RESEARCH HIGHLIGHTS

DEUTSCHE INSTITUTE FÜR TEXTIL- UND FASERFORSCHUNG DENKENDORF

DITF REPORT

January 2023 – No. 1

THE Congress – NATURAL**fiber**EXTRACTION

DITF and AFBW initiate new platform for natural fibers

On October 26, 2022, the successful premiere of The Congress – Natural Fiber Extraction took place at Look 21 in Stuttgart. With this, the DITF and AFBW, as initiators and organizers of the event, gave the starting signal for the establishment of a platform that focuses on the industrial processing of renewable raw and residual materials and brings together and networks all relevant stakeholders – from farmers to users. More than 200 participants took part in the premiere event. They experienced a diverse program of presentations with a comprehensive overview of the given technologies for the effective processing of plant-based raw materials and residues into fibers for clothing, home textiles and technical applications. One focus was on the processing of hemp and bast fibers with field reports showing what is already feasible. Four parallel workshops enabled complementary exchange on specific technical topics such as "Holistic use of biomass and integration into existing value chains".

A start-up and material slam and an accompanying foyer exhibition completed the rich offer of information on this day and presented innovative ideas, technologies and products from research institutes as well as young and established companies.

The need to intensify and expand the cultivation and use of natural fibers for industrial applications in Baden-Württemberg is also seen by the state of Baden-Württemberg, which sponsored the event through the Ministry of Food, Rural Areas and Consumer Protection. Alexander Möndel, head of department at the MLR, summed up the MLR's motivation in his welcoming address. "Natural fibers offer solution approaches and great potentials for the circular economy. We need innovative solutions for transformation and system change towards a circular bioeconomy and rural areas offer diverse resources and competencies."

After the successful start, the activities must now be consolidated. The DITF and AFBW are already working on a concept. The goal is to systematically network all players along the natural fiber-based value chain.

The Congress: Auditorium with more than 200 participants at the Look 21 in Stuttgart

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In this issue: Focus on Sustainability

2022, the DITF conducted research in 106 public projects. While the research topics and highlights for many years primarily included technical innovations for higher productivity, greater effectiveness, automation, and flexibility, today the topics of digitization and sustainability are in the foreground. In 2022, there was hardly a project that did not address these topics and came up with comprehensive digitization concepts and/or took the concept of sustainability into account. Instead of "faster, higher, further", the work at the DITF is focused on "smart, digital and sustainable". Reason enough to focus on sustainability projects in this newsletter and to report on current developments in the field of energy and resource efficiency, recycling and renewable raw materials as a key topic.

Lavender cultivation on the Swabian Alb

Essential oil from the blossoms and textiles of plant residues

Provence is known for its fragrant, deep purple-blue lavender fields. This splendor may soon also be seen in Baden-Württemberg. In a joint research project, the DITF, the University of Hohenheim and the company naturamus are testing lavender varieties suitable for the region and developing energy-efficient methods for producing essential oil from them. There are also ideas for recycling the large quantities of residual materials generated during production: The DITF are researching how it can be used to produce fibers for classic textiles and fiber composites.

At naturamus at the foot of the Swabian Alb, there is high demand for high-quality essential oils for medicines and natural cosmetics. There is much to be said for growing lavender on site. The ecological cultivation of the lavender fields would help to increase the proportion of organic farming in the country and save transport costs.

Growing lavender on the Alb means breaking new ground. The University of Hohenheim is therefore testing five different varieties at four locations, for example at Sonnenhof near Bad Boll. The first results are expected in a few weeks.

Lavender plants shortly before blooming on the experimental field near Hülben

The extraction of essential oils produces a large amount of residual material that has not yet been utilized. Fibers can be obtained from the lavender stalk. Corresponding developments and analyses are underway at the DITF. In order to utilize lavender distillation residues, the plant stalks with their fiber bundles must be broken down, i.e. broken down into smaller fiber units. Within a fiber bundle, the lignified individual fibers are firmly connected by a plant sugar, pectin. This bond is to be dissolved with bacteria or with enzymes, for example.

Dr. Jamal Sarsour, a scientist at the Textile Chemistry, Environment & Energy Competence Center at the DITF, is investigating various preparation techniques and methods to produce long and short fibers from the material. Fine fibers are suitable for clothing, coarser fiber bundles for technical applications.

