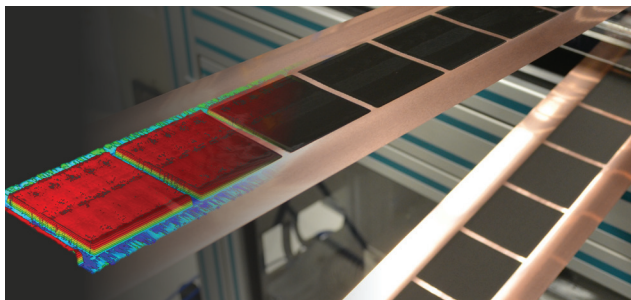


## 12<sup>th</sup> Short Course Coating and Drying of Thin Films

3(+2)-day short course on fundamentals and applications with virtual workshop from the coating and printing lab



## 5<sup>th</sup> Thin Film Technology Forum Advances in Battery & Fuel Cell Electrode Processing & Smart Coatings

2-day forum on June 24-25, where renowned scientists will present and discuss recent research results and new trends in industry and academia



**June 21-25, 2021**

### Virtual Venue

Organization: Prof. Dr.-Ing. Dr. h. c. Wilhelm Schabel  
Dr.-Ing. Philip Scharfer  
with 34 experts from industry and academia

Organized by Gesellschaft für Chemische Technik  
und Biotechnologie e.V.

  
supported by DECHEMA

## Program Short Course and Forum

42 contributions from 36 speakers (21 invited external)

### Schedule 21.06.2021 – Short Course Monday

- 08:00** *Registration and virtual check-in*
- 08:30** *Welcome and introduction*  
Prof. Dr.-Ing. W. Schabel / Dr.-Ing. P. Scharfer (KIT)
- 09:15** *Coating and printing fluids characterization*  
Dipl.-Ing. Gilbert Gugler (iPrint, CH)
- 10:30** *Coffee break*
- 11:00** *Rheology of coating fluids*  
Prof. Dr. Norbert Willenbacher (KIT)
- 12:00** *Introduction to premetered coating methods*  
Dr. Peter Schweizer (Schweizer Coating Consulting, CH)
- 13:00** *Lunch break*
- 14:00** *Special issues on curtain and slide coating*  
Dr. Peter Schweizer (Schweizer Coating Consulting, CH)
- 15:30** *Coffee break*
- 16:00** *Fluid flow in coating tools*  
Prof. Dr. Dr. h. c. mult. Franz Durst (FMP)
- 17:00** *High-speed coating and extended coating window*  
Dipl.-Ing. Ralf Diehm / Sandro Spiegel M. Sc. (KIT)

### Schedule 22.06.2021 – Short Course Tuesday

- 08:30** *Knife and blade coating*  
Prof. Dr. Hadj Benkreira (University of Bradford, UK)
- 09:15** *Gravure and roll coating*  
Prof. Dr. Hadj Benkreira (University of Bradford, UK)
- 10:00** *Coffee break*
- 10:30** *Industrial perspectives on curtain & slot die coating*  
Dipl.-Ing. Harald Döll (TSE, CH)
- 11:00** *Coating of thin films in industrial environment*  
Dr. Robert Beer (Polytype Converting AG, CH)
- 11:30** *Fundamentals of film drying technology*  
Prof. Dr.-Ing. Wilhelm Schabel (KIT)
- 13:00** *Lunch break*
- 14:00** *Film drying phenomena and drying studies*  
Prof. Dr.-Ing. Wilhelm Schabel (KIT)
- 15:10** *Coffee break*
- 15:40** *Drying of multicomponent mixtures*  
Dr.-Ing. Philip Scharfer (KIT)
- 16:00** *Drying of particulate coatings and crack formation*  
Dr. Alex Routh (Cambridge, UK)

