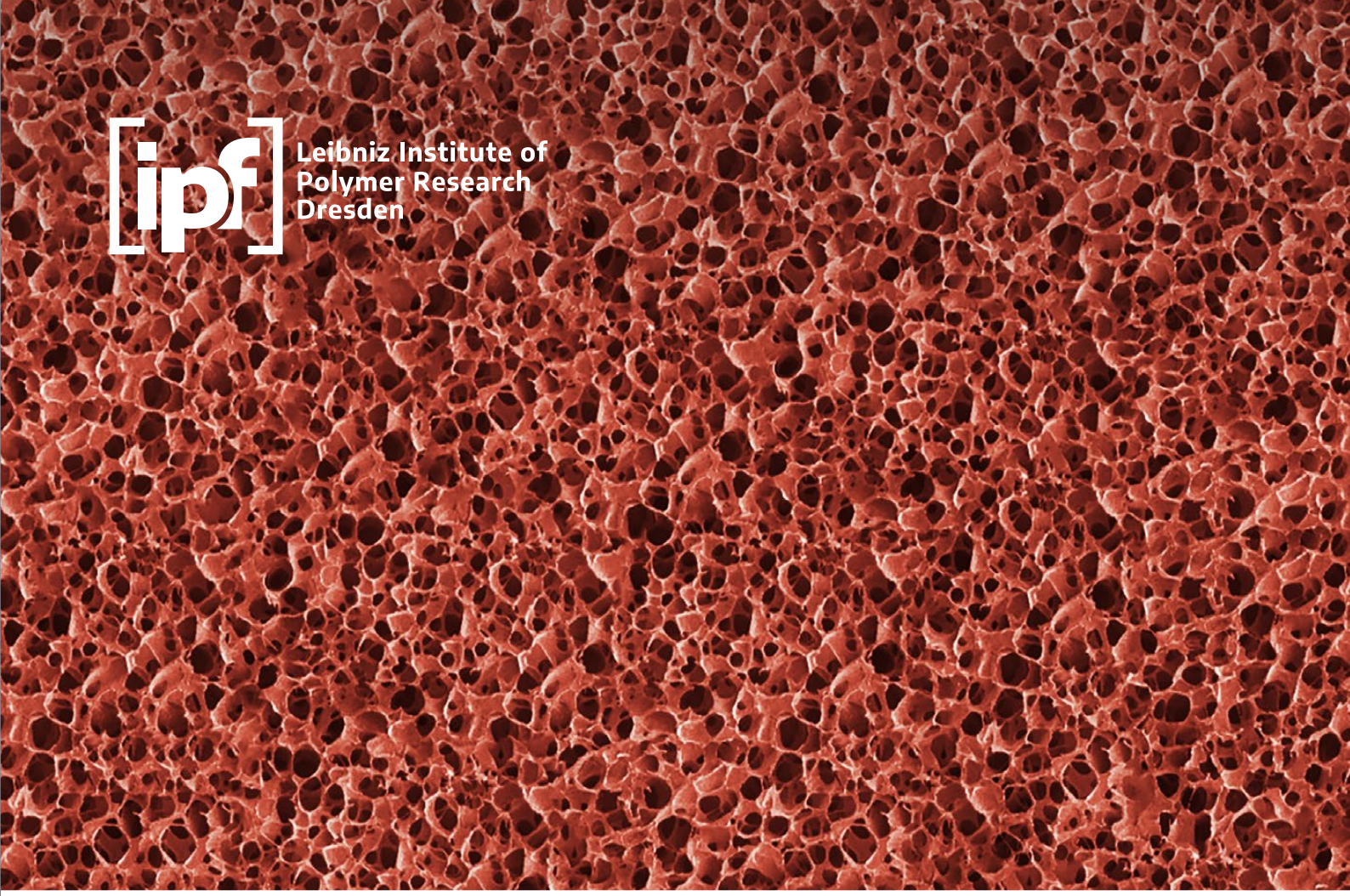
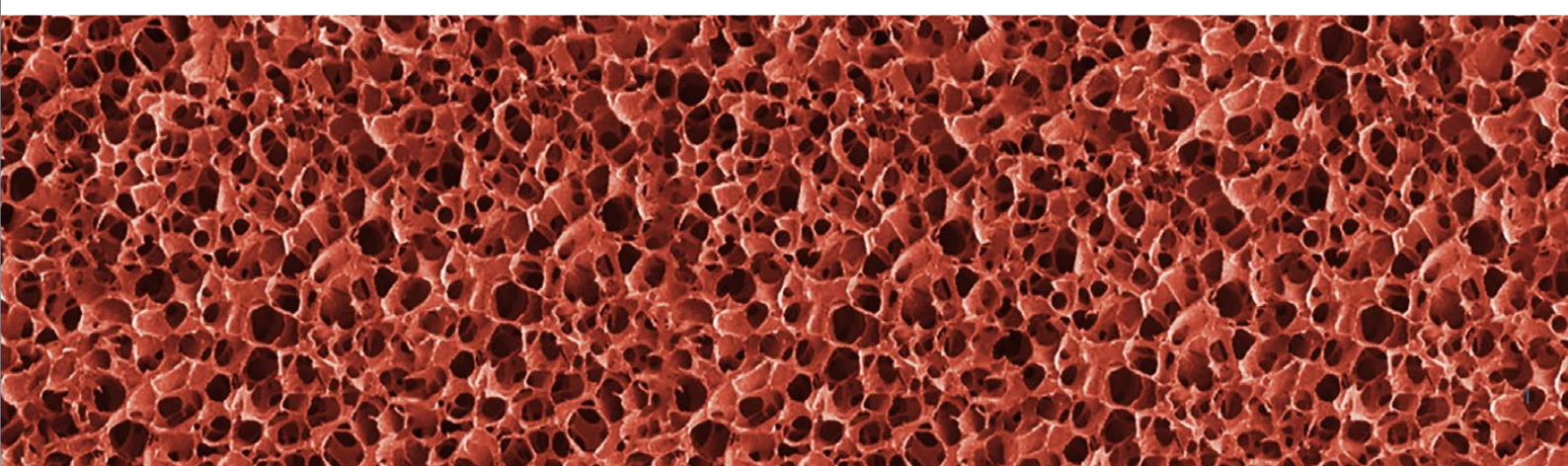


Leibniz Institute of Polymer Research Dresden

Leibniz Gemeinschaft

DRESDEN concept

Annual Report 2024



Leibniz Institute of Polymer Research Dresden

Annual Report 2024

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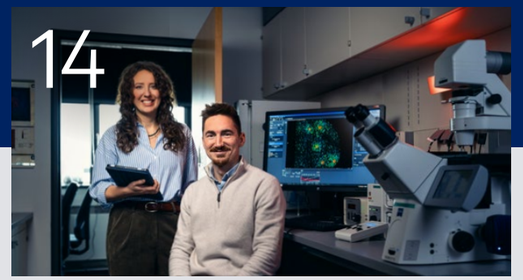


Preface

Dear readers,

The year 2024 was a transformative one for the IPF, marked by significant strides in research, innovation, and collaboration. To realign our scientific profile, enhance coherence, and fully leverage the complementarity of our researchers' expertise, we launched **a new research program**. Central to this program are seven *Emerging Topics* of particular scientific and technological relevance, each with the highest potential for innovation. These topics will be jointly pursued, fostering collaboration and maximizing synergies across the institute.

This collaborative spirit is further exemplified by the IPF's active involvement in three of TU Dresden's (newly funded or continued) **Clusters of Excellence**. These clusters target future responsible electronics, sustainable construction, and the physics of life—topics that align perfectly with the priorities of our new research program.

In addition to these efforts, the program emphasizes the **technological translation** of advanced materials solutions into real-world applications. The IPF has traditionally been strong in technology transfer, as evidenced by several successful spin-off companies and vibrant collaborations with industrial partners. A prime example is *ResCure*, our most recent spin-off initiative, which began a clinical study in 2024 to validate a new anti-inflammatory wound dressing. This innovation, based on the IPF's fundamental research on functional polymer networks, has already shown highly promising results. Achievements like these have positioned the institute as one of the key drivers of the Leibniz Association's recently established task force dedicated to advancing technology transfer.

Tying together academic excellence and translational expertise is also the core objective of the newly established **bioelectronics network, *BiotroNiS*,** funded by the European Regional Development Fund. The potential of bioelectronics to revolutionize medical technologies—such as multimodal neuroimplants—is immense. The formation of this dedicated research network in Saxony, coordinated by the IPF, is therefore both timely and significant.

The year 2024 also brought well-deserved **recognition to members of the IPF team**. Professor Gert Heinrich, one of our former directors, was honored with the prestigious Hermann Mark Medal. At the same time, the institute's dedication to fostering young talent was highlighted by Saya Inka Helm who received the Leibniz Award for Apprentices, marking the second time this award has been presented to an IPF member.

These accomplishments reflect the dynamic evolution of the IPF and our commitment to making significant scientific contributions to critically important fields, providing much-needed solutions and unprecedented options for future technologies.

We are grateful for the funding and support we have received, as well as for the dedication, creativity, and hard work of our employees.

The Board of the IPF
Carsten Werner and Agnes Schausberger

Research Program

The interdisciplinary materials research at the IPF aims to create fundamental knowledge and enable technological innovations in the fields of resources, health, and information.

Scientific Institutes / Program Areas

The IPF is divided into five Scientific Institutes / Program Areas, supported by central administrative and technical services.

Program Area 1 — The IPF Institute
Macromolecular Chemistry
develops effective and sustainable synthesis methods, complemented by characterization techniques, for multifunctional polymers, hybrids, assemblies, and nanocomposites.

Program Area 2 — The IPF Institute
Physical Chemistry and Physics of Polymers
focuses on the understanding, synthesis, and chemical modification of colloids and interfaces, the rational design and assembly of particle-based and/or nanostructured materials, and their integration into systems for sensing, optoelectronics, and energy applications.

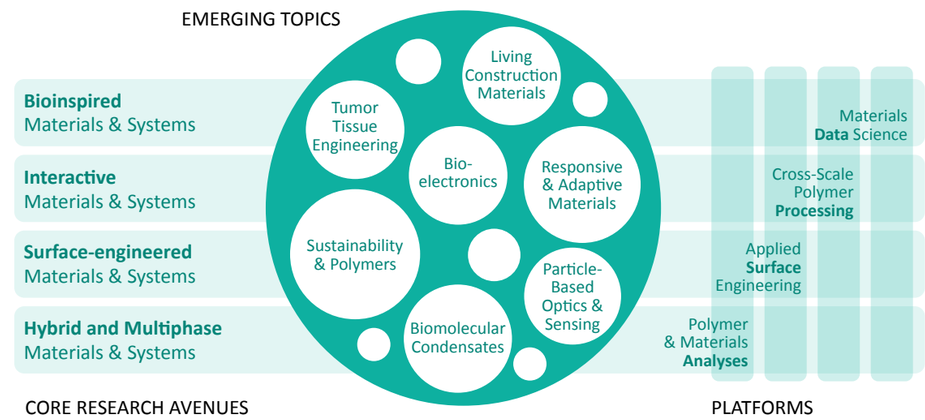
Program Area 3 — The IPF Institute
Polymer Materials
is dedicated to research topics along the development and processing chains of polymer materials, with a particular emphasis on multiphase and hybrid materials.