The opportunities on the market are good. Regional value creation and ecologically and fairly produced textiles are in vogue. The focus is not primarily on clothing, but on technical textiles. The fiber composites that are so important for lightweight construction can also be produced with renewable natural fibers.

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The AlbLavendel project team on the trial field near Bad Boll

Project cluster: DACCUS-Pre

Building materials made from CO_2-based carbon fiber and CO_2-absorbing rock

The BMBF funding measure CDRterra researches political, ecological, technical and social issues relating to CDR (Carbon Dioxide Removal) methods. The aim is to improve the knowledge base for research and climate policy decisions by the German government by researching methods for removing carbon dioxide from the atmosphere. In CDRterra, more than 100 researchers have joined forces in 10 collaborative projects throughout Germany. The DITF are a project partner in the joint project DACCUS-Pre. Project leader is Dr. Erik Frank, deputy head of the Competence Center High Performance Fibers at the DITF. DACCUSS stands for Direct Air Carbon Capture, Utilization and Safe Storage and investigates the uptake and fixation of carbon dioxide (CO2) in a novel lightweight material made of hard rock, carbon fibers and biochar for permanent carbon storage.

In addition to the DITF, partners in the project are the Labor für Stahl- und Leichtmetallbau GmbH, TechnoCarbonTechnologies, the University of Hamburg and AHP GmbH & CoKG, which will subject the entire process chain to a life cycle analysis (LCA) and a techno-economic analysis (TEA), as well as the TU Munich/WSSB, GvU GmbH and Carbon Collect Ltd (Ireland) as associated partners.

At the Climate Conference COP27 in Sharm El-Sheikh, the project was presented to a broad expert audience at an event in the German Pavilion and via livestream.

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Seeds in textile packaging

DITF and ESKUSA develop technical textiles for agriculture

In order for seeds to sprout optimally, they can be "packed" beforehand. This creates small pelletts, which is why the process is called "pelleting". The advantages are obvious: the seed becomes "grippier", all seeds are given a uniform size and weight, and very small seeds are given more volume. This makes it easier to place the seed in the ground with machinery. Textile casings are particularly suitable as packaging because they are made of natural fibers and, unlike synthetic materials such as PAV, are biodegradable. Unlike seed embedded in gelatin capsules or alginate, textile seed wrappings can be excellently functionalized. They are equipped with nutrients for the emerging plants, and substances such as activated carbon protect against pests. This means that active ingredients are applied directly to the seed and do not have to be applied to the soil over a large area.

Radish grows from burl

Isolated punched out textile burls

Deep drawing tool for the textile burls

After extensive testing, a cotton fleece was selected as the material, where the textile structure quickly gives way when the seedling pushes outward and to the surface. However, the production of cotton multipills cannot yet be standardized in commercially available pelleting machines. It requires a great deal of intuition and results in different numbers of seeds within a pill for each pelleting batch. It is not uncommon for the process to render entire batches of seed unusable. In the "Mufus" project, a modular seeding line was therefore developed with which the seed of one or more plant species can be placed in a textile, deep-drawn seed hopper in precisely metered quantities. The core of the process solution is a drum seeder that has been modified so that it sows the seed into a deep-drawn endless textile web instead of cultivation trays. The textile web filled with seed is closed with a second textile web and separated into individual seed packets.

The fabric-wrapped seed was tested for its better suitability in field emergence and inventory establishment in foil house and field trials. The pellet-packed seedlings make direct seeding of many plants successful and create the prerequisite for large-scale agricultural cultivation. An economic analysis and a calculation model for process capacity provide the basis for further planning of upscaling.

The research project was funded by the project executing agency BLE on behalf of the German Federal Ministry of Food and Agriculture.

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DNFI Innovation of Natural Fibres Award

DITF award for the development of PureCell

For the sixth time since 2017, the Discover Natural Fibres Initiative (DNFI) has announced the DNFI Innovation of Natural Fibres Award. The award is intended to draw public attention to innovative and trend-setting, science-based work and products based on natural fibers. This year, the prize was awarded to Dr. Frank Hermanutz and Dr. Tanja Schneck, whose work "PureCell – Natural fiber-reinforced composites based on pure cellulose" presents a pure cellulose composite material.