### Schedule 23.06.2021 – Short Course Wednesday

- 08:30** *Sorption equilibrium in polymeric and porous films*  
Thilo Heckmann M. Sc., Nadine Zimmerer M. Sc. (KIT)
- 09:00** *Simulation & design of industrial thin film dryers*  
Dr.-Ing. Philip Scharfer (KIT)
- 10:30** *Coffee break*
- 11:00** *Homogeneous drying with comb nozzles*  
Dipl.-Ing. Philipp Cavadini (CN Drying Technology UG)
- 11:25** *Coating, drying and web handling apps*  
Prof. Dr. Steven Abbott (TCNF, UK)
- 13:00** *Lunch break*
- 14:00** *Live streaming of experimental workshop at the TFT coating and printing laboratory*  
- Rheology & wetting  
- Pilot-scale coating trials  
- Heat and mass transfer coefficients  
- Experimental drying curves

### Schedule 24.06.2021 – Short Course & Forum Thursday

- 09:00** *Welcome and introduction to TFT Forum*  
Prof. Dr.-Ing. W. Schabel / Dr.-Ing. P. Scharfer
- 09:10** *Welcome and Introduction to KIT*  
Prof. h.c. Dr. Joachim Knebel (KIT)  
Head of Division 3 (Mechanical & Electrical Engineering)
- 09:20** *Industrial production of lithium-ion battery cells*  
Dr.-Ing. Bastian Westphal (Volkswagen AG)
- 09:50** *Simulation approaches in mixing of battery slurries*  
Prof. Dr.-Ing. habil. Hermann Nirschl (KIT)
- 10:20** *Model-based design of electrodes for Li-ion and all-solid-state batteries*  
Prof. Dr.-Ing. Ulrike Krewer (KIT)
- 10:50** *Coffee break with exhibition*
- 11:20** *Production challenges for fuel cell technologies*  
Dr.-Ing. Helmut Rauner (cellcentric)
- 11:50** *Processing and characterization of porous gas-diffusion electrodes for electrochemical processes*  
Prof. Dr.-Ing. Thomas Turek (TU Clausthal)
- 12:20** *Lunch break*
- 13:20** *Solution-processed functional films in chem. industry*  
Prof. Dr.-Ing. Frank Kleine Jäger (BASF SE)
- 13:50** *Jet wiping: from modelling to experimental and numerical simulation*  
Prof. Dr. Jean-Marie Buchlin (von Karman Institute, BEL)
- 14:20** *Formation of crack networks in coatings*  
Prof. Dr. Ludovic Pauchard (Univ. Paris, FR)

**14:50** Coffee break with exhibition

**15:20** Marangoni-induced flow fields in drying films and printed structures  
Prof. Dr.-Ing. W. Schabel / Dipl.-Ing. M. Tönsmann (KIT)

**15:50** Interdiffusion of polymer multilayers during drying  
Lisa Merklein M. Sc. (KIT)

**16:15** Drying of polymer composites  
Victor Gracia M. Eng. (KIT)

**16:25** Coffee break with exhibition

**16:35** Coated membranes for fuel cell applications  
Philipp Quarz M. Sc. / Nadine Zimmerer M. Sc. (KIT)

**16:45** Coating and drying of perovskite thin-film solar cells  
Simon Ternes M. Sc. (KIT)

**16:55** New coating and drying concepts for format and material flexible battery electrode production  
Jonas Mohacs M. Sc. (KIT)

#### Schedule 25.06.2021 – Short Course & Forum Friday

**09:00** Advances in processing and recycling of battery cells  
Prof. Dr.-Ing. Arno Kwade (TU Braunschweig)

**09:30** A research factory for battery cell production – developing a suitable infrastructure  
Prof. Dr. Jens Tübke (Fraunhofer ICT, KIT)