Program Area 4 — The IPF Institute
Biofunctional Polymer Materials
explores living matter from a materials science perspective, develops bioinspired materials, and supports their translation into biomedical applications.

Program Area 5 — The IPF Institute
Theory of Polymers
is dedicated to the theory and simulation of polymers and soft matter, working closely with experimental research.

Synergy Initiative

To strengthen institutional core competencies and foster collaboration across the Program Areas, the IPF has launched a Synergy Initiative. The initiative is a key component of the institute's research program for 2025/2026 and has already been progressively implemented.



The Synergy Initiative is anchored in four **Core Research Avenues** which represent the IPF's fundamental key competencies.

The Core Research Avenues are complemented by four **Platforms** dedicated to coordinating and advancing expertise and infrastructure.

The IPF's research profile is further enhanced through the strategic prioritization of **Emerging Topics**, which are jointly pursued by the Program Areas.

Engineered biological cascade reactions in hydrogel-based microfluidic chips

A significant challenge in synthetic biology is the development of complex hybrid structures within confined reaction cavities under continuous flow. To address this challenge, the research team led by Dietmar Appelhans is pioneering new solutions to transfer biomimetic structures and functions from static environments to dynamic microfluidic systems, enabling a continuous supply of nutrients and metabolites.

"Nothing is impossible when implementing multicompartmental smart polymeric structures in microfluidic devices," says Dietmar Appelhans. Traditionally, microfluidic channels are used to create microgel and molecularly shaped compartments—such as particles and vesicular structures—loaded with distinct cargoes for applications in life and material sciences. However, the team at the IPF focuses on the controlled integration of enzymes into polymeric compartments that are either continuously or temporarily permeable. This approach allows for the study of temporal and pH-dependent molecular communication between different enzyme-loaded compartments, which is crucial for understanding enzymatic cascade reactions.

The research team employs a simultaneous photopolymerization process to achieve sequential or parallelized enzymatic cascade reactions in microfluidic chips with single- or multiple-chamber reactors. This involves placing various precursor solutions in different cavities of a mold, ensuring the precise location of enzyme-loaded hydrogel dot arrays within the microfluidic chips. By integrating this concept into a microfluidic multi-chamber reactor, different enzyme combinations can be distributed across hydrogel dot arrays in different reaction chambers. This setup permits researchers to explore key phenomena such as dilution, inhibition, and substrate channeling effects for any kind of enzymatic cascade reaction.

To gain further control over enzymatic processes, the research group uses multi-functionalized hydrogel dots. For temporal and spatial control, pH-responsive enzyme-loaded polymersomes are needed to switch enzyme reaction on and off at selected pH values. Additionally, a copper-free click reaction is utilized for the surface conjugation of enzyme-loaded polymersomes onto the outer spheres of hydrogel dots, which can also be loaded with additional enzymes. "This method allows us to construct complex biohybrid structures both along and within the hydrogel dots," explains Dietmar Appelhans. The hydrogel dots can incorporate different networks of permanent and non-permanent crosslinking points, further enhancing the precise localization of enzymes. "This paves the way for the integration of organic or inorganic catalysts as enzyme substitutes within the polymeric network," he adds.

A notable recent advancement of this microfluidic approach is the in-line surface modification of the hydrogel dot arrays under continuous flow. This innovation promotes the integration of additional enzymes and enzyme-loaded polymersomes into the outer sphere of enzyme-loaded hydrogel dots, allowing for the direct initiation of enzymatic cascade reactions.

» Key to our research is the multiple in-line surface modification of the outer sphere of enzyme-loaded hydrogel dot arrays. This unlocks new possibilities for designing complex biohybrid structures in real time, enabling us to mimic cell structures and functions under continuous microfluidic flow. «

Overall, the group's approach holds great potential for mimicking cell structures and functions under continuous microfluidic flow conditions with immediate optical read-out of information. This opens new avenues for microfluidic-based models of disease conditions and therapies that do not require in vivo experimentation.

Original publication on the subject:
https://doi.org/10.1002/smtd.202400282

Dr. Dietmar Appelhans earned his doctorate in chemistry from the University of Marburg in 1994. After postdoctoral work at the TU Dresden (1994–1998), he joined the IPF in 1999. Since 2022, he has been leading the research group "Responsive Self-Assemblies and Bioconjugates", which focuses on biomimetic structures and functions, with a particular emphasis on artificial organelles. His current team includes Yang Zhou, Andrea Koball, Bhavati Tarpara, Vladislav Stavinskii, Andreas Schurig, and Franzisca Kucharczyk.

Leveraging bio-nano interactions in blood for improved drug delivery

Designing nanomaterials that avoid immune system-mediated clearance from circulation remains a major challenge in nanomedicine. The ultimate goal is to deliver targeted therapeutics to diseased tissue with minimal side effects. However, nanoparticles inevitably interact with non-target biological components, such as proteins and lipids, which can flag the immune system. Traditional approaches aim to minimize these interactions, but complete avoidance has proven exceptionally difficult. Quinn Besford and his team approach this problem from a different angle: instead of preventing bio-nano interactions, they seek to selectively enhance them by leveraging biology against itself. Using specific biopolymers, the group is designing nanoparticle architectures that interact with specific components of human blood, rendering them less detectable to the immune system.

Traditionally, nanomedicine has relied on cloaking nanoparticles with poly(ethylene glycol) (PEG) to reduce fouling. However, even PEG-coated nanoparticles still foul to some extent with proteins and lipids from blood, forming a biomolecular corona that can trigger immune responses. Recognizing that complete avoidance of fouling is impossible, Quinn Besford's team takes an innovative approach: rather than fighting this process, they exert some control over it by selectively enriching the corona with specific proteins that promote a more favorable immune response. In addition, they leverage natural biopolymer nanoparticles, which are inherently less likely to be recognized as foreign by the blood.

Leibniz Institute of Polymer Research Dresden

"In the kitchen, we use robust surface coatings to prevent food gunk from sticking to our pans. However, on nanoparticles, we cannot prevent proteins and lipids in blood from adsorbing," explains Quinn Besford. The composition of this biomolecular "gunk" signals to the immune system whether something is foreign in the blood, which is a key barrier to creating long-circulating nanoparticles for delivering therapeutics. "Our goal is not to scrub the 'gunk' off nanoparticles, but to enrich it with components that calm immune responses. This allows the game of cat and mouse between the immune system and nanoparticles to continue until the therapeutics reach the target tissue."

The group works with soft polymeric nanoparticles that integrate multiple functionalities. One approach involves functionalizing synthetic polymer nanoparticles with bio-ligands that have binding partners in human blood (doctoral thesis project of Vaidehi Londhe). This enables the particles to selectively recruit specific blood components into their biomolecular corona. Moreover, the group uses glycogen nanoparticles derived from nature, which they functionalize for therapeutic purposes (e.g., as clot-busting nanoparticles), before reinserting them into biological contexts (doctoral thesis project of Nadiia Davydiuk).

> » Our goal is to work with biology, rather than against it, by leveraging bio-nano interactions for better outcomes in nanomedicine. «

While these novel nanomaterial designs hold great promise for treating a variety of debilitating diseases, many hurdles remain on the path to clinical translation. Currently, the team is focused on fundamental bio-nano interactions, with applications in thrombosis and cancer. Future research will extend to diseases such as cystic fibrosis, rheumatoid arthritis, and sepsis, supported by plans to apply for new international consortium funding.

Achieving these ambitious goals requires interdisciplinary collaboration. A key strength of Quinn Besford's team lies in its diversity and global outreach. Members come from Australia, Ukraine, India, China, the USA, Hungary, Poland, and Azerbaijan, with alumni from many other countries. The group collaborates widely with biologists, cardiovascular experts, polymer chemists, and other physical chemists. At the IPF, they work closely with the Carsten Werner group, particularly with Manfred Maitz. This collaborative, interdisciplinary approach enriches problem-solving with a broad range of perspectives. As Quinn Besford emphasizes, "By getting people with different backgrounds and expertise into the same room—even if it's a virtual room—exciting ideas and outcomes can emerge."

Original publication on the subject:
https://pubs.rsc.org/en/content/articlelanding/2025/nr/d4nr03034f

Dr. Quinn Besford completed his PhD in 2016 at The University of Melbourne, Australia, specializing in statistical mechanics of polar liquids. He then joined the ARC Centre of Excellence in Convergent Bio-Nano Science and Technology, working with Professor Frank Caruso to develop new functional nanomaterials for theranostics. In 2019, he joined the IPF as an Alexander von Humboldt fellow, hosted by Professor Andreas Fery. Since 2022, he has been leading the "Functional Polymer Architectures" research group, which currently includes Dr. Khrystyna Rymsha, Dr. Jyoti Yadav, Dr. László Mérai, Vaidehi Londhe, Nadiia Davydiuk, Jiayi Liu, Adelaide Levenson, Weronika Woronko, and Nuray Mammadzada.

Hybrid membranes with high monovalent ion selectivity for desalination applications

The growing global demand for clean water, exacerbated by increasing fresh water scarcity, saltwater intrusion, and nitrate contamination from fertilizers—even in highly developed countries like Germany—has created an urgent need for innovative desalination and water purification solutions. Electrochemical processes such as electrodialysis (ED) or membrane capacitive deionization (MCDI) have proven effective for the partial removal of monovalent ions like sodium, chloride and nitrate. However, the efficiency of these processes can be significantly enhanced through the use of ion exchange membranes which are highly selective for monovalent ions. In the BMBF joint project *innovatION,* Jochen Meier-Haack and his group, in collaboration with eight partners from universities, industry, and water suppliers, successfully developed advanced ion exchange membranes with high monovalent selectivity.

Although such membranes are already commercially available, research in this field continues to evolve rapidly, as reflected in the growing number of scientific publications. Much of this research has focused on applying barrier layers for higher-value ions, or incorporating intercalated/exfoliated 2D materials or nanoporous structures, including metal-organic frameworks (MOFs) and covalent organic frameworks (COFs). These materials create defined channels that selectively allow smaller monovalent ions to pass through. However, these approaches are often time-consuming and currently limited to laboratory-scale applications.

To address these limitations, the “Polymeric Membrane Materials” group at the IPF has developed an innovative hybrid membrane concept that combines the separation properties of nanofiltration membranes (NF) and ion exchange membranes (IEM). These hybrid membranes are created by coating a conventional ion exchange membrane with a thin, highly cross-linked, and stiff polyamide layer. This unique design integrates multiple mechanisms for separating monovalent from higher-valent ions. One key mechanism is electrostatic repulsion, as the charged membrane surface repels higher-valent ions more strongly than monovalent ones. This property can be fine-tuned by using specific charged monomers. Moreover, the sieving effect (size exclusion), which depends on the membrane structure and the diameter of the hydrated/non-hydrated ions, further enhances selectivity. The dense network structure of the applied polyamide layer allows monovalent ions, with their smaller radii and lower Gibbs Free Hydration Energies, to more easily strip off the hydration shell and enter small transport channels compared to higher-valent ions.

Although the development is still in progress, these hybrid membranes show strong potential for large-scale deployment. A major advantage lies in their production process, which relies on conventional processes used in large-scale membrane fabrication technology, such as interfacial polymerization. This allows for time- and cost-efficient production and facilitates broader industrial implementation.