The cellulose matrix of PureCell is produced in a process in which the solvent from ionic liquids is 100 % recycled. After impregnation of the natural fibers serving as reinforcement with the cellulose matrix, the desired composite material can be obtained. The manufacturing process is thus particularly environmentally friendly and follows the sustainability concept in textile and material production. The composite material is lightweight and impresses with its high mechanical strength. It can be easily molded in a hot-pressing process and thus prepared as a component for technical parts.

DITF DNFI Award winners: Dr. Tanja Schneck and Dr. Frank Hermanutz (center)

An important criterion for the award for PureCell was its advanced stage of development, which offers the potential to open up new applications for products made from natural fibers.

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Closing loops: WhiteCycle

DITF are part of an international consortium for plastics recycling

A consortium of 16 public and private sector organizations under the name "WhiteCycle" has set itself the goal of establishing a comprehensive and closed-loop recycling system for plastic waste. The DITF are part of this consortium and will make its contribution with a new synthesis process for processing recycled plastics.

"WhiteCycle" was constituted at the beginning of July 2022 as a consortium led by Michelin Group France. The aim of the European initiative is to establish an economic cycle to process inhomogeneous textile waste from different materials to produce new, high-quality products. This project is intended to help achieve the targets set by the European Union for reducing CO_2 emissions by 2030.

Complex textile-containing PET waste, such as tires, tubes or multilayer composite textiles from the clothing sector, is difficult or impossible to recycle. The WhiteCycle network brings together several projects and research approaches to tackle this problem and provide new solutions. The DITF will adapt an existing PET synthesis process to new types of recycled monomers. The fundamental problem to be overcome is the impurities in the starting material due to its inhomogeneous composition. Together with the project partner Kordsa Teknik Textil A.S. (Turkey), the DITF are developing new synthesis concepts. Their aim is to eliminate possible disadvantages caused by residual contamination of the monomers. This is because, despite purification of the monomers prior to further processing, not all impurities can be removed.

Polymer Technical Center of the DITF

The approaches taken are demanding. For example, the type and quantity of additives used must be specifically adapted. These include catalysts, processing aids, nucleating and coupling agents, and chain extenders. In this way, it is possible to avoid the negative effects of unknown impurities. This improves the material properties of the recycled plastics, as they are thermally stabilized in the long term, which in turn results in improved mechanical and rheological properties. The modified process should enable recycled PET (r-PET) to have the same properties as commercial PET.

The consortium partners are pursuing other approaches to produce an improved recycling rate and higher-quality r-PET products: Optimized sorting technologies for the single-variety separation of waste are just as much a part of this as enzyme-based treatment of plastics to break them down into monomers in a sustainable way. Ultimately, the high-quality manufacture of new products from recycled plastics will also help to close the raw material cycle.

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Bioeconomy as a driver of innovation

4th Bioeconomy Congress BW: Excursion to the DITF

At the 4th Bioeconomy Congress Baden-Württemberg from September 26 to 28 in Stuttgart, the focus was on "Contributions of the Bioeconomy to the European Green Deal". As part of the supporting program, the DITF offered an excursion to the Technika in Denkendorf and presented the current developments in materials research for sustainable industrial applications and the establishment of a circular bioeconomy.

On site, both the production of cellulosic filament yarns with the multiple award-winning HighPerCell®- technology and the production of carbon fibers from beech wood (HighPerCell **Carbon**®) were presented directly on the production line. In the supplementary lecture program, DITF scientists and Rolf Moors, head of fiber-based materials at Technikum Laubholz GmbH, reported on other research projects, such as sustainable and environmentally friendly developments in materials technology based on natural fibers, biopolymers and composites, which aim to make the leap into industrial production.