**10:00** AgiloBat: Flexible production of battery cells  
Prof. Dr.-Ing. Jürgen Fleischer (KIT)

**10:30** Coffee break with exhibition

**11:00** Simultaneous double-sided coating of LiB electrodes  
Sandro Spiegel M. Sc. (KIT)

**11:20** Flex Die high speed intermittend coating  
Dipl.-Ing. Ralf Diehm

**11:40** Advances in drying of multilayer LiB electrodes  
Jana Kumberg M. Sc., Kevin Ly M. Sc. (KIT)

**12:00** Coffee break with exhibition

**12:30** Influence of particle properties on battery electrode processing  
Julian Klemens M. Sc. (KIT)

**12:45** Radiation-based drying of battery electrodes  
Andreas Altvater M. Sc. (KIT)

**13:00** Integrated process chain simulation for LiB electrodes  
Thilo Heckmann M. Sc. (KIT)

**13:20** TFT Forum closing session



#### Registration fees Short Course and TFT Forum

|                                   | Early Bird (until 15.05.21) | later    |
|-----------------------------------|-----------------------------|----------|
| Short Course & TFT Forum*         |                             |          |
| General                           | € 1500.–                    | € 1650.– |
| GVT discount                      | € 1450.–                    | € 1600.– |
| Exhibition booth (5 days)         | € 500.–                     |          |
| TFT Forum only                    |                             |          |
| General                           | € 200.–                     |          |
| Exhibition booth (2 days @ Forum) | € 300.–                     |          |

#### Registration

Anna-Maria Hipp: [gvt-hochschulkurse@gvt.org](mailto:gvt-hochschulkurse@gvt.org)

Phone: +49 69 7564-118

\*Note: The TFT Forum is already included in the Short Course registration. A participation only for the TFT Forum can be registered separately.

#### Payment

According to §4 Nr. 22a UStG the registration fee is purchase tax free. Registration fees include a short course file as .pdf with documentation of lectures and workshop. A participation certificate will be distributed.

#### Venue

The short course takes place online and moves to a virtual venue. The virtual venue provides opportunities for networking, live discussions as well as valuable breakout sessions. After registration, all "login details" of the virtual venue provider for the Short Course and the TFT Forum will be provided via email.

#### Contact

Short course organization:

Thilo Heckmann M. Sc.: [thilo.heckmann@kit.edu](mailto:thilo.heckmann@kit.edu)

Office TFT: [margit.morvay@kit.edu](mailto:margit.morvay@kit.edu)

#### Who has been attending last Short Course

Participants from Germany and **more than 12 EU countries, the US, China, Korea, Taiwan, Japan and others (85 % from industry / average value of the last 12 years)**

#### Further information and registration

<http://www.thin-film-technology.de>

<http://www.gvt.org/Hochschulkurse.html>



#### Feedback about the last TFT courses

- "Excellent introduction in coating and drying of films. Demonstrates the complexity, offers better understanding of processes."
- "Very interesting course, lots of information on all coating application! Building bridge from university to industrial applications."
- "Well built-up structure, wide range of theory and application covered, too short time for discussion/break."
- "High level talks with broad range of topics but with good scientific and practical depth, also on application."
- "Good structure."

#### Feedback workshop

- "Good to see how the theory of the courses works in real life"
- "Experiments were very well prepared and perfectly organized"
- "Interesting, well organized"
- "Good coverage of application of topics covered in course"
- "Interesting material analysis; nice discussions"

#### Feedback Coating International



<http://coating.ch/thin-film-technology-forum-review/>



## Introduction

The short course **Coating and Drying of Thin Films** addresses engineers, scientists and technicians working in the areas of coatings, functional films, direct printing, inkjet printing, sensors, adhesives, paints, automotive coatings, patches, optical foils, tapes, diagnostics, membranes, printed electronics, fuel cells and battery coatings, who intend to get insight into more fundamental aspects with industrial applications or to deepen their expertise. Leading national and international scientists and experts from academia and industry will report on topics of coating technologies, rheology, preparation of coating fluids and about fundamentals and industrial aspects of drying technology. Coating and printing processes and drying technology are explained interactively by easily accessible examples and in a **practical workshop in the TFT Coating and Printing Lab** instructed (virtually) by TFT staff members (see photos below).

The **5<sup>th</sup> Thin Film Technology Forum** will take place on the last two days, where renowned scientists will present and discuss new trends in industry and academia with a focus on **advances in Battery & Fuel Cell Electrode Processing & Smart Coatings**.

The **Short Course** and the **TFT Forum** provide a platform for scientific and technical exchange with advanced learning.