Initial tests in an MCDI pilot plant (~ 11 m^2 active area) using real nitrate-contaminated groundwater demonstrated a high level of nitrate selectivity while reducing energy consumption by 50% compared to pressure-driven processes like nanofiltration. The treated water can be used directly for drinking water supply or reinjection into the aquifer, enabling even the reactivation of disused wells. Beyond desalination, these membranes hold promise for lithium separation from salt lake brines, minimizing the environmental footprint of lithium production. Other potential applications include the extraction of raw materials from aqueous solutions and energy generation in technologies such as reverse electrodialysis and redox flow batteries.

As Jochen Meier-Haack emphasizes, the success of the project was made possible only through close collaboration with the *innovatION* partners, particularly with the TU Dresden. The “Polymeric Membrane Materials” group is now actively pursuing further projects to scale up production and expand the applications of the hybrid membranes, marking a significant step toward addressing global water and resource challenges.

» Membrane-based desalination processes are crucial for supplying the world's population with clean drinking water. The membranes developed at the IPF can make a valuable contribution to this pressing global challenge. «

Dr. Jochen Meier-Haack studied chemistry at the University of Hamburg, where he received his doctorate in polymer chemistry under the supervision of Professor Hans R. Kricheldorf. He joined the IPF in 1993 and has been leading the “Polymeric Membrane Materials” group since 2000. The group’s main research topics are surface modification of porous membranes for fouling mitigation and development of ion-exchange membranes for electromembrane processes. His team currently includes Tim Oddoy, Akshay Kulkarni, and Dr. Wladimir Butwilowski.

Precision microgels for guiding tissue development

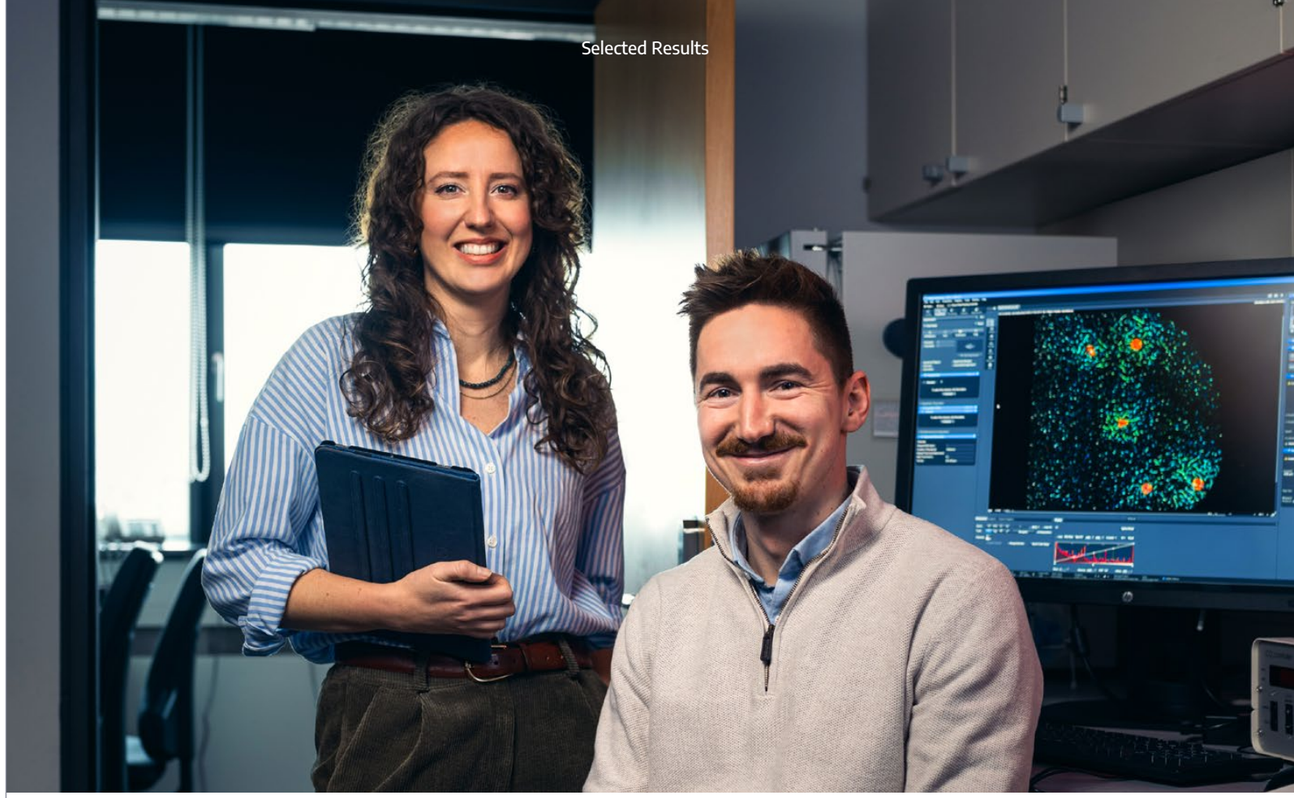
Tissues and organs develop from just a few cells into complex, functional structures. Creating faithful lab models of these processes enables researchers to study morphogenesis and disease more effectively, while reducing reliance on animal testing. To advance this goal, an interdisciplinary team from the IPF Institute of Biofunctional Polymer Materials has designed customized hydrogel microparticles (microgels) to direct tissue development in vitro by precisely controlling the spatiotemporal distribution of soluble signaling molecules.

During tissue development, specialized clusters of cells secrete signaling molecules called morphogens, which form concentration gradients around them. By sensing the concentration and duration of these gradients, surrounding cells determine their positional identity and execute their genetic program. “Morphogen-secreting cells act like orchestra conductors directing a symphony,” explains Valentina Magno, a member of the research team. “Just as a conductor guides musicians, setting the tempo and providing cues to create a harmonious performance, morphogen-secreting cells release chemical signals that instruct surrounding cells on how to grow and develop. Without this guidance, musicians may play out of sync, just as cells may fail to coordinate effectively without the right morphogen gradients, leading to defective tissue formation.” “By loading microgels with morphogens and precisely controlling their release, we can replicate the function of these ‘conductor cells’ and guide tissue development ourselves,” adds her colleague Sebastian Kühn.

Previous approaches for creating morphogen gradients have relied on complex genetic engineering of cells or technically demanding setups that could interfere with the developing tissue structures. In contrast, the cell-sized microgels created at the IPF can be easily positioned within the developing tissue, offering a versatile and accessible tool for other research labs.

The key innovation of these microgels lies in their fine-tuned interaction with morphogens. In tissues, highly negatively charged carbohydrates called sulfated glycosaminoglycans (sGAGs) reversibly bind morphogens with high affinity, primarily through electrostatic interactions with positively charged domains of the signaling molecules. The research team translated this binding mechanism into polymer networks that incorporate sGAGs. By modifying the sGAG concentration and charge patterns, the researchers can control the microgels’ negative charge and thus their affinity for morphogens. These precision-engineered microgels, termed “Micro(µ)Gel Units to Instruct Development” (µGUIDEs), can establish morphogen gradients with cellular resolution lasting from hours to days.

To demonstrate the potential of µGUIDEs, the team tested them in several biological systems, including kidney organoids—one of the most complex lab-grown tissue models. Derived from human-induced pluripotent stem cells, kidney organoids feature key morphological aspects of the early embryonic kidney and contain structures that resemble nephrons, the kidney’s functional units. However, a major limitation of kidney organoids is their poor nephron vascularization, which impairs tissue function and limits their maturation and application. By creating local gradients of vascular endothelial growth factor from the precisely positioned µGUIDEs, the researchers successfully stimulated vascular development in the required areas of the organoids. This resulted in a more functional tissue organization, where the vascular network closely integrates with the nephrons.



> **» Our µGUIDEs are signaling sources that can advance the understanding of tissue and organ development. «**

Encouraged by these promising results, the team is now exploring the application of the µGUIDEs to other morphogens and tissue models, also in collaboration with other research labs to help them tackle challenges in tissue development. Furthermore, their goal is to create more complex systems where multiple morphogen fields can be generated in combination or in staged sequences, getting closer and closer to native tissues.

Dr. Sebastian Kühn earned his M.Sc. in Biomedical Engineering from Imperial College London, United Kingdom, and completed his PhD at the IPF under the supervision of Professor Carsten Werner. Dr. Valentina Magno received her M.Sc. in Biotechnology from the University of Bari, Italy, and also completed her PhD at the IPF under Professor Carsten Werner’s guidance. Both are now postdoctoral researchers in his multicultural, interdisciplinary IPF institute and realized this project together with Dr. Ralf Zimmermann, Dr. Yanuar Dwi Putra Limasale, Dr. Passant Atallah, Aukha Stoppa, Dr. Jens Friedrichs, and Dr. Uwe Freudenberg, in collaboration with Max Männel and Professor Julian Thiele from the Department “Nanostructured Materials”.

Original publication on the subject:
https://advanced.onlinelibrary.wiley.com/doi/epdf/10.1002/adma.202409731

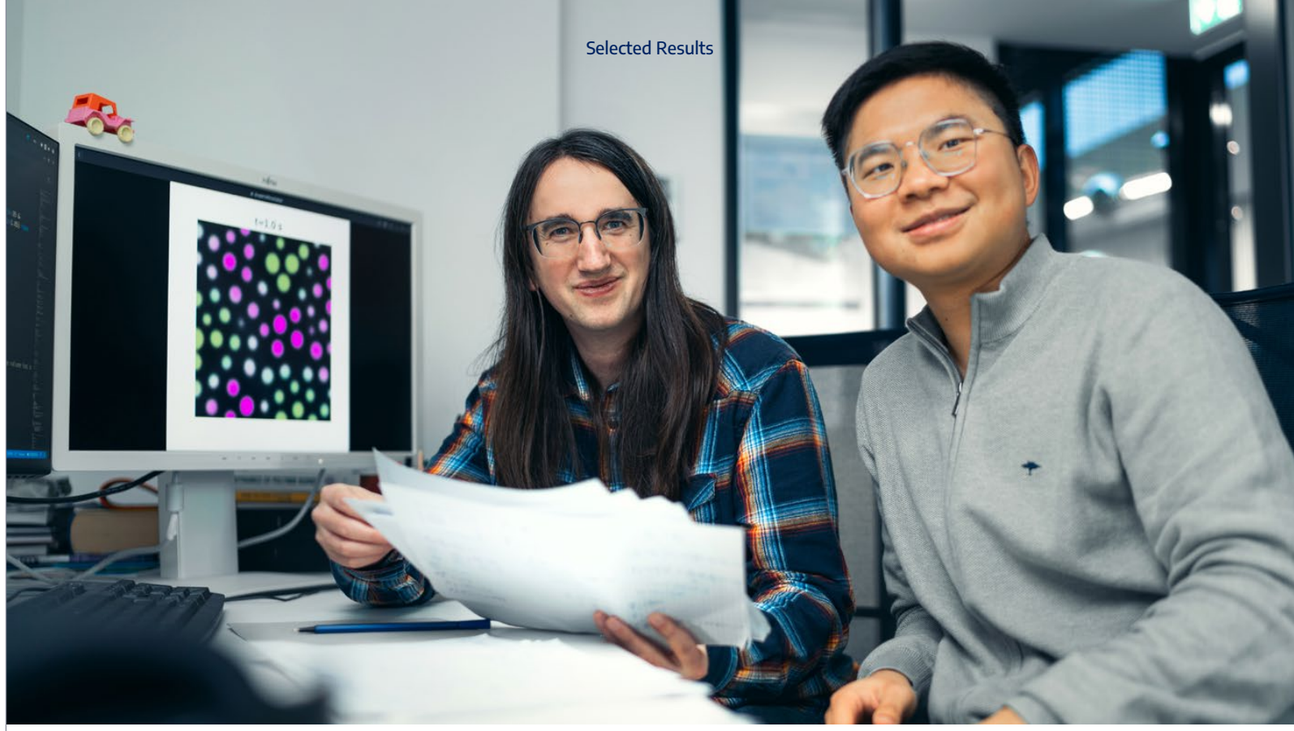
Chemically active biomolecular condensates for cellular regulation

Biomolecular condensates (BMCs) are membrane-less organelles found in cells across various biological systems. These condensates are characterized by spatially organized biopolymers that form through polymer phase separation. Over the past 15 years, BMCs have been linked to an expanding list of critical biological functions, such as regulating cell division and repairing DNA damage. However, the mechanisms by which these condensates interact with biochemical processes remain an evolving area of research. Understanding these interactions is essential for uncovering how BMCs function and for developing methods to regulate their behavior. Tyler Harmon from the IPF Institute Theory of Polymers, along with his doctoral students, is investigating how coupling chemical reactions with phase separation can drive the formation of new condensates in response to changing cellular needs.