Renewable biopolymers as an important component of a system change in the coming years

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Circular economy in the automotive industry

CYCLOMETRIC supports development of recyclable components

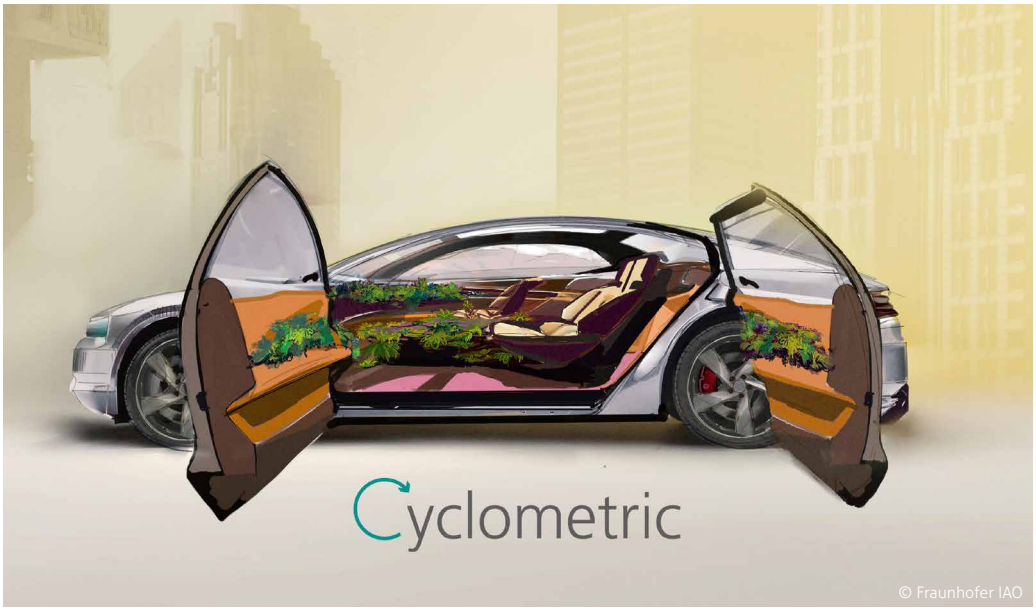
Automotive components no longer only have to meet the highest technological standards, they also have to be sustainable and recyclable. The CYCLOMETRIC project is addressing this requirement and developing a tool that makes suggestions for optimizing the recyclability of components as early as the product planning stage. Recycling of high-performance materials often fails because the materials cannot be separated into their original components. CYCLOMETRIC aims to ensure that this problem does not have to be solved at the end of a product's life cycle. With current methods and tools, environmental impacts are often not examined until near the end of development or even after production has begun – even though the most relevant decisions about product properties are made much earlier. The new system helps to make the right decisions during development. To this end, data, information and knowledge are analyzed and evaluated across all development phases and interfaces. Research approaches from advanced systems engineering and model-based systems engineering are used in conjunction with life cycle assessment methods and business model analysis.

Product developers juggle complex parameters such as producibility, recyclability, reusability, CO_2 emissions and costs on a daily basis. In addition, the expectations and habits of customers must be taken into account. Whether selecting materials or planning production steps, the tool calculates the impact and makes suggestions for improvement.

In the CYCLOMETRIC project, a center console trim serves as an application example for the digital tool. It is made of sustainable textile materials and has smart functions integrated into the textile. Nevertheless, the finished tool is not limited to the automotive industry. It can be used in all industrial fields.

The DITF's task is to select and test suitable materials. The team develops the appropriate manufacturing and processing procedures and creates a prototype. Test runs are carried out at the test laboratories on the functional, everyday, long-term and extreme suitability of the textile structures and fiber composites, which can be reproduced in subsequent applications. Concepts for sensors and actuators are being developed for the smart functions of the console.

As a partner in the ARENA2036 research campus, the DITF bring extensive experience in lightweight construction through function integration in automobiles. After completion of the project, the Denkendorf researchers will advise companies on how textiles can be increasingly used in vehicle interiors.



Sustainable car of the future: The CYCLOMETRIC tool is designed to ensure that all components are recyclable even during development

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SHORT NOTES

IoT2022 Best Paper Award

For her paper "Connecting Textiles: Exploring Textile Interior Surfaces for Power Supply, Communication and User Interaction in the IoT", Valérie Bartsch received the following award at the 12th International Conference on the Internet of Things IoT2022! November 7-10, 2022 in Delft, Netherlands, the Best Paper Award together with her research colleagues Frank Beruscha, Katharina Lorenz, Anke Königschulte, Serge Autexier, Annika Sabrina Schulz, Bodo Pahlke and Hendrik Leibrandt.