**Prof. Dr.-Ing. Dr. h. c. Wilhelm Schabel (KIT)** graduated from the Institute of Thermal Process Engineering in Karlsruhe with a doctor thesis about film drying in 2004, which was honored with the Carl Freudenberg Award from University Karlsruhe (TH) in 2005. His further academic contributions were honored with the Arnold-Eucken Award (2007) and the L. E. Scriven Young Investigator Award in 2008 in the US by the International Society of Coating Science and Technology. 2007, he started working in the R&D department at Lonza Foils (LOFO) in Basel and 2009 he was appointed to a first Professorship in Thin Film Technology in Germany initiated and funded by KIT and a company consortium of BASF, BAYER and ROCHE. In 2012, the Technical University of Jast was granted him with a doctor honoris causa and in 2015 he refused a full professorship offer to Technical University of Dresden. Since 2009, members of the TFT group were honored in total with 29 different national and international research awards for best posters, best papers, best talks or best thesis works in various related fields of Thin Film Technologies. Since 2018, Prof. Schabel is Vice President of the European Coating Society and in 2020, he was granted with a Fellowship from the Edwards Center of Soft Matter of the University of Cambridge. Prof. Schabel is a leading expert in Thin Film drying and processing technologies with 140 Scopus listed publications in these fields.



**Dr.-Ing. Philip Scharfer (KIT)** is head of the TFT group at KIT together with Prof. Schabel. He received his PhD in process engineering from the University of Karlsruhe (TH) in 2009. Dr. Scharfer is an expert in the fields of drying and thermodynamics of thin films. He deals with measuring methods for the investigation of polymer film drying and develops numerical simulation tools for industrial dryer applications. Since 2009, Dr. Scharfer is member of the scientific committee of the European Coating Symposium (ECS), since 2012 member of the Board of Directors of the International Society of Coating Science and Technology (ISCST). In 2014, he was awarded with the L. E. Scriven Young Investigator Award by the ISCST. Dr. Scharfer is former Vice President Europe of the ISCST and organized ECS 2009 in Karlsruhe and ECS 2019 in Heidelberg as Chairman together with Prof. Schabel.



**Dipl.-Ing. ETH Gilbert Gugler (iPrint, CH)** received his diploma in material science from the ETH Zurich in 1992. From 1992 to 1998 he worked in the area of chemical and physical vapour deposition. From 1998 on, he worked at Ilford Imaging Switzerland GmbH. Leading the Technology Center of Wifag-Polytype Technologies AG since 2014 he was responsible for all coating and process related topics. End of 2016 he joined the university of applied science and arts of Western Switzerland as deputy managing director of the iPrint institute. Gilbert Gugler is an expert in multilayer curtain coating technology, starting from the preparation of coating fluids, characterization, processing, to the multilayer curtain coating and drying. Since 2017, he is heading his own company called Gugler Coatech Consulting.



**Prof. Dr. Norbert Willenbacher (KIT)** is head of the Institute of Mechanical Process Engineering and Mechanics at Karlsruhe Institute of Technology (KIT) since 2004. He received his diploma degree in Physics and his PhD from the University of Mainz. After his dissertation at the Max-Planck-Institute for Polymer Research he joined BASF SE as a research associate in the fields of rheology of complex fluids and adhesion of soft polymers for 15 years. Prof. Willenbacher is president of the German Society of Rheology, assigned member of the ProcessNet Technical Committee on Rheology, and member of the Editorial Board of *Rheologica Acta*.



**Dr. Peter M. Schweizer (Schweizer Coating Consulting, CH)** received his PhD in Mechanical Engineering from the Swiss Federal Institute of Technology in 1979, and he did postdoctoral research in coating flows at the University of Minnesota with Prof. Scriven from 1979 – 1980. From 1981 – 1986, Dr. Schweizer worked in the Coating Flow Research Group at Kodak in Rochester, New York, and from 1987 – 1996, he worked at ILFORD in Fribourg, Switzerland. From 1997 – 2000, Dr. Schweizer was Managing Director of TSE Troller Schweizer Engineering in Switzerland. From 2001 - 2016, he worked for Polytype Converting in Fribourg, Switzerland. Since 2016, he is heading his own company called Schweizer Coating Consulting GmbH.