Dr. Tyler Harmon specializes in the theory and coarse-grained simulations of biomolecular condensates. He studied physics at Linfield College in McMinnville, USA, starting in 2006 and pursued a doctorate in biological physics at Washington University in St. Louis, USA, from 2011. In 2017, he moved to Dresden as a postdoctoral researcher at the Max Planck Institute for the Physics of Complex Systems. Since 2021, he has been leading a junior research group focusing on biomolecular condensates.

"We want to understand the fundamental principles by which cells use chemical reactions to trigger the formation of new BMCs, thereby increasing the diversity of condensates," explains Harmon. Chemical reactions can convert a single population of one type of BMC into two distinct populations that use the same proteins but differ in their enzymatic composition and other sub-components. To explore this phenomenon, Tyler Harmon and his team have developed a simple model system involving a protein that forms a condensate and two enzymes: The first enzyme, a kinase, catalyzes a post-translational modification to the protein by adding a phosphate group. The second enzyme, a phosphatase, catalyzes the reversal of the modification by removing the phosphate group. The researchers investigate minor modifications which do not affect the phase behavior of the protein. However, the enzymes have an additional binding domain that interacts preferentially with their respective products: the kinase binds to the phosphate group, while the phosphatase is more attracted to the unmodified protein.

Original publication on the subject:
https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.133.028402



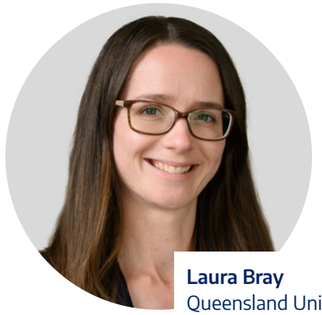
The team's findings demonstrate that this combination of reactions and binding properties can drive the spontaneous formation of two distinct BMCs. If two nearby BMCs are nearly identical except one is slightly enriched in phosphorylated protein, the kinase will be preferentially recruited to this condensate, leading to stronger phosphorylation. This, in turn, results in an even stronger preference for recruiting kinase. This feedback loop continues until almost all of the proteins in the BMC are modified. Conversely, the other BMC, originally slightly depleted in the modified protein, will become almost entirely composed of unmodified proteins over time. This process can be conceptually understood as a self-amplification mechanism that reinforces differences in enzyme composition. Using analytical models, Harmon and his team identified the set of parameters under which this type of behavior is expected and employed Cahn-Hilliard equations to study the dynamics of the process numerically.

As Harmon emphasizes, "The linchpin of this result is that the enzyme's non-catalytic interaction site specifically binds the product of the enzyme's reaction." Notably, many enzymes exhibit such interaction domains featuring this exact architecture, suggesting that BMC feedback may explain why these architectures are so prevalent in biological systems.

» Understanding biomolecular condensates and their regulation in living cells is crucial for gaining a better understanding of life functions and for developing novel methods to improve human health. In this context, polymer physics can make a significant contribution. «

The study of BMCs originated in Dresden and was significantly shaped by the pioneering work of Anthony A. Hyman's group at the Max Planck Institute of Molecular Cell Biology and Genetics and Frank Jülicher's group at the Max Planck Institute for the Physics of Complex Systems. The theory of reactive condensates has particularly benefited from collaboration with Frank Jülicher's group. The theoretical models and techniques developed by Tyler Harmon and his team are now being expanded to explore new questions, such as the role of condensates in hosting chemical reactions.

IPF Fellows



Laura Bray
Queensland University of Technology,
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3D Cancer In Vitro Models

Mahmoud Al-Hussein
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Amman, Jordan
Nanostructured Organic Materials

Igor M. Kulic
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Biopolymer Physics and Active Condensed Matter

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Photochemical Polymerization, Polymer Networks

Ayala Lampel
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Biomolecular Self-Assembly, Protein Phase Separation, Nanoparticle Superlattice Design

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Polymer Composites, Surface Modification of Carbon Nanotubes and Graphenes

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Rubber Blends and Nanocomposites

Joseph B. Tracy
North Carolina State University,
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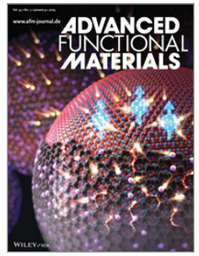
Particle-Based Functional Materials

Benjamin Newland
Cardiff University,
Cardiff, UK
Polymeric Biomaterials for Drug Delivery and Neuroscience

Kim Williams
Colorado School of Mines,
Golden, USA
Field-Flow Fractionation Techniques

Exemplary Publications



Boosting OECT performance with PEGylated gold nanoparticles in hydrophobic channels

Po Yuen Ho, Oliver Ditzer, Ali Solgi, Haoran Zhang, Ronja Thümmler, Mahmoud Al-Hussein, Hans Kleemann, Ningwei Sun, Franziska S.-C. Lissel

Advanced Functional Materials,
DOI: 10.1002/adfm.202412559

Continuous transformation from membrane-less coacervates to membranized coacervates and giant vesicles: toward multicompartmental protocells with complex (membrane) architectures

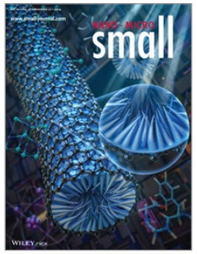
Yang Zhou, Kehu Zhang, Silvia Moreno, Achim Temme, Brigitte Voit, Dietmar Appelhans

Angewandte Chemie International,
DOI: 10.1002/anie.202407472

Nominally identical microplastic models differ greatly in their particle-cell interactions

Simon Wieland, Anja F. R. M. Ramsperger, Wolfgang Gross, Moritz Lehmann, Thomas Witzmann, Anja Caspari, Martin Obst, Stephan Gekle, Günter K. Auernhammer, Andreas Fery, Christian Laforsch, Holger Kress

Nature Communications,
DOI: 10.1038/s41467-024-45281-4



Plasmonic particle integration into near-infrared photodetectors and photoactivated gas sensors: toward sustainable next-generation ubiquitous sensing

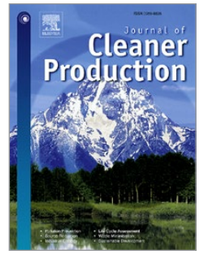
Hendrik Schlicke, Roman Maletz, Christina Dornack, Andreas Fery

Small,
DOI: 10.1002.smll.202403502

Design, simulation and experimental analysis of a monolithic bending section for enhanced maneuverability of single use laparoscopic devices

Kai Uhlig, Sascha Bruk, Matthieu Fischer, Konrad Henkel, Franz Brinkmann, René Körbitz, Ronny Hüttner, Malte Pietsch, Phillip Hempel, Axel Spickenheuer, Markus Stommel, Andreas Richter, Jochen Hampe

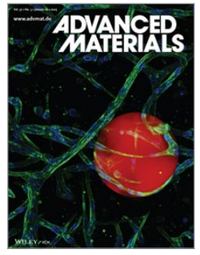
Scientific Reports,
DOI: 10.1038/s41598-024-53914-3



Unlocking the potential of lignin: towards a sustainable solution for tire rubber compound reinforcement

Sakrit Hait, Labeesh Kumar, Jyotirmaya Ijaradar, Anik Kumar Ghosh, Debapriya, Jagannath Chanda, Prasenjit Ghosh, Saikat Das Gupta, Rabindra Mukhopadhyay, Sven Wießner, Gert Heinrich, Amit Das

Journal of Cleaner Production,
DOI: 10.1016/j.jclepro.2024.143274



Microgels with electrostatically controlled molecular affinity to direct morphogenesis

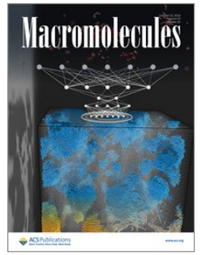
Sebastian Kühn, Valentina Magno, Ralf Zimmermann, Yanuar Dwi Putra Limasale, Passant Atallah, Aukha Stoppa, Max J. Männel, Julian Thiele, Jens Friedrichs, Uwe Freudenberg, Carsten Werner

Advanced Materials,
DOI: 10.1002/adma.202570017

Interpenetrating polymer network hydrogels with tunable viscoelasticity and proteolytic cleavability to direct stem cells in vitro

Prannoy Seth, Jens Friedrichs, Yanuar Dwi Putra Limasale, Nicole Fertala, Uwe Freudenberg, Yixin Zhang, Ayala Lampel, Carsten Werner

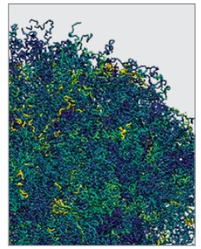
Advanced Healthcare Materials,
DOI: 10.1002/adhm.202402656



Nucleation patterns of polymer crystals analyzed by machine learning models

Atmika Bhardwaj, Jens-Uwe Sommer, Marco Werner

Macromolecules,
DOI: 10.1021/acs.macromol.4c00920



The conformations of protein chains at the interface of biomolecular condensates

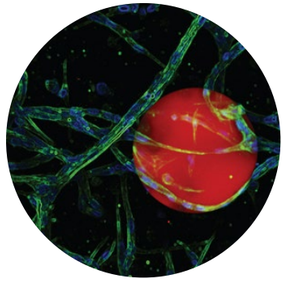
D. Janka Bauer, Arash Nikoubashman

Nature Communications,
DOI: 10.1038/s41467-024-53575-w

Events and Achievements

Christina Scheffler Appointed Professor of *Polymers for Construction*

Christina Scheffler assumed the Chair of ***Polymers for Construction*** at the TU Dresden, a joint appointment with the IPF dedicated to advancing sustainable material technologies. Her research focuses on bio-inspired interphase structures between textile reinforcements and concrete.