Apprenticeship awarded

The Esslingen-Nürtingen Chamber of Industry and Commerce has honored the Service Center for Testing Technologies at the DITF for the training of the "outstanding exam participant Anne Reissmüller in the apprenticeship as textile laboratory assistant". She is even one of the best graduates in the country. Anne Reissmüller was trained by her instructor, laboratory manager Matthias Schweins, and by laboratory assistants with many years of experience in testing fiber-based materials and textiles. She particularly liked the diversity of her training. "Whether novel materials for space suits or textile techniques from the Stone Age – at the DITF I was able to get to know a broad field of applications."

Laboratory manager Matthias Schweins with successful trainee Anne Reissmüller

Medium-term goal of climate neutrality

Expansion of renewable energy sources at the DITF

The energy crisis caused by the war in Ukraine also poses major challenges for science and research institutions in the country and thus threatens Germany's future viability. At the same time, climate change addresses major tasks for science and research. The DITF are facing these challenges with great commitment and extensive investments in sustainable projects. As a research institution of the state, the DITF not only intend to achieve the climate goals of the state of Baden-Württemberg and become climate-neutral by 2030, but also to drastically reduce its energy and heating requirements and at the same time to cover them itself to a considerable extent with regenerative energy sources.

In order to further reduce dependence on external and fossil energy sources, extensive investments in photovoltaic systems are planned at the Denkendorf site. For this purpose, all possibilities on the roofs will be exhausted. At the same time, photovoltaic systems are being planned, e.g. by roofing over the parking lots and using other free areas. With these measures, it should be possible to cover one third of the DITF's current electricity requirements of around 4.2 GWh/a by the end of 2023. The costs for this amount to about 1.6 million euros and are supported with 1.4 million euros by the Ministry of Economics of Baden- Württemberg. "We see this funding not only in terms of the economic effect we achieve with this project. The ecological aspect and thus the contribution to achieving the climate protection goals in the state were also decisive for our funding decision," said Minister Hoffmeister-Kraut, explaining the state's support for this measure.

The buildings of the DITF offer many open spaces for the installation of photovoltaic systems, for example on the roofs and by covering the parking lots

The measure is to be seen in the context of a comprehensive transformation concept of the DITF, which will be developed from the beginning of the coming year and will lead to further extensive investments in the lower double-digit million range in the years from 2024. Among other things, a comprehensive renewal of the DITF's plant and building technology with highly efficient machinery and equipment is planned. This package of measures also includes energy refurbishment and the implementation of innovative shading systems and modern building control technology. Energy recovery plays a special role in the planning. Here, the DITF can contribute its expertise in the development of ecological and sustainable materials and products and thus also play a pioneering role in decarbonization.

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Project WWW – Effective Warmer Living

Energy saving through convection-oriented, interior sun protection roller blinds

Saving energy is the order of the day in view of climate change and the energy crisis. Enormous savings potential exists on buildings, including in the window area. Interior sunblinds can make a significant contribution to energy savings here, which is often underestimated in practice. In most cases, interior sun shades are purchased for visual reasons, disregarding the energy aspect. With the aim of optimizing conventional interior sun shading blinds in terms of their thermal insulation, the DITF launched the research project "Convection-compatible interior sun shading to minimize heat emission" in November – short title: "WWW – Wirksam Wärmer Wohnen". In the project, the researchers are developing, among other things, a new, textile, interior sun protection system that optimally conducts heat flow so that only minimal heat is lost through the windows. The aim is to reduce or prevent air exchange between the window glass and the room as much as possible. The development requires close cooperation with simulation specialists and the use of state-of-the-art numerical methods, as well as hardware and software for flow simulation. New adapted measurement, control and manufacturing techniques will thus open up new energy-saving potential.

The new sunshade element will be installed in the DITF research KUBUS in Denkendorf for demonstration to interested companies.

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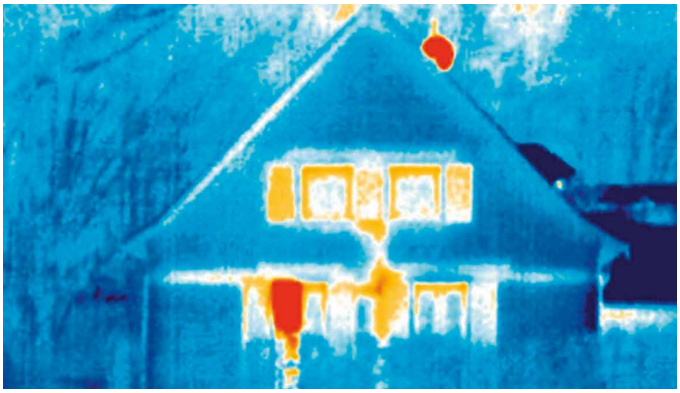