**Prof. Dr. Dr. h. c. mult. Franz Durst (FMP TECHNOLOGY GMBH)** graduated from Imperial College at the London University and received his doctor's degree in 1972 (PhD). In 1972, he returned to Germany and worked as subproject leader of various research projects at the Collaborative Research Center 80 at the University of Karlsruhe for ten years. Prof. Durst was offered a C3 professorship for Fluid Mechanics at the University of Karlsruhe in 1978 and was appointed chair of the Institute of Fluid Mechanics at the University of Erlangen-Nuremberg in 1982. In 2006, Prof. Durst retired from the University of Erlangen-Nuremberg and founded the company FMP TECHNOLOGY GMBH, whose CEO he has been until 13 August 2018. He is now still one of the two shareholders of the company.



**Prof. Dr. Hadj Benkreira (Univ. of Bradford, UK)** (B. Eng., M. Sc. Chemical Engineering) obtained his PhD on the Fluid Mechanics of Coating Flows in 1980 under the supervision of Professor WL Wilkinson (CBE, FRS). Following five years of EPSRC postdoctoral research, he joined the academic staff of the University of Bradford in 1985 and was endowed a Personal Research Chair in 1998 for research in Thin Film Coating and in Polymer Processing and became in 2004-2009 Associate Dean for Research. Professor Benkreira is member of several learned societies including the UK EPSRC Peer Review College, the ISCST of which he was the Vice President in 2006-8 and the European Coating Symposia steering committee. He has published widely on coating science and technology and is the editor of the Special Issues of the ISCST conferences.



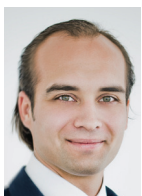
**Dipl.-Ing. Harald Döll (TSE Troller AG, CH)** successfully graduated from the Technical University in Darmstadt in Mechanical Engineering in 1989. After some year in web-guiding systems Harald Döll joined TSE Troller AG in 1997. In the beginning, he was the head of the engineering team; since 2008, he is in charge of the entire application technology. Design of die internals, experiments with customers, start-ups and technical customer support are part of his assignment. Furthermore, he is giving talks at several short courses and international conferences in the US, Europe and Asia.



**Dr. Robert Beer (Polytype Converting AG, CH)** completed his PhD in physical chemistry in 1988 at the University of Berne. After a postdoctoral stay at the Loughborough University of Technology, he returned to the University of Berne continuing the studies in photophysics and photochemistry as scientific assistant. From 1992 to 2014 he was working at Ilford Imaging GmbH in Switzerland, starting in R&D. From 2006 he moved to the process technology department, engaging himself in the curtain coating technology and production scale up. After 2014, Robert Beer increased his competence in coating technology at Polytype Converting AG and since 2016 he is co-heading the Technical Center.



**Prof. Dr. Alex Routh (Cambridge University, UK)** received his PhD from Princeton University in the US in 2000. He has been lecturing in Chemical Engineering at the University of Cambridge since 2006 and was promoted to full professor in 2017. His position is a joint appointment with the BP Institute for Multi-Phase Flow; a multi-disciplinary research institute within the University, spanning the physical sciences. His research is in the field of colloid science and Prof Routh has worked in the areas of encapsulation, dispersion stability, formulation and drying. Within the film drying topic, he has been active for the past 15 years and has published extensively in the specifics of film cracking and the flows within thin films.



**Dipl.-Ing. Philipp Cavadini (CN Drying Technology GmbH)** graduated in Aerospace Engineering at the University of Stuttgart. In his PhD studies at KIT/TFT until 2015 he investigated surface tension driven convection and the optimisation of impinging jet systems from the viewpoint of homogeneity of the distribution of the heat and mass transfer coefficient. Currently Mr. Cavadini works on cooling technologies in the department of "Methods and Technology" at Siemens Energy. In secondary employment, he is working on the spin-off creation "CN Drying Technology GmbH", developing highly homogeneous combustion dryers for lab application.



