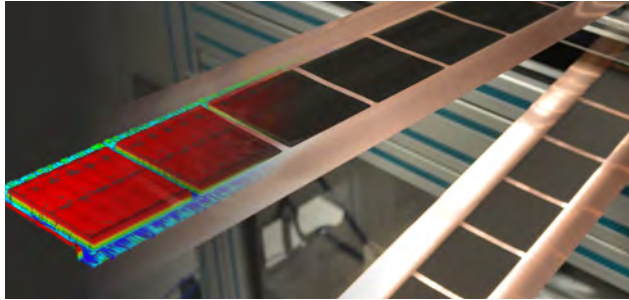


## 12<sup>th</sup> Short Course Coating and Drying of Thin Films

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



## 5<sup>th</sup> Thin Film Technology Forum

2-day forum on May 28-29, where renowned scientists will present and discuss recent research results and new trends in industry and academia with a focus on Advances in Printing, Batteries, Smart Processes & Coatings



**May 25-29, 2020**  
**KIT Tagungszentrum (FTU)**  
**Hermann-von-Helmholtz-Platz 1**  
**76344 Eggenstein-Leopoldshafen**

Organization: Prof. Dr.-Ing. Dr. h. c. Wilhelm Schabel  
Dr.-Ing. Philip Scharfer  
with 32 experts from industry and academia

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

  
supported by DECHEMA

## Program Short Course and Forum

41 contributions from 34 speakers (20 external)

### Schedule 25.05.2020 – Short Course Monday

- 08:30** *Registration and hand out of course material*
- 09:00** *Welcome and introduction*  
Prof. Dr.-Ing. W. Schabel / Dr.-Ing. P. Scharfer (KIT)
- 09:45** *Coating and printing fluids characterization*  
Dipl.-Ing. Gilbert Gugler (iPrint, CH)
- 11:00** *Coffee break*
- 11:30** *Rheology of coating fluids*  
Prof. Dr. Norbert Willenbacher (KIT)
- 12:30** *Lunch break*
- 13:30** *Introduction to premetered coating methods*  
Dr. Peter Schweizer (Schweizer Coating Consulting, CH)
- 14:45** *Special issues on curtain and slide coating*  
Dr. Peter Schweizer (Schweizer Coating Consulting, CH)
- 16:00** *Coffee break*
- 16:30** *Fluid flow in coating tools*  
Prof. Dr. Dr. h. c. mult. Franz Durst (FMP)
- 17:30** *The extended high speed slot die coating window*  
Dipl.-Ing. Ralf Diehm (KIT)
- 19:30** *Social dinner at Charles Oxford (Waldstraße 30, KA)*

### Schedule 26.05.2020 – Short Course Tuesday

- 09:00** *Knife and blade coating*  
Prof. Dr. Hadj Benkreira (University of Bradford, UK)
- 09:45** *Gravure and roll coating*  
Prof. Dr. Hadj Benkreira (University of Bradford, UK)
- 10:30** *Coffee break*
- 11:00** *Industrial perspectives on curtain & slot die coating*  
Dipl.-Ing. Harald Döll (TSE, CH)
- 11:30** *Coating of thin films in industrial environment*  
Dr. Robert Beer (Polytype Converting AG, CH)
- 12:00** *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)
- 15:30** *Coffee break*
- 16:00** *Drying of multicomponent mixtures*  
Dr.-Ing. Philip Scharfer (KIT)
- 16:20** *Drying of particulate coatings and crack formation*  
Dr. Alex Routh (Cambridge, UK)

### Schedule 27.05.2020 – Short Course Wednesday

- 08:30** *Sorption equilibrium in polymeric and porous films*  
Tobias Börnhorst M. Sc., Jochen Eser 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** *Experimental workshop at the TFT coating and printing laboratory*  
- Rheology & wetting  
- Pilot-scale coating trials  
- Heat and mass transfer coefficients  
- Experimental drying curves  
  