Paper Highlighted as Editor's Choice by *Advanced Materials*

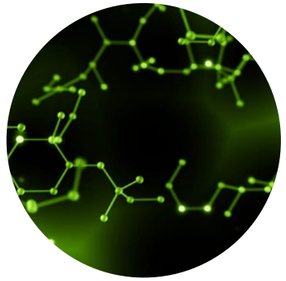
The article "Microgels with Electrostatically Controlled Molecular Affinity to Direct Morphogenesis" by Sebastian Kühn, Valentina Magno, and colleagues from the IPF was recognized as an Editor's Choice in the journal ***Advanced Materials***. Their work presents a precision toolbox to modulate morphogen gradients in tissue cultures, advancing the understanding of tissue and organ development (→ see article "Precision microgels for guiding tissue development" on pages 14/15).
doi.org/10.1002/adma.202409731

Funding for the *BiotroNiS* Research Network

The ***BiotroNiS*** network, coordinated by the IPF, integrates research efforts on bioelectronic materials and systems across Saxony. Its aim is to develop industrial technologies that bridge electronic circuits and living organisms. Partners include the TU Dresden and the Centre for Applied Research and Technology at the University of Applied Sciences Dresden.

52nd Biennial Assembly of the German Colloid Society

Organized by Andreas Fery and other researchers from the IPF, the 52nd Biennial Assembly of the German Colloid Society was held in Dresden from September 30 to October 2. The event attracted more than 160 participants who discussed topics such as particle-based functional materials and polyelectrolyte coacervates.



Biennial Meeting of the Macromolecular Division of the GDCh

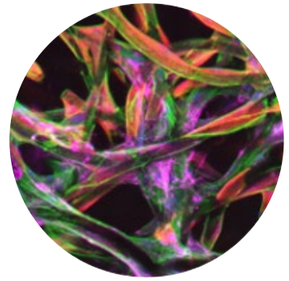
The Biennial Meeting of the Macromolecular Division of the ***Gesellschaft Deutscher Chemiker (GDCh)***, organized by Brigitte Voit and colleagues from the IPF, welcomed around 200 participants to Dresden. The event served as a platform for exploring the physical and chemical aspects of polymers and sustainability.

12th World Biomaterials Congress

At the 12th World Biomaterials Congress in Daegu, South Korea, IPF researchers organized three symposia, showcasing innovations in hydrogel materials, tumor tissue engineering, and hemocompatible coatings. With over 4,000 participants from 62 countries, the congress is the largest scientific conference in the field of biomaterials.

International Summer School

In September, the IPF hosted 20 students from Charles University Prague, TU Dresden, TU Chemnitz, and the University of Applied Sciences Dresden for the summer school "Discover Advanced Materials".



Colloquium on Tumor Tissue Engineering

Organized by Anna Taubenberger and Daniela Lössner, the colloquium aimed to foster collaboration among researchers across the Dresden Life Science Campus who are engaged in cancer-related research. The event aligns with the IPF's Synergy Initiative, which has identified "Tumor Tissue Engineering" as an ***Emerging Topic***.

Team *ResCure* wins Science4Life Venture Cup

The IPF's *ResCure*® team won first place at the Science4Life Venture Cup, Germany's leading business plan competition for start-up projects in life sciences, chemistry, and energy. The team was awarded €25,000 in recognition of their innovative project and entrepreneurial excellence.

Hermann F. Mark Medal for Gert Heinrich

Gert Heinrich, former director of the IPF Institute of Polymer Materials, was awarded the Hermann F. Mark Medal by the Austrian Research Institute for Chemistry and Technology, honoring his outstanding contributions to polymer research.

Recognition for Trainees

Two former IPF trainees were recognized for their achievements during training and final examinations: Saya Inka Helm was honored with the Leibniz Award for Apprentices, while Max Becker received the Professor Joehnk Trainee Sponsorship Award from the "Future through Education" foundation.

Dresden is(s)t bunt Banquet

The IPF participated in the *Dresden is(s)t bunt* banquet, contributing a rich variety of international dishes. The civic initiative celebrates cultural diversity while promoting openness and unity within the city.

IPF EMERGED!

Annual Reception *IPF EMERGED!*

On April 11, the IPF welcomed over 30 guests to its Annual Reception at the historic Löwensaal in Dresden. The event featured a keynote by Anthony A. Hyman, a concert by the Kurt Masur Academy, and the presentation of awards by the IPF's Association of Supporters.

Innovation Award for Jens Friedrichs

Jens Friedrichs and colleagues received the Innovation Award of the IPF's Association of Supporters for discovering how cholesterol-containing surfaces can repel the adhesion of biomolecules and bacteria.

Doctoral Thesis Award for Hidde Vuijk

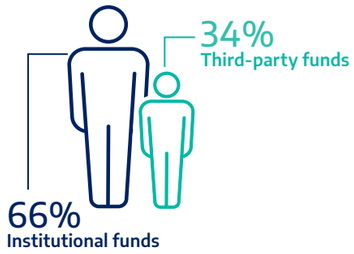
Hidde Vuijk was honored with the Doctoral Thesis Award of the IPF's Association of Supporters for his dissertation "Self-Propelled Particles with Inhomogeneous Activity".

Professor Franz Brandstetter Prize for Valentine Comoy

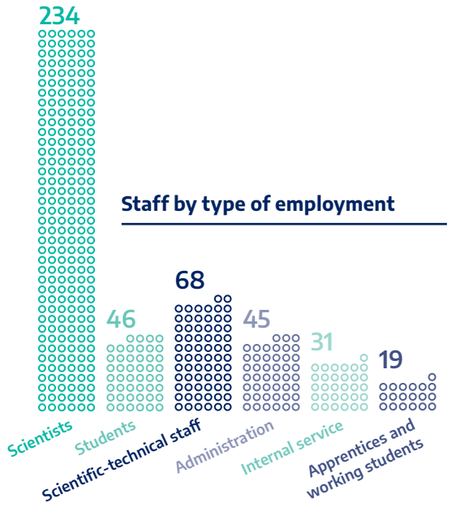
Valentine Comoy was awarded the Professor Franz Brandstetter Prize of the IPF's Association of Supporters for her master's thesis "Spreading of Granular Suspensions on Flat Surfaces".

Figures

Employees by funding source



Staff by type of employment



46% Female employees

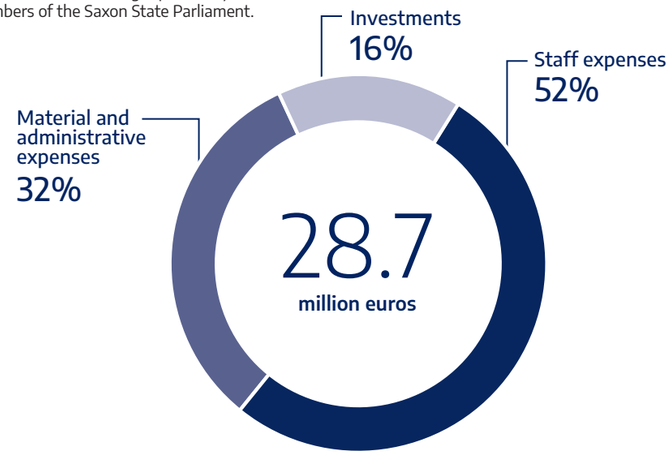
29% International employees

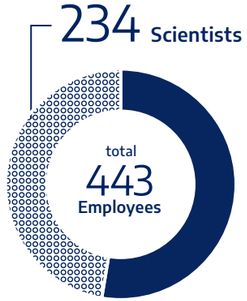
139 Visiting scholars

Zertifikat seit 2010 audit berufundfamilie

Institutional funding

The IPF is jointly funded by the federal and state governments. The institute is co-financed by tax funds on the basis of the budget passed by the members of the Saxon State Parliament.





Apprentices 19

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- Diploma and Master's theses 19
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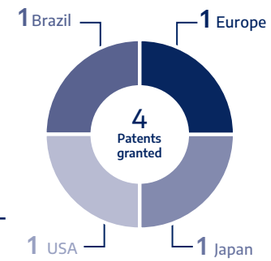
Patents



First filings

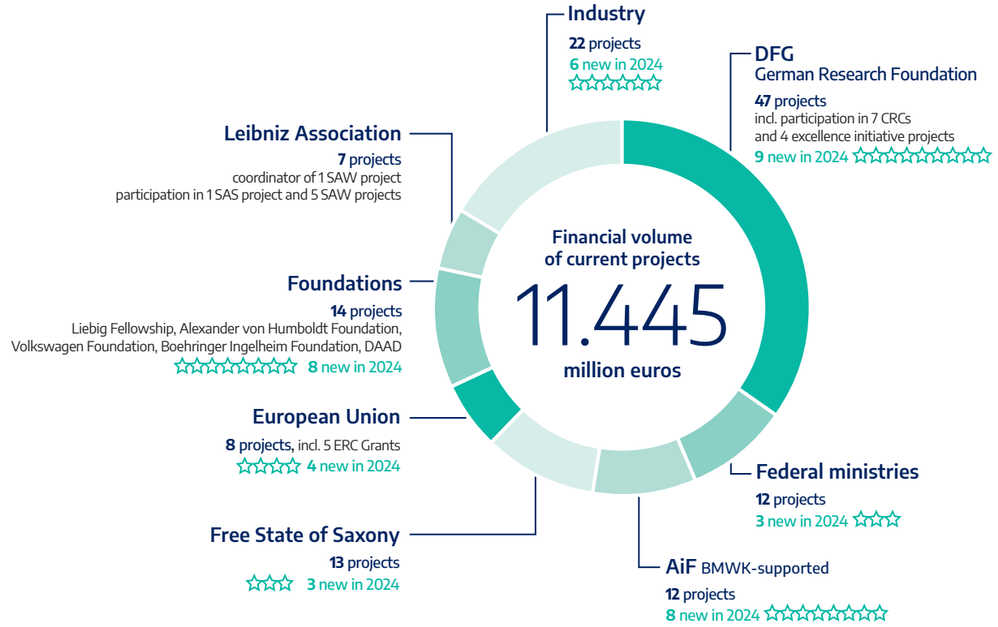
7 Patents

2 Patentable inventions
transferred to industry and cooperation partners

Subsequent filings

11 Patents

Third-party funding



Organisation Organization

ORGANE ORGANS

Mitgliederversammlung General Meeting

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Prof. Dr. Gerhard Rödel
Prof. Dr. Dr. h. c. Roland Sauerbrey
Prof. Dr. Jens-Uwe Sommer
Prof. Dr. Ursula M. Staudinger
Prof. Dr.-Ing. Markus Stommel
Prof. Dr. Carsten Werner
Dr. Agnes Schausberger
Achim von Dungern
Prof. Dr. Manfred Stamm

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Prof. Dr. Ursula M. Staudinger, Technische Universität Dresden, von der Mitgliederversammlung gewähltes Mitglied des Vereins

Prof. Dr. Dr. h. c. Peter Fratzl, Max-Planck-Institut für Kolloid- und Grenzflächenforschung, von der Mitgliederversammlung gewählter Sachverständiger

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FORSCHUNG RESEARCH

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Leiterin: Prof. Dr. Brigitte Voit
mit den Abteilungen Polymerstrukturen, Bioaktive und responsive Polymere, Funktionale Nanokomposite und Blends sowie Makromolekulare Strukturanalyse