**Prof. Dr. Steven Abbott (TCNF, UK)** received his Oxford PhD in Chemistry from Harvard University in 1978 and was postdoc in the Nobel Prize winning lab of Prof. J.-M. Lehn in Strasbourg before working for ICI where he was Senior Manager before joining the high-tech coating company Autotype near Oxford as Research Director. He worked closely with coating experts at U. Leeds (appointed Visiting Professor in 2000) and co-created the TopCoat and TopWeb programs for the coating industry. He now teaches, consults and troubleshoots around the world on coating, solubility, surfactant and adhesion science, using his own apps and software to bring science to life.

#### Additional speakers at the 5<sup>th</sup> TFT Forum on June 24-25



**Dr.-Ing. Bastian Westphal (Volkswagen AG)** graduated as a process engineer in 2010 at the TU Braunschweig majoring in process development for lithium-ion battery production. In 2017 he received his PhD after working as a research associate at the Battery LabFactory Braunschweig. His research focused on structural changes in the coating of lithium-ion batteries during drying and the development of multilayer coatings to overcome transport limitations along the cross-section of the electrode coating. During his PhD he co-founded a company to develop an economical recycling process for lithium-ion batteries. In 2017 he joined the Volkswagen Center of Excellence for Battery Cells as process developer responsible for the coating and drying process.



**Prof. Dr.-Ing. habil. Hermann Nirschl (KIT)** received his Ph.D. in Fluid Mechanics from the Technical University of Munich in 1994. For his Habilitation in 1997 he worked on the numerical simulation of the particle laden flows. He joined the 3M company in the dental division as the head of process engineering in the years between 1997 and 2002 where he worked as a project manager for different projects in Munich and St. Paul/Minnesota. Since 2003 he is Professor for Mechanical Process Engineering at the KIT in Karlsruhe. The focus of the research is on particle technology with a special emphasis on separation processes, numerical simulations and the development of particle analysis technologies.



**Prof. Dr.-Ing. Ulrike Krewer (KIT)** is full Professor for Electrochemical Energy Conversion and Storage. She has 18 years experience in model-assisted analysis and design of electrochemical systems from surface to system level and dynamic characterisation methods. Starting with fuel cells during her PhD studies at MPI Magdeburg and 2 years industrial research in South Korea (Samsung), she extended her research area to batteries as group leader and Juniorprof. at Magdeburg. From 2012 to 2020 she was full Professor at TU Braunschweig and board member of the Battery LabFactory Braunschweig. A focus of her work is model-assisted analysis of processes in and design of electrodes.



**Dr.-Ing. Helmut Rauner (cellcentric GmbH & Co. KG)** received his doctoral degree in mechanical engineering from the technical university of Munich (TUM) in 2001, where he also led the research network of material science. He started his career at Daimler AG in 1999 as process development engineer for testing procedures. From 2001 to 2008, he worked in various leading positions in the combustion engine production and manufacturing engineering. In 2008, he transitioned to renewable automotive technologies, where he started with manufacturing engineering for battery cell, battery, e-drive and fuel cell production. In 2011, he concentrated on process development, manufacturing engineering and production for fuel cells. Dr.-Ing. Rauner is an expert in fuel cell technologies, focusing on production chain development.



**Prof. Dr.-Ing. Thomas Turek (TU Clausthal)** received his doctoral degree in chemical process engineering from Karlsruhe University in 1992, where he also completed his habilitation in early 2000. From 2000 to 2004 he worked as a process engineer and group leader at Bayer AG and Bayer Technology Services GmbH. At the end of 2004 he joined Clausthal University of Technology as a professor and head of the Institute of Chemical and Electrochemical Process Engineering. Prof. Turek is an expert in reaction engineering focusing on heterogeneous catalysts and gas-diffusion electrodes for electrolysis and battery applications.



**Prof. Dr.-Ing. Frank Kleine Jäger (BASF SE)** is currently Vice President and Head of Solids Formulation and Handling Group at BASF SE in Ludwigshafen. In this role, he manages the global R&D activities in this field of Solids and Film Processing ranging from development of new process technologies and optimization to trouble shooting and debottlenecking in BASF's global production plants. He is Chemical Engineer with Diploma and PhD degrees from RWTH Aachen. He also received his Habilitation from RWTH Aachen in 2004. Since 2011 he holds a Professorship as apl. Prof. Dr.-Ing. at RWTH Aachen.



