineering and research for the development of sustainable fibers and yarns (bio-based fibers, new recycling strategies)
  - Fiber and technology developments for the optimization of the carbon fiber production
  - New developments and future trends of (high performance) fiber types (e.g. carbon fibers, polyaromatic fibers, ceramic fibers etc.)
- **Development and production of 3D system-integrated fiber compounds for automotive, construction and architecture**
  - Insight into new advanced materials – simulation and testing systems
  - Potentials of polymer matrix materials and functionalization
  - Bionic structures – new developments in building component construction
  - Shaped fiber compounds – new approaches and developments
  - Technologies for applications in the automotive industry and construction
  - New developments in process technology
- **Medical textiles / Medical technologies**
  - Drug delivery: Functionalization of fiber-based medical devices for the specific support of healing processes
  - New polymeric biomaterials for implantation and regenerative medicine
  - Resorbable polymeric implants for the support of regenerative processes
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  - Fiber-based cell scaffolds for tissue engineering
  - Nonwovens for wound treatment and hygiene
- **Transfer Session "From Idea to Practice"**
  Presentation of innovations (e.g. products, technologies, processes) transferred into the industry from research co-operations, especially by IGF/ZIM

Deadline Call for Papers: March 31, 2017

Contact 2017:
Sabine Keller
Deutsche Institute für Textil- und Faserforschung Denkendorf (DITF)
sabine.keller@ditf.de, Tel.: +49 711 9340 505

Further information: www.aachen-dresden-denkendorf.de

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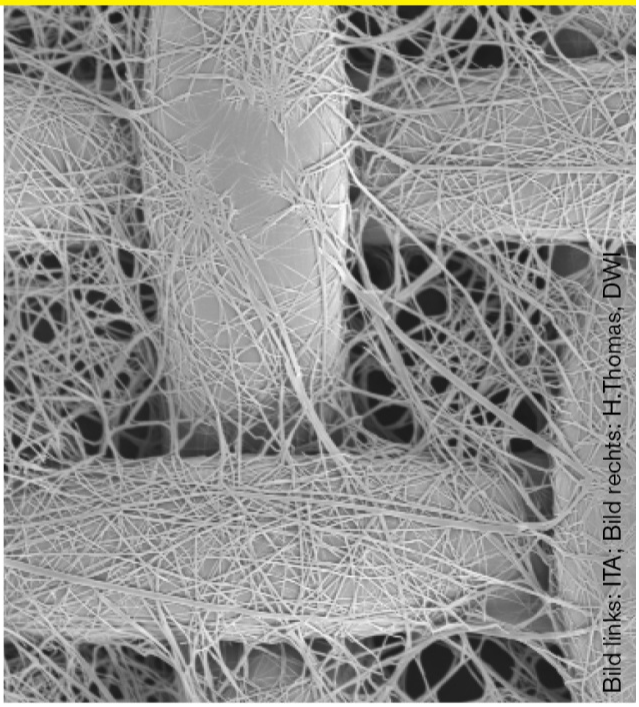

Bild links: ITA; Bild rechts: H.Thomas, DWI

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- ITMC, Institut für Technische und Makromolekulare Chemie der RWTH Aachen
- STFI, Sächsisches Textilforschungsinstitut e.V., Chemnitz
- TFI, Deutsches Forschungsinstitut für Bodensysteme e.V., Aachen
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