Institut Physikalische Chemie und Physik der Polymere
Leiter: Prof. Dr. Andreas Fery
mit den Abteilungen Funktionale kolloidale Materialien, Nanostrukturierte Materialien, Polymergrenzflächen sowie Multiskalen-Charakterisierung

Institut Polymerwerkstoffe
Leiter: Prof. Dr.-Ing. Markus Stommel
mit den Abteilungen Werkstofftechnik, Verarbeitungstechnik, Elastomere, Fiber Engineering sowie Tailored Lightweight Composites

Institut Biofunktionelle Polymermaterialien
Leiter: Prof. Dr. Carsten Werner
mit den Abteilungen Bio-Grenzflächen, Matrix und Tissue Engineering sowie Electronic Tissue Technologies

Institut Theorie der Polymere
Leiter: Prof. Dr. Jens-Uwe Sommer
mit den Abteilungen Theorie der weichen Materie und Polymerphysik, Materialtheorie und Modellierung sowie Theorie biologisch inspirierter Polymere

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Leibniz-Institut für
Polymerforschung
Dresden

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Absolventen Graduates

PROMOTIONEN
DOCTORAL THESES

Lisa Ehrlich
Struktur-Eigenschafts-Beziehungen von Polymerelektrolyten basierend auf ionischen Flüssigkeiten für die Anwendung in Festkörperbatterien
Technische Universität Dresden

Ignatus Van Wyk Ferreira
Design of Bicomponent Poly(lacticacid)Fibres contaning NN-dicthyl-3-methylbenzamide for Biodegradable Mosquito Repellent Textiles
Technische Universität Dresden

Danny Friese
Entwicklung einer robotergestützten Technologie zur Herstellung von biologisch inspirierten, lastangepassten 3D-Textilbewehrungsstrukturen
Technische Universität Dresden

Krishna Gupta
Developing programmable DNA-based reaction cascades and devices for point-of-care nucleic acid testing
Technische Universität Dresden

Lars Hahn
Technologien für mehraxial lastangepasst angeordnete, textile Hochleistungsstrukturen mit hohem Vorfertigungsgrad zur Anwendung in Faserverbundwerkstoffen
Technische Universität Dresden

Ezgi Inci
Synthesis of high-performance supercapacitor electrode materials based on polyaniline and corbarons
Technische Universität Dresden

Chen Jiao
Reversible molecular capture/release by hydrogel microdots and biocatalysis in microfluidics
Technische Universität Dresden

Alexander Kriwet
Vorhersage der Körperschallübertragung von Kunststoffbauteilen im Motor-Getriebe-Verbund
Technische Universität Dresden

Shayan Vazirieh Lenjani
Insights into self-assembly mechanisms of polymer-grafted gold nanoparticles in colloidal solution
Technische Universität Dresden

Andrei Mitrofanov
Low-dimensional lead halide perovskites with conjugated organic cations
Technische Universität Dresden

Sajid Naseem
Transition metal layered double hydroxides (LDHs): Multifunctional material for polymers and energy applications
Technische Universität Dresden

Paul Penzel
Modellierung und Entwicklung verbundoptimierter Textilbeton-bewehrungen zur gezielten Beeinflussung des Verbund- und Versagensverhaltens in Betonmatrices
Technische Universität Dresden

Piotr Rzeczkowski
Kleben von hochgefüllten PP/Graphit-Bipolarplatten als alternative Abdichtungsmethode in Brennstoffzellen
Technische Universität Dresden

Daniel Schletz
Advancing plasmon resonance engineering via combinatorics and artificial intelligence
Technische Universität Dresden

Anna Siedel
Automated fabrication of cell-instructive synthetic sulfonated and sulfated hydrogels
Technische Universität Dresden

Dmitri Sychev
Hydrogel-based adhesion sensors
Technische Universität Dresden

Kehu Zhang
Multi-compartmental structures for mimicking structure-function of natural organelles and cells
Technische Universität Dresden

DIPLOM- UND MASTERARBEITEN
DIPLOMA AND MASTER'S THESES

Mariam Ahmed Farag Ali
Membrane-functionalized polymersomes for molecular communications
Freie Universität Berlin

Simone Arndt
Engineering injectable capillaries for ischemic tissue regeneration
Technische Universität Dresden

Abdé-Samaad Djebbour
Mechanofluorescent polymer brushes for probing cell traction forces
Technische Universität Dresden

Sebastian Eich
Entwurf und Crashmodellierung einer mittels Tailored Fiber Placement (TFP) herstellbaren, tragwerksartigen Chassisprimärstruktur für die Formula Student
Technische Universität Dresden

Marcel Enders
Untersuchung von Alginaten als biobasierte Filmbildner in Glasfaser-schichten und daraus resultierende Verbundeigenschaften
Technische Universität Dresden

Kai Gossen
Herstellung und Charakterisierung von Eco-corona Modellpartikeln
Technische Universität Dresden

Jiawei Guo
Schnelle Konfokalmikroskopie: Automatisierte Optimierung der Bildqualität und Evaluierung der Möglichkeiten zur Beobachtung von Tropfenaufprall auf ebenen Substraten
Technische Universität Dresden

Marie Hagenbruch
Konzeption neuartiger Greifsysteme auf Basis von Gelenkstrukturen aus Multi-Matrix-Faser-Kunststoff-Verbundmaterial
Technische Universität Dresden

Lukas Haugk
Numerical investigations on polymer assisted condensation under the influence of force
Technische Universität Dresden

Doreen Hofmann
Biosensitive hydrogel films on the nanometer scale
Technische Universität Dresden

David Hönel
Verarbeitungsverhalten und Haftfestigkeit von Thermoplasten und Thermoplastischen Elastomeren in additiv gefertigten Zweikomponen-tenbauteilen
Technische Universität Dresden

Henry Lila
Design of a valve-controlled aspiration platform for fabrication of inter-crosslinked polymeric microparticle assemblies
Technische Universität Dresden

Apolline Limouzin
Synthesis of biobased model polymers with photo-labile functionalities for degradation on demand
Technische Universität Dresden

Yujun Lin
Theoretical and experimental investigation of air cushion dynamics on nanoporous surfaces during drop impact
Technische Universität Dresden

François Rivat
Synthesis and characterization of linear redox-active polymer brushes on different surfaces
Technische Universität Dresden

Leon Schild
Entwicklung eines tragwerksartig versteiften Faser-Kunststoff-Verbund (FKV)- Formula Student Monocoques auf Basis von Tailored Fiber Placement-Preformen
Technische Universität Dresden

Tim Johannes Ulbricht
Modifizierung von uretdion-basierenden Pulverlacken mit flammhemmenden Additiven
Technische Universität Dresden

Barath Kumar Vudumula
Study on process-related material properties of Injection-molded EPDM materials
Martin-Luther-Universität Halle

Tobias Zerbe
High-throughput preparation of synthetic sulfonated polymer hydrogels in the 384 well plate
Technische Universität Dresden

BACHELORARBEITEN
BACHELOR'S THESES

Nico Albert
Triggering the molecular degradation of enzymes and peptides by digestive artificial organelles through the use of protein-repellent surface characteristics of polymersomes
Hochschule Reutlingen

Julia Berner
Immobilization of cleavable peptides as reporter system for protease analysis
Technische Universität Dresden

Jule Marie Paul
Mechanobiology of kidney organoids
Duale Hochschule Sachsen, Riesa

Louis Rothenhäußer
Degradationsverhalten von CaAl LDH - PLA Kompositen
Technische Universität Dresden

Johanna Schober
Bioadhäsion auf Cholesterin(analog) Dünnschichten
Duale Hochschule Sachsen, Riesa

Svenja Thömel
Validation of molar mass characterization approaches for advanced lignin analysis
Hochschule für Technik und Wirtschaft Dresden

Diana Tränkner
Herstellung und Charakterisierung von Anionenaustauschermembranen für die Alkali-Brennstoffzelle
Hochschule für Technik und Wirtschaft Dresden

Auszeichnungen Awards

Dr. Jens Friedrichs & Team
Innovationspreis des IPF und des Fördervereins des IPF
für ihre Arbeiten zu neuen Konzepten für entropieabstoßende Oberflächenbeschichtungen
„Cholesterol can make surfaces non-stick by entropic repulsion“

Dr. Hidde Derk Vuijk
Promotionspreis des IPF und des Fördervereins des IPF
für seine Dissertation
„Self-propelled particles with inhomogeneous activity“

Valentine Comoy
Professor-Franz-Brandstetter-Preis des IPF und des Fördervereins des IPF
für ihre Masterarbeit
„Spreading of granular suspensions on flat surfaces“

Dr. Uwe Freudenberg & ResCure® Team
1. Platz im Science4Life Venture Cup
für ihren Businessplan zu neuartigen Polymeren zur Behandlung von Entzündungen
„ResCure® Dressing – Eine Wundauflage für chronische Wunden“

Dr. Passant Morsi Atallah
Biobusiness Award 2024
für ihre Präsentation des Businessplans zu neuartigen Polymeren zur Behandlung von Entzündungen
„ResCure® Dressing – Eine Wundauflage für chronische Wunden“

Prof. Dr. Gert Heinrich
Hermann-F.-Mark-Medaille 2024
für seine herausragenden Beiträge zur Polymerforschung, insbesondere auf dem Gebiet der Elastomere und Reifenmaterialien

Saya Inka Helm
Leibniz-Auszubildenden-Preis 2024
für ihre exzellenten Leistungen als Chemielaborantin und ihr soziales Engagement

Ashwin Shah
L'Oréal-Reisestipendium beim 22nd International Congress of the European Society of Toxicology in vitro (ESTIV2024)
für das Poster
“Validation of a human 3D high-throughput vasculogenesis model for developmental toxicity screening”
Autor:innen: N. Dennison, U. Freudenberg, M. Fusenig, T. M. Hauser, J. Irmai, S. Klier, M. A. Ramirez Martinez, A. Shah, J. Schröter, L. Sturm, C. Werner

Ashwin Shah
Posterpreis des ATLA-FRAME Best Poster Award beim 22nd International Congress of the European Society of Toxicology in vitro (ESTIV2024)
für das Poster
“Validation of a human 3D high-throughput vasculogenesis model for developmental toxicity screening”
Autor:innen: N. Dennison, U. Freudenberg, M. Fusenig, T. M. Hauser, J. Irmai, S. Klier, M. A. Ramirez Martinez, A. Shah, J. Schröter, L. Sturm, C. Werner

Ahmed Omara
Posterpreis des Journal of Materials Chemistry B beim Cambridge Bioelectronics Symposium
für das Poster
“Hydrogel-functionalized microelectrode arrays (MEAs) for multimodal cell stimulation”
Autoren: T. F. Akbar, A. Omara, C. Jimenez Rodriguez, C. Tondera, C. Werner

Dr. Sebastian Kühn
Posterpreis auf der EMBL-IBEC Conference 2024
für das Poster
“µGUIDE – A precision microgel platform to direct development in vitro”
Autor:innen: P. Atallah, U. Freudenberg, S. Kühn, Y. D. P. Limasale, V. Magno, M. J. Männel, A. Stoppa, J. Thiele, C. Werner, R. Zimmermann