**Prof. Dr. Jean-Marie Buchlin (von Karman Institute, BEL)** has been graduated from the engineering school ISIN (Nancy, France, 1971). He obtained the von Karman Institute (VKI) diploma with the AIAA prize in 1972 and received his PhD in Applied Sciences at the Université Libre de Bruxelles (1978). He is Full-Professor at the VKI where he has been head of the EA department from 2009 to October 2018. He has also been Professor at the Université Libre de Bruxelles from 1992 to 2013 where he is currently invited Professor. He serves as expert in the fields of heat transfer, multiphase flows, safety processes, pollutant dispersion in unconfined and confined areas and liquid film coating techniques. He is member of scientific international association boards and regular reviewer of High Impact Factor Scientific Archival Journals.





**Prof. Dr. Ludovic Pauchard (University Paris-Saclay, France)** completed his PhD in Laboratoire de Physique Statistique (Ecole Normale Supérieure, Paris) in 1997. He has been a researcher in CNRS (French National Centre for Scientific Research) at the University Paris-South since 1999 and was promoted to Director of Research in 2015. His scientific interests are at the frontier of Soft Condensed Matter and Physics-Mechanics, including drying of complex liquids (colloids, polymers), morphogenesis, and mechanical instabilities in out-of-equilibrium systems. He has been active in studying crack morphologies in coatings, specifically applied to paintings for the past 15 years, to deduce physical and mechanical properties of pictorial matter (including the Mona Lisa).



**Prof. Dr.-Ing. Arno Kwade (TU Braunschweig)** graduated from the Institute of Mechanical Engineering, Technische Universität Braunschweig and received his doctor's degree (PhD) in 1996. Until 2005 he was Executive Director of Betonwerke Emsland GmbH and Kwade+Schwedes Zerkleinerungstechnik. He is Professor at Technische Universität Braunschweig, head of the Institute for Particle Technology and one of the founders of the BLB (Battery lab Braunschweig). Prof. Kwade is a leading expert in battery processing technology, coordinator of the BMBF cluster "ProZell" and initiator of the annual International Battery Production Conference (IBPC).



**Prof. Dr. Jens Tübke (Fraunhofer ICT, KIT)** is the director of the Department "Applied Electrochemistry" at the Fraunhofer ICT in Pfinztal and was appointed in 2015 to the KIT with a professorship for "Materials and Processes for Electrochemical Storage". He studied chemistry with the specialization of technical and macromolecular chemistry at the Martin-Luther-University Halle Wittenberg and finished his PhD in 1997 with the topic "Structure-Properties-Relationships of Polymeric Gel Electrolytes for Lithium-Ion Batteries". From 1997-2000 followed an overseas stay at Kyoto University (Japan) in the working group Prof. Zempachi Ogumi and the Toyota Corp. with the aim of developing electrolyte and electrode materials for lithium-ion polymer batteries for hybrid and electric vehicles. Since 2000, he has been working at the Fraunhofer ICT.



**Prof. Dr.-Ing. Jürgen Fleischer (KIT)** obtained his doctorate at the Institute of Production Science (wbk) in 1989. From 1992 on, he held several leading positions in industry before being appointed professor and head of the wbk at today's Karlsruhe Institute of Technology (KIT) in 2003. Furthermore, he is a visiting professor at Tongji University in Shanghai since 2012. Prof. Fleischer is active in various national and international societies. Since 2020, Professor Fleischer has been the spokesman for the Battery Competence Cluster of the German Federal Ministry of Education and Research. His current scientific research focuses on intelligent components, automated manufacturing systems for lightweight structures, and the production of components for electromobility.



**Dipl.-Ing. Ralf Diehm (KIT)** graduated in Process Engineering at KIT in 2014, majoring in Thermal Process Engineering and Chemical Energy Sources. Already during his studies he started to specialize in thin film coatings of organic electronics in his student research project and of lithium-ion battery electrodes in his diploma thesis. Since 2014, he is working as research assistant at the KIT/TFT group, focussing on stability and mechanism of slot die coating and in particular of intermittent coating to provide a fundamental understanding of the process and its limitations. In 2015, he was awarded with the first prize of the KIT "Neuland" award for his innovations in high speed intermittent slot die coating.