Typical building with significant energy saving potential in the area of windows

AiF-project NiBreMa

Cold-curing high-performance ceramic composites for the construction industry

The construction industry contributes up to 60% of global resource consumption, with growing demand fuelled by the world's growing population. The production of cement and concrete consumes about 10% of the world's energy and is a major source of global greenhouse gas emissions. Reinforcing concrete with glass, basalt or carbon fiber reinforced plastics can significantly reduce material consumption, construction material costs, time, weight, wall thicknesses as well as greenhouse gas emissions and waste generation. Due to the corrosion resistance of the composites, considerably less concrete cover can be used. Compared to reinforcement with steel, this results in an up to 80% reduction in concrete consumption with a corresponding reduction in the weight of the concrete structures.

The possible applications of fiber-reinforced composites as concrete reinforcements and generally for the construction of buildings and bridges have so far been limited mainly by the relatively low working temperature of the organic matrices (< 200 °C) and their flammability or fire behavior.

Basalt roving, CBPC matrix, pultruded profiles and a wound plate

Often, they do not meet the high fire safety requirements in construction. One way of utilizing the aforementioned advantages of textile composites in construction and meeting the fire safety requirements is to use fine-grained concrete or inorganic chemically bonded ceramics (CBC) matrices such as water glass systems or phosphate ceramics. Water glass matrices and concrete are strongly alkaline in nature and aggressive for E-glass or basalt fibers. For this reason, only expensive AR-glass or carbon fibers are usually used.

The AiF project NiBreMa addresses these challenges through the development of phosphate ceramic matrix that is in the acidic pH range in its initial state and thus does not harm E-glass or basalt fibers. For this approach, the DITF together with the DLR (German Aerospace Center) investigated both the matrix and the process development. Various parameters play a decisive role in the development of the phosphate ceramic slurry:

> the choice of raw materials; they must contain the required amount of aluminum and silicate with suitable physical properties
> the pH of the slurry; it determines the pot life of the matrix and the reaction kinetics of the alumino-silicate salts with the acid solution
> the viscosity and wettability of the slurry; they influence the processability with basalt fibers in the pultrusion and winding process

In the project, different slurries with various additives and fillers were developed and tested to maximize the mechanical properties and compatibility of the matrix for concrete. With regard to the processability, curing behavior and mechanical properties of the basalt fiber-reinforced phosphate ceramic composite, the fiber volume content, pultrusion temperature, pulling speed and post-curing temperatures were investigated in the pultrusion process. The cold-cured basalt fiber-reinforced composites exhibit good mechanical properties and good compatibility with Portland cement concrete. The developed ceramic composites maximize the use of E-glass and basalt fibers for construction applications, especially where fire safety requirements are critical.

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DITF again in the Zuse Presidium

Peter Steiger succeeds Prof. Dr. Meike Tilebein

ZUSE-GEMEINSCHAFT

Peter Steiger is a new member of the Executive Board of the German Industrial Research Association Konrad Zuse e. V. (Zuse Association). The board member for administration and finance of the DITF was elected unanimously at the general meeting of the Zuse Association in Berlin. Steiger succeeds Prof. Dr. rer. pol. Dipl.-Ing. Meike Tilebein. He has been involved in several working groups since the founding of the Zuse Association in 2015 and is also a member of the Institute Leadership Council of the Innovation Alliance Baden-Württemberg.

The Zuse Association represents the interests of non-profit, privately organized research institutions. More than 70 institutes nationwide belong to the association, which is open to technology and industry. As practical and creative providers of ideas to German SMEs, they translate the findings of science into applicable technologies, thus preparing the ground for innovations that make German SMEs successful worldwide.

Peter Steiger

Gabriele Schmeer-Lioe celebrated 40 years of service

On January 1, 2023, Dipl.-Ing. (FH) Gabriele Schmeer-Lioe celebrated her 40th anniversary of service at the DITF. Chief Human Resources Officer Peter Steiger recognized her work for the DITF and thanked her for her many years of dedication.