Talika A. Neuendorf
Posterpreis auf der POLY-CHAR: Polymers for our Future (IUPAC)
für das Poster
“Mix and match: the power of modular polymer design for system integration”
Autor:innen: I. Kühnert, T. A. Neuendorf, J. Thiele, N. Weigel, C. Zschech

Verena Kast
Posterpreis auf dem 12th World Biomaterials Congress
für das Poster
“A tumour-engineered platform of pancreatic cancer”
Autor:innen: F. Baenke, S. Hauser, K. C. Honselmann, V. Kast, D. Loessner, A. Nadernezhad, D. Pette, D. E. Stange, C. Werner

Vaidehi Londhe
Posterpreis auf dem 12th World Biomaterials Congress
für das Poster
“Understanding the biomolecular corona formation at the nano-bio interface”
Autor:innen: Q. Besford, V. Londhe, M. Maitz, A. C. G. Weiss, C. Werner

Markus Kämpfe
Posterpreis auf der DKT Nürnberg - German Rubber Conference
für das Poster
“Characterization of wall slip and shear flow contributions to the thermo-rheological behavior of blend-based Thermoplastic Elastomers”
Autor:innen: M. Kämpfe, I. Kühnert, S. Wießner

Marina Sebastian
Springer Posterpreis auf der 52nd Biennial Assembly of the German Colloid Society
für das Poster
“Multicompartmentalized micellar structures by gold nanoparticles grafted with diblock-copolymer ligands”
Autor:innen: A. Fery, A. Nikoubashman, C. Rossner, M. Sebastian

Rahma Boughanmi
Springer Posterpreis auf der 52nd Biennial Assembly of the German Colloid Society
für das Poster
“Preparation of polyelectrolyte complexes and their application as adsorbent material for heavy metal ions”
Autor:innen: R. Boughanmi, M. Oelmann, C. Steinbach, S. Schwarz

Dr. Ilka Hermes
Posterpreis auf dem 7th Nanoscientific Forum Europe (NSFE) 2024
für das Poster
“Functional imaging of polymer electrolytes for battery applications”
Autor:innen: L. Ehrlich, P. Uhlmann, M. Checa, L. Collins, I. Hermes

Ronja Bodesheimer
Royal Society of Chemistry Posterpreis auf der GDCh MAKRO: Polymers for a Sustainable Future 2024
für das Poster
“Bio-inspired polymer metallisation with the adhesion promoter dopamine”
Autor:innen: R. Bodesheimer, F. Simon, P. Friedel, B. Voit, C. Zimmerer

Andrea Koball
Posterpreis auf der IUPAC Macro 2024
für das Poster
“Snail slime as by-product of agriculture and promising base material for nanoparticle hydrogel composites”
Autor:innen: D. Appelhans, J. Gaitzsch, A. Koball, B. Voit

Robin Lenz
FAIR4Chem Award 2024
für seinen Datensatz
“Database of Raman and ATR-FTIR spectra of weathered and biofouled polymers”

Stipendiaten Visiting Scholars

Humboldt-Forschungsstipendium der Alexander von Humboldt-Stiftung

Dr. Jyoti Yadav
Institute of Physical Chemistry, Polish Academy of Sciences, Warschau, Polen
Spatially resolving charge transport in solution with mechanofluorescent polymer brush surfaces
01.03.2023 – 01.03.2025

Dr. Fei Zhang
Institute of Flexible Electronics Technology, Tsinghua University, Zhejiang, China
Development of mixed ion-electron conductive composites for strain sensors
04.09.2024 – 03.09.2026

Liebig-Stipendium

Dr. Christian Roßner
Maßgeschneiderte Nanohybridmaterialien für die plasmonen-verstärkte Photokatalyse
01.12.2022 – 30.11.2024

Stipendium des Deutschen Akademischen Austauschdienstes (DAAD)

Dr. Ana Bárbara Krummenauer Formenton
Universidade Federal do Rio Grande do Sul, Brasil
Evaluation, applicability and modifications of hyperelastic models used to determine the mechanical behavior of fiber-reinforced elastomeric polymers with a focus on biological tissues and industrial applications
07.06.2023 – 29.02.2024

Ravichandir Shashank
Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India
Active molecules in inhomogeneous environments: emergence of chemotactic behaviour
01.11.2024 – 31.10.2025

Deepak Panwar
Indian Institute of Technology, Delhi, India
Enhanced photoluminescent properties of asymmetric gratings via template-assisted self-assembled quantum dots
01.10.2024 – 31.03.2025

Stipendium des chinesischen State Scholarship Funds
vergeben über China Scholarship Council (CSC)

Li Chen
The stretchable organic electrochemical transistors for flexible gas sensors
31.03.2023 – 01.04.2024

Chen Jiao
Chemical utilization of double cross-linked hydro gels within microfluides
01.10.2019 – 31.05.2024

Stipendium der Evonik-Stiftung

Fabian Mehner
Synthese eines bioabbaubaren PEK-Surrogats mittels radikalischer Ringöffnungspolymerisation von zyklischen Ketenacetalen
01.11.2021 – 31.10.2024
International Graduate Education Scholarship (YLSY), Türkei

Zeynep Tansu Atasavum
Investigation of the effects of extracellular matrix on neurodegeneration from a molecular and matrix biology perspective
17.08.2020 – 16.08.2024

International Graduate Education Scholarship (YLSY), Türkei

Zeynep Tansu Atasavum
Investigation of the effects of extracellular matrix on neurodegeneration from a molecular and matrix biology perspective
17.08.2020 – 16.08.2024

Schwedisches Regierungs-Stipendium

Radhika Thakore
Lund University, Sweden
Interaction behavior of pseudo-glycodendrimers against Aβ peptide (1-40)
01.08.2023 – 31.08.2023

Short-term research stay at Harvard University

Krishna Gupta
Development of enzymatic and biological methods for DNA production and innovative solutions for DNA nanotechnology application
01.03.2024 – 01.06.2024

Veranstaltungen Events

WISSENSCHAFTLICHE VERANSTALTUNGEN
SCIENTIFIC EVENTS

International Workshop "Additive Manufacturing und Final Meeting M-Era.Net Project MultiMat3"
09. – 10.01.2024, Dresden

GUMFERENCE 2024: Advanced testing of soft polymers materials
08.02.2024, online

IPF DAY
20.03.2024, Dresden

IPF EMERGED! – Jahresempfang mit Preisverleihung
11.04.2024, Dresden

FAIR Research Data Management Workshop (NFDI4Chem)
24. – 25.04.2024, Dresden

33. Seminar Kunststoffrecycling in Sachsen
07.05.2024, Dresden

39th International Conference of the Polymer Processing Society
19. – 23.05.2024, Cartagena de Indias, Kolumbien

12th World Biomaterials Congress
26. – 31.05.2024, Daegu, Südkorea

23rd Virtual Symposium on Field- and Flow-based Separations
03. – 05.06.2024, Nantes, Frankreich

Leibniz-Kolloquium: Functional Nanocomposites
zu Ehren von Dr. Petra Pötschke
06.06.2024, Dresden

26th International Conference on Science and Technology of Synthetic Electronic Materials
23. – 28.07.2024, Dresden

38th Conference of European Colloid & Interface Society (ECIS)
01. – 06.09.2024, Kopenhagen, Dänemark

Summer School Advanced Materials Dresden
10. – 11.09.2024, Dresden

GDCh MAKRO: Polymers for a Sustainable Future
Biennial Meeting of the Macromolecular Division of the GDCh
16. – 18.09.2024, Dresden

52nd Biennial Assembly of the German Colloid Society
30.09. – 02.10.2024, Dresden

Workshop "Life-Inspired Functional Assembly"
01. – 02.10.2024, Dresden

29. NDVaK: Beschichtung, Modifizierung und Charakterisierung von Polymeroberflächen
06. – 07.11.2024, Dresden

Thermoplastic Elastomers World Summit
19. – 20.11.2024, Wien, Österreich

Kolloquium Tumor Tissue Engineering
03.12.2024, Dresden

KOLLOQUIEN LECTURES

Dr. Mrityunjoy Kar
Max Planck Institute of Molecular Cell Biology and Genetics, Dresden
RNA-binding proteins form nano-to-mesoscale assemblies prior to phase separation
10.01.2024

Dr. Sarathal Koyiloth Vayalil
Deutsches Elektronen-Synchrotron (DESY), Hamburg
Growth analysis of metallic thin films on potential templates: An in situ micro-GISAXS study
15.01.2024

Prof. Dr. Andreas Menzel
Otto-Von-Guericke Universität, Magdeburg
Different scenarios of individual and collective motion of selfdriven objects
16.02.2024

Prof. Dr. Nico Bruns
Technische Universität Darmstadt
Force-responsive polymersome nanoreactors
23.02.2024

Prof. Dr. Kathrin Harre
Hochschule für Technik und Wirtschaft, Dresden
Turning waste into value: Gelatine for sensors instead of Jelly
19.03.2024

Prof. Dr. Jae-Won Choi
The University of Akron, USA
Artificial sense of touch realized by additive manufacturing: Processes, materials, and applications
22.03.2024

Prof. Dr. Andreas Schrell
Gleiss Große Schrell und Partner mbB, Stuttgart
From the bench into the patent
27.03.2024

Anna Mora-Boza
Georgia Institute of Technology, Atlanta, USA
Engineering in vitro microphysiological systems with synthetic polymers
24.04.2024

Prof. Dr. Laura Bray
Queensland University of Technology, Brisbane, Australien
Tissue engineered 3D cell culture approaches for cancer research
03.05.2024

Prof. Paul Mulvaney
University of Melbourne, ARC Centre of Excellence in Exciton Science, School of Chemistry, Australien
Spectroscopy of gold nanocrystals and quantum dots
14.05.2024

Prof. Dr. Guiseppe Battaglia
Institute for Bioengineering of Catalonia, Barcelona, Spanien
Principles and applications of supramolecular drug design
17.05.2024

Dr. Peter Sherrell
RMIT University, School of Science, Melbourne, Australien
Harnessing motion via polymers: from ferroelectricity to electrostatics
21.05.2024

Prof. Dr. Frieder Mugele
University of Twente, Physics of Complex Fluids, MESA + Institute for Nanotechnology, Enschede, Niederlande
Adaptive Wetting: Surface ordering-induced wetting transition and vaporcontrolled drop transport on thermos-responsive oleophilic polymer brushes
22.05.2024

Prof. Dr. Amy Lynn Oldenburg
University of North Carolina at Chapel Hill, USA
Study of soft biomaterials via diffusive gold nanorod probes inoptical coherence tomography
28.05.2024

Prof. Dr. Emiliano Cortés
Ludwig-Maximilians-Universität München
Designing plasmonic photocatalysts
27.06.2024

Dr. Dana Cialla-May
Leibniz-Institut für Photonische Technologien, Jena
Surface enhanced Raman spectroscopy (SERS) detection of antibiotics and metabolites in complex biological matrices
03.07.2024

Prof. Dr. Nikhil Singha
Rubber Technology Centre, Indian Institute of Technology Kharagpur, Indien
Dynamic Covalent Network in Polymer Materials: Design and Applications
10.07.2024