Visit PVD Plasma Coating Lab @ IAM-AWP

### Schedule 28.05.2020 – Short Course & Forum Thursday

- 09:30** *Welcome & Introduction to TFT Forum*  
Prof. Dr.-Ing. W. Schabel / Dr.-Ing. P. Scharfer
- 09:40** *Welcome & Introduction to KIT*  
Prof. h.c. Dr. Joachim Knebel (KIT)  
Head of Division 3 (Mechanical & Electrical Engineering)
- 09:50** *Advances in digital direct printing*  
Prof. Fritz Bircher (iPrint, CH)
- 10:30** *Coffee break with exhibition*
- 11:10** *Shear-induced wetting phenomena of interfaces*  
Prof. Dr.-Ing. Cameron Tropea (TU Darmstadt)
- 11:50** *Interdiffusion of polymer multilayers during drying*  
Lisa Merklein M. Sc. (KIT)
- 12:10** *Marangoni-induced flow fields in drying films and printed structures*  
Dipl.-Ing. Max Tönsmann (KIT)
- 12:30** *Lunch break*
- 13:30** *Formation of crack networks in coatings*  
Prof. Dr. Ludovic Pauchard (Univ. Paris, FR)
- 14:10** *Drying of polymer composites*  
Victor Gracia M. Eng. (KIT)
- 14:30** *Water mass transport in the post-drying process of LiB*  
Jochen Eser M. Sc. (KIT)
- 14:50** *Coffee break with exhibition*
- 15:30** *Simultaneous double-sided coating of LiB electrodes*  
Sandro Spiegel M. Sc. (KIT)

- 15:40** *Processing of post lithium battery electrodes*  
Julian Klemens M. Sc. (KIT)
- 15:50** *Radiation-based drying of battery electrodes*  
Andreas Altvater M. Sc. (KIT)
- 16:00** *Integrated process chain simulation for LiB electrodes*  
Thilo Heckmann M. Sc. (KIT)
- 16:10** *Coated membranes for fuel cell applications*  
Philipp Quarz M. Sc. (KIT)
- 16:20** *Coating and drying of perovskite thin-film solar cells*  
Simon Ternes M. Sc. (KIT)
- 16:40** *Jet Wiping: from modelling to experimental and numerical simulation*  
Prof. Dr. Jean-Marie Buchlin (von Karman Institute, BEL)
- 17:20** *Solution-processed functional films in chem. industry*  
Prof. Dr.-Ing. Frank Kleine Jäger (BASF SE)
- 19:30** *Get-together at BESITOS (Karlsruhe town square)*

**Schedule 29.05.2020 – Short Course & Forum Friday**

- 09:00** *A research factory for battery cell production – developing a suitable infrastructure*  
Prof. Dr. Jens Tübke (Fraunhofer ICT, KIT)
- 09:30** *Industrial production of lithium-ion battery cells*  
Dr.-Ing. Bastian Westphal (Volkswagen AG)
- 10:00** *Challenges and advances in electrode processing*  
Dr.-Ing. Wolfgang Haselrieder (TU Braunschweig)
- 10:30** *Coffee break with exhibition*
- 11:10** *Simulation approaches in mixing of battery slurries*  
Prof. Dr.-Ing. habil. Hermann Nirschl (KIT)
- 11:40** *Model-based design of Li-Ion battery electrodes*  
Prof. Dr.-Ing. Ulrike Krewer (KIT)
- 12:10** *Flex Die high speed intermittend coating*  
Dipl.-Ing. Ralf Diehm (KIT)
- 12:30** *Drying of multilayer LiB electrodes*  
Jana Kumberg M. Sc. (KIT)
- 12:50** *TFT Forum closing session lunch (Finger Food)*



**Registration fees**

	Early Bird (until 15.03.20)	later
General	€ 1650.–	€ 1800.–
GVT discount	€ 1600.–	€ 1750.–
Exhibition booth (5 days)	€ 975.–	€ 1125.–
Exhibition booth (2 days @ Forum)	€ 575.–	€ 675.–

**Registration**

Anna-Maria Hipp: [gvt-hochschulkurse@gvt.org](mailto:gvt-hochschulkurse@gvt.org)  
Phone: +49 69 7564-118

**Payment**

According to §4 Nr. 22a UStG the registration fee is purchase tax free. Registration fees include a short course folder with documentation of lectures and workshop, coffee, refreshments, lunch and social dinner on Monday evening and the TFT Forum get-together on Thursday evening. A participation certificate will be distributed.

**Venue**

The short course takes place at the KIT-Tagungszentrum (FTU), Seminarraum 157, Hermann-von-Helmholtz-Platz 1 in 76344 Eggenstein-Leopoldshafen.