For her special professional anniversary, Gabriele Schmeer-Lioe received the greetings of the Minister President in the form of a certificate of thanks from the state of Baden-Württemberg.

Gabriele Schmeer-Lioe works as a scientific employee in the Textile Chemistry, Environment & Energy Competence Center. She began her work in 1983 in the field of technical textiles.

Dr.-Ing. Larisa Ausheyks, who works as a research assistant in the Competence Center Staple Fibers, Weaving & Simulation, celebrated her 25th anniversary on January 1, 2023.

Gabriele Schmeer-Lioe with DITF Executive Board member Peter Steiger on the occasion of her 40th anniversary of service.

SWR filming

Our Service Center Testing Technologies has tested functional clothing for SWR. You can find out how the materials passed the endurance test on January 31, 2023 in the program "Inexpensive, useful, good"

with Hendrike Brenninkmeyer. The program is also available now in the ARD Mediathek.

User Forum SMART TEXTILES 2023

The renowned event format of FKT, DITF and TITV on the topic of Smart Textiles invites you to the Swiss Materials Research Institute Empa at the St. Gallen site on March 15 and 16, 2023. On March 15, the Empa team will provide exciting insights into its research work. Empa combines application-oriented research with practical implementation of new ideas.

On March 16, manufacturers of smart textiles will report on their experiences and research will highlight possible solutions. This will generate ideas for new products and strategies for successfully establishing smart textiles on the market. The event will be complemented by an exhibition and an attractive supporting program. Cooperation partner of this year's forum is Swiss Textiles.

H.F. Mark Medal of the OFI

Each year, the Austrian Research Institute for Chemistry and Technology (OFI) honors outstanding individuals for their achievements in the field of plastics and polymer technology with the H.F. Mark Medal. In October 2022, Prof. Dr. rer. nat. habil. Michael R. Buchmeiser, Chairman of the DITF and Chair of Macromolecular Materials and Fiber Chemistry at the Institute of Polymer Chemistry (IPOC) of the University of Stuttgart, received the prestigious award, together with DI Roman Eberstaller and FH Prof. Mag. Dr. Wolfgang Stadlbauer. The honor is in recognition of his outstanding scientific achievements in the field of polymer synthesis and the synthesis of functional polymer materials – more than 450 publications and over 50 patent applications alone speak for themselves. In the panel discussion with his laudator Prof. Dr. Walter Kaminsky from the University of Hamburg and DI Udo Pappler, Prof. Dr. Buchmeiser explained his research focus on polymers, high-performance fibers and energy storage.

Prof. Dr. Michael R. Buchmeiser (center) at the award ceremony for the H.F. Mark Medal 2022

Fairs & Events

January 10 – 13	DNFI Annual Conference during Heimtextil, Frankfurt – DNFI Award presentation to the DITF
January 26	Integration and sustainable value creation: Digital solutions for the textile chain, Denkendorf – *Textil vernetzt* and the Mittelstand Digital Center Climate
January 31	Functionalization Forum, Denkendorf – DITF in cooperation with AFBW and Hohenstein
February 06 – 09	DAGA 2023 Annual Conference on Acoustics, Hamburg
February 16	DITF Innovation Day, Denkendorf
March 15 – 16	User Forum SMART TEXTILES 2023, St. Gallen, Switzerland – DITF in cooperation with FKT, TITV and Swiss Textiles
March 30 – April 01	TV TecStyle Visions, Stuttgart, Germany
April 18 – 21	INDEX 2023 International Nonwovens Exhibition, Geneva – DITF booth
April 25 – 27	JEC World Paris 2023 – DITF booth
April 27	Girls'Day, Denkendorf – DITF action day for career orientation
May 10 – 12	Techtextil North America, Atlanta – DITF presentation and booth
May 13	The Fiber Society's 2023 Spring Conference: Fibers for a Sustainable World, Denkendorf – DITF in cooperation with The Fiber Society
May 22 – 26	International Conference of the Polymer Processing Society, St. Gallen, Switzerland
May 23 – 25	MedtecLIVE with T4M, Nuremberg – DITF booth together with ITVP Denkendorf
June 08 – 14	ITMA 2023, Milan – DITF booth and lectures
June 29	ITMA Nachlese, Denkendorf – DITF in cooperation with FKT

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