Prof. Dr. Stephan Reitzenstein
Institute of Solid State Physics, Technische Universität Berlin
Single-quantum-dot devices for photonic quantum technologies: Design, deterministic nanofabrication, and application perspectives
11.07.2024

Prof. Dr. Jakson Vassoler
Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brasilien
Numerical and experimental characterization approaches for biological tissues
29.08.2024

Prof. Dr. Behnam Akhavan
University of Newcastle, Newcastle, Australien
Plasma-engineered biomimetic interfaces for next-generation implantable medical devices
30.08.2024

Prof. Dr. Arash Nikoubashman
Leibniz-Institut für Polymerforschung Dresden
Watching paint dry- structure formation in drying colloidal dispersions
11.09.2024

Prof. Dr. Lukas Zeininger
Max-Planck-Institut für Kolloid- und Grenzflächenforschung, Potsdam
Self-regulating complex droplets as nano-to-macro messenger colloids
11.09.2024

Prof. Dr. Michael Engel
Friedrich-Alexander-Universität Erlangen-Nürnberg
Structural complexity in colloidal self-assembly
12.09.2024

Prof. Dr. Robin Klupp Taylor
Friedrich-Alexander-Universität Erlangen-Nürnberg
Scalable synthesis and multidimensional characterization of plasmonic patchy nanoparticles
12.09.2024

Prof. Dr. Reinhard Miller
Institut für Physik Kondensierter Materie, Technische Universität Darmstadt
Adsorption of surfactants at the aqueous solution interface to air, alkane vapor and liquid alkane
12.09.2024

Dr. Florian Schulz
Universität Hamburg
Thin film plasmonic supercrystals as new optical materials
13.09.2024

Prof. Dr. Markus Retsch
Universität Bayreuth
Functional disorder: How to make colloidal glasses and what they are good for
13.09.2024

Prof. Dr. Stefan Weber
Universität Stuttgart
The nanoscale photovoltaics laboratory on a tip
17.09.2024

Prof. Dr. Christiano Monteiro de Barros Cordeiro
Campinas State University, Sao Paolo, Brasilien
Overview of the specialty optical fibers & optical sensors laboratory
17.09.2024

Dr. Arthur Chen
National Taiwan University of Science and Technology, Taipei City, Taiwan
Advanced injection molding with mixing screw for degradable bio-implants with PLA/BG composites
08.10.2024

Prof. Dr. Sebastian Aland
Hochschule für Technik und Wirtschaft, Dresden
Multiphase numerical simulation: Exploring droplets, shells and biomembranes
08.10.2024

Dr. Christian Schäfer
Chalmers University of Technology, Göteborg, Schweden
Polaritonics for enantiomer-selective control and enhanced plasmonic catalysis
17.10.2024

Prof. Dr. Ulrich Rant
Kurt-Schwabe-Institut Meinsberg
Biomolecular Interaction Analysis- From small molecules to cells
22.10.2024

Prof. Dr. Rogério José Marczak
Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brasilien
Topology optimization of anisotropic problems using boundary integral equations
05.11.2024

Prof. Dr. Raimundo Nogueira da Costa Filho
Federal University of Ceará, Fortaleza, Brasilien
Exploring graphene properties through the position dependent operator formalism
11.11.2024

Jun. Prof. Dr. Linus Stegbauer
Technische Universität Bergakademie Freiberg
Photomodulation of the mechanical properties of chitosan-based thin films modified with an azobenzene-derivative
28.11.2024

Prof. Cesar Liberato Petzhold
Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brasilien
From glycerol and vegetable polyols towards new renewable materials
29.11.2024

M. Sc. Yahya Asl Soleimani
Technische Universität Dresden
The temporal electric response of organic electrochemical transistors
13.12.2024

Dr. Jonas Schubert
DermaPurge GmbH, c/o Leibniz-Institut für Polymerforschung Dresden
Forschungstransfer: Vom Unfall zur Produktpalette. Die Erfahrungen von DermaPurge mit Gründung, Förderung und mehr
13.12.2024

Ph.D. Oleksandr Dolynchuk
Experimental Polymer Physics, Martin Luther University Halle-Wittenberg
Interface-induced crystallization in polymers: From model systems to functional conjugated polymers
13.12.2024

M. Sc. Hazem Ali
University of Luxemburg, Luxemburg
Investigating the stability of perovskite absorbers as a function of halide ratio for potential space application
13.12.2024

M. Sc. Appanna Parvangada Pemmaiah
Center for Hybrid Nanostructures, Universität Hamburg
Magnetotransport and ESR studies on Sn contacted MoS2
13.12.2024

Prof. Dr. Stephan Link
University of Illinois Urbana-Champaign, USA
Insights from single particle spectroscopy of plasmonic nanostructures
19.12.2024

Prof. Dr. Christy F. Landes
University of Illinois Urbana-Champaign, USA
Electrochemical modulation of energy transfer in plasmonic-polymer hybrid nanomaterials
19.12.2024

MESSEAUFTRITTE TRADE FAIR PRESENTATIONS

JEC, Paris
05. – 07.03.2024

VERANSTALTUNGEN FÜR DIE ALLGEMEINE ÖFFENTLICHKEIT
EVENTS FOR THE GENERAL PUBLIC

SPIN2030 Wissenschaftsfestival
08. – 09.03.2024
Vorstellung des Forschungsprojekts „ResCure“ im Rahmen des Formats „Meet a Scientist“
Präsentation eines optimierten Leichtbau-Clinchwerkzeugs als interaktives Exponat
ca. 8.000 Teilnehmer

Gastmahl: Dresden is(s)t bunt
09.09.2024
Kulinarische Beiträge, wissenschaftliches Experiment und „Meet a Scientist“

Lehrtätigkeit Teaching

PROFESSUREN PROFESSORSHIPS

Technische Universität Dresden

Bereich Mathematik und Naturwissenschaften, Fakultät Chemie und Lebensmittelchemie

- **Prof. Dr. Brigitte Voit**
  Professur für Organische Chemie der Polymere
- **Prof. Dr. Andreas Fery**
  Professur für Physikalische Chemie Polymerer Materialien
- **Prof. Dr. Carsten Werner**
  Professur für Biofunktionelle Polymermaterialien

Bereich Mathematik und Naturwissenschaften, Fakultät Physik

- **Prof. Dr. Jens-Uwe Sommer**
  Professur für Theorie der Polymere
- **Prof. Dr. Arash Nikoubashman**
  Professur für Theorie biologisch inspirierter Polymere

Bereich Bau und Umwelt, Fakultät Bauingenieurwesen

- **Prof. Dr.-Ing. Christina Scheffler**
  Professur für Polymere im Bauwesen

Bereich Ingenieurwissenschaften, Fakultät Maschinenwesen

- **Prof. Dr.-Ing. Markus Stommel**
  Professur für Polymerwerkstoffe
- **Prof. Dr.-Ing. Sven Wießner**
  Professur für Elastomere Werkstoffe

Bereich Bau und Umwelt, Fakultät Bauingenieurwesen

- **Prof. Dr.-Ing. Christina Scheffler**
  Professur für Polymere im Bauwesen

Medizinische Fakultät Carl Gustav Carus Zentrum für Regenerative Therapien Dresden

- **Prof. Dr. Carsten Werner**
  Professur für Biofunktionelle Polymermaterialien

Medizinische Fakultät Carl Gustav Carus Else Kröner Fresenius Zentrum für Digitale Gesundheit

- **Prof. Dr. Ivan R. Minev**
  Professur für Electronic Tissue Technologies

ANDERE EINRICHTUNGEN OTHER INSTITUTIONS

Hochschule für Technik und Wirtschaft Dresden

Fakultät Design
- **Prof. Dr.-Ing. Axel Spickenheuer**
  Honorarprofessur für Werkstoffe und Simulationstechnik

Otto-von-Guericke-Universität Magdeburg

Fakultät für Verfahrens- und Systemtechnik
- **Prof. Dr. Julian Thiele**
  Leiter des Lehrstuhls für Organische Chemie

Monash University, Australien

Department Chemical and Biological Engineering
- **Prof. Dr. Daniela Lössner**
  Professor of Chemical and Biological Engineering

Stellenbosch University, Südafrika

Department of Chemistry and Polymer Science
- **Prof. Dr. Albena Lederer**
  SASOL Chair in Analytical Polymer Science
- **Dr.-Ing. Ines Kühnert**
  Gastvorlesungen zu Special Topics in Polymer Science

Technische Universität Hamburg

Head of Functional Electronic Materials Group (FEM)
- **Prof. Dr. Franziska Lissel**
  Professor of Applied Polymer Physics

WEITERE LEHRAUFTRÄGE FURTHER TEACHING ASSIGNMENTS

Technische Universität Dresden

Bereich Mathematik und Naturwissenschaften

- **PD Dr. Tobias A. F. König** – TUD Young Investigator an der Fakultät Chemie und Lebensmittelchemie sowie Privatdozentur im Gebiet Physikalische Chemie
- **Dr. Elisha M. Krieg** – TUD Young Investigator an der Fakultät Chemie und Lebensmittelchemie
- **Dr. Christian Roßner** – TUD Young Investigator an der Fakultät Chemie und Lebensmittelchemie
- **Dr. Abhinav Sharma** – TUD Young Investigator an der Fakultät Physik
- **PD Dr. Martin Müller** – Privatdozentur im Gebiet Makromolekulare Chemie
- **Dr. Quinn A. Besford** – Privatdozentur im Gebiet Biofunktionelle Polymermaterialien und Physikalische Chemie Polymerer Materialien

Bereich Ingenieurwissenschaften

- **PD Dr. Marina Grenzer** – Privatdozentur für Rheologie komplexer Fluide
- **Dr.-Ing. Ines Kühnert** – Lehrauftrag in der Fakultät Maschinenwesen
- **Dr. Andreas Leuteritz** – Lehrauftrag in der Fakultät Maschinenwesen
- **Dr. Amit Das** – Lehrauftrag an der Fakultät Maschinenwesen

Bereich Ingenieurwissenschaften, fakultätenübergreifend
Graduiertenkolleg 2430 „Interaktive Faser-Elastomer-Verbunde“

- **PD Dr. Marina Grenzer**
- **Prof. Dr.-Ing. Sven Wießner**

Graduiertenkolleg 2767 “Supracolloidal Structures”

- **Prof. Dr. Andreas Fery**
- **Prof. Dr. Brigitte Voit**
- **Dr. Franziska Lissel**
- **Dr. Hendrik Schlicke**

Graduiertenkolleg 2250 „Impaktsicherheit von Baukonstruktionen durch mineralisch gebundene Komposite“

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- **Dr.-Ing. Ines Kühnert** – Lehraufträge „Verarbeitungsbedingte Materialstrukturen“ und „Aufbau und Materialverhalten der Kunststoffe“

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- **Prof. Dr.-Ing. Christina Scheffler** – Gastvorlesung zu Verstärkungsfasern und Faser-Matrix-Grenzschichten

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- **Dr. Christian Roßner** – Assistant Professor of Macromolecular Chemistry

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- **Prof. Dr.-Ing. Axel Spickenheuer** – Gastvorlesung zu Leichtbautechnologien: TFP / Preforming / Anwendungen

Technische Universität Dresden

- **Prof. Dr.-Ing. Axel Spickenheuer** – Ringvorlesung FLiK-Modul Bionik: Limits of Bio-inspired Design