**Hotel recommendations**

Hotel Kaiserhof, Hotel Novotel Karlsruhe City, City Partner Hotel Berliner Hof, Hotel Rio

**Contact**

Short course organization:  
Sandro Spiegel M. Sc.: [sandro.spiegel@kit.edu](mailto:sandro.spiegel@kit.edu)

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

**Who has been attending Short Course 2019**

Participants from Germany and **more than 10 EU countries and Asia (85 % from industry)**

**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 by TFT staff members (see photos below).

The [5<sup>th</sup> Thin Film Technology Forum](#) will take place on the 4<sup>th</sup> and 5<sup>th</sup> day, where renowned scientists will present and discuss new trends in industry and academia with a focus on [Printing, Batteries, Smart Processes & 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)** studied process engineering in Karlsruhe and received his doctor degree in the field of drying of polymeric films honored with the Carl Freudenberg Award 2006 by the University. 2007-2008 he worked as R&D engineer at LoFo (Lonza Foils) High Tech Film GmbH in Basel. 2007 he was honored with the prestigious Arnold-Eucken Award by VDI-GVC and 2008 with the SCRIVEN

Young Investigator Award in the US by the ISCST. He is active in national and international committees, such as ECS and ISCST as past Vice President of the ISCST and current Vice President of the European Coating Society (ECS). He organized as Symposium Chairman the ECS 2009 and ECS 2019 in Heidelberg. 2009 he received a Professorship in Thin Film Technology funded by a company consortium of BASF, BAYER and ROCHE. In 2012 he was honored with a Dr. h. c. by the Technical University lasi. In 2014 Prof. Schabel was offered a W3 Professorship at TU Dresden. More than 25 research awards were granted to TFT group members in the past decade. In 2020 Professor Schabel is honored with the Edwards Fellowship of the University of Cambridge.



**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 the 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)** (BEng, MSc 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.



**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 UG)** 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 UG", developing highly homogeneous comb nozzle 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.



**Dipl.-Ing. Harald Döll (TSE, CH)** successfully graduated from the Technical University in Darmstadt in Mechanical Engineering in 1989. After some year in web-guiding systems Harald Doell 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.

### Additional speakers at the 5<sup>th</sup> TFT Forum on May 28-29



**Prof. Fritz Bircher (iPrint, CH)** studied electrical engineering at ETH Zurich. After graduating he worked as R&D engineer for different companies developing mechatronic system solutions. In 1993 he was appointed professor at Bern University of Applied Sciences, where he started his research in inkjet printing, studying and exploring all possible jetting and dispensing principles with all kinds of materials in a wide range of applications. In 2012 he joined the University of Applied Sciences Western Switzerland in Fribourg, where he founded iPrint institute and iPrint Center for Digital Printing on the Marly Innovation Center. Fritz's main research interests based on inkjet printing include packaging printing, direct-to-shape printing, material printing including 3D printing and bio printing.



**Prof. Dr.-Ing. Cameron Tropea (TU Darmstadt)** graduated from the University of Toronto in Engineering Sciences, followed by a Masters degree in Mechanical Engineering (1977). He completed his Dr.-Ing. in Civil Engineering at the Technical University of Karlsruhe (1982) and his Habilitation in Fluid Mechanics at the University of Erlangen-Nürnberg (1991) where he was appointed as Professor of Fluid Mechanics until 1997. This was followed by an appointment to his current position at the Institute of Fluid Mechanics and Aerodynamics at the TU Darmstadt. Currently Editor-in-Chief of the Springer journal Experiments in Fluids and past Director of the Center of Smart Interfaces (CSI) in the period 2007-2014, his research interests include Optical Measurement Techniques in Fluid Mechanics, Interfacial Transport Phenomena, Atomization and Spray Processes and Unsteady Aerodynamics. He has recently been appointed a member of the Scientific Commission of the Council of Science and Humanities in Germany.



**Prof. Dr.-Ing. Frank Kleiner (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. 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. 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. 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.



**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.



**Dr.-Ing. Wolfgang Haselrieder (TU Braunschweig)** received his diploma in process engineering from the TU Braunschweig in 2007. He then established the research group "Battery Process Engineering" at the Institute for Particle Technology, where currently about 40 PhD students are working along the electrode production value chain. Since 2014, he is also responsible for the Battery LabFactory Braunschweig as scientific manager. Wolfgang Haselrieder is an expert in battery electrode and cell manufacturing as well as corresponding characterization. Especially mixing and calendaring, as well as process interactions along electrode manufacturing are core know-how for which he also received his PhD.



**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 loaden 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.

**A total of 34 speakers, including 20 external and following PhD students of the TFT group at KIT.**