### A total of 36 speakers, including 21 external and following PhD students of the TFT group at KIT:



**Lisa Merklein M. Sc. (KIT)** completed her studies in Chemical Process Engineering at KIT in 2015, majoring in Thermal and Mechanical Process Engineering. Topic of her master's thesis was solution processing of nanolayers for organic electronics. Since 2016, she is working as research assistant at the KIT/TFT group, focusing on multilayer concepts for slot die coated OLEDs and the development of a fundamental understanding of interdiffusion in multilayer systems.



**Jana Kumberg M. Sc. (KIT)** graduated in Process Engineering at KIT in 2015, majoring in Thermal Process Engineering and Mechanical Process Engineering. During her studies she started to focus on processing of thin films, investigating thermal treatment of polymer solar cells in her bachelor's thesis at TFT. She further specialized on drying technology in her master's studies. Since 2016 she is working as research assistant at the KIT/TFT group, investigating drying behavior of lithium ion battery electrodes.



**Víctor Gracia M. Eng. (KIT)** completed his studies in Chemical Engineering at the University of Mexico in 2014, with minors in organic synthesis, applied mathematics and process design. In 2016 he got his Masters degree in Process Engineering with the thesis titled "Analysis of mass exchangers". Since 2017, he has been working as a research assistant at the KIT/TFT group, focusing in suspensions mass transport and drying of particle coatings, establishing simulation models to predict particle distribution in dry films.



**Simon Ternes M. Sc. (KIT)** received his Master of Science in Physics from the Heidelberg University in 2017 with a thesis about slot-die coating of polycrystalline hybrid perovskite thin-films. From 2017 to 2020 he has continued his work in the area of perovskite thin-film photovoltaics as a research assistant and PhD candidate at the Light Technology Institute (LTI) and the Thin Film Technology Group (TFT) at KIT. He is responsible for transitioning the perovskite film deposition from spin coating to industrial coaters. In particular, his research focuses on thin-film quality monitoring by in situ characterization techniques.



**Sandro Spiegel M. Sc. (KIT)** completed his studies of Chemical Process Engineering at KIT in 2017 with a focus on Thermal Process Engineering and Mechanical Process Engineering. During his studies, he specialized in intermittent coatings of lithium-ion battery electrodes in his bachelor thesis and concentrated on the mechanical cracking behavior of lithium-ion battery electrodes in his master thesis. Since 2017, he is working as a research assistant at the KIT/TFT group on simultaneous double-sided coatings and edge effects of lithium-ion battery electrodes.



**Andreas Altvater M. Sc. (KIT)** completed his studies of Chemical and Process Engineering at KIT in 2018 with a focus on Thermal Process Engineering and product design. Already during his studies he specialized in the sorption and drying behavior of thin film coatings. In his master thesis in the TFT Group he investigated the drying behavior of functional coatings for energy storage. Since 2018, he is working as a research assistant at KIT/TFT on the processing of battery electrodes to optimize the drying process by different types of drying applications.



**Julian Klemens M. Sc. (KIT)** completed his master's degree in Process Engineering in 2019 at KIT, majoring in Thermal Process Engineering and Chemical Process Engineering. In an internship at BASF SE he gained experience in the processing of various material systems from formulation to coating technologies and drying strategies. During his master thesis at BASF SE he was engaged in the investigation of process parameters on drying behaviour of pastose and ceramic films. Since 2019, he is working as research assistant in the KIT/TFT group, focussing on the processing of lithium ion and post-lithium battery electrodes.

### Additional speakers and workshop instructors



Thilo Heckmann  
(since 2019)



Philipp Quarz  
(since 2019)



Jonas Mohacsi  
(since 2020)



Kevin Ly  
(since 2020)



Nadine Zimmerer  
(since 2021)



Alexander Hoffmann  
(since 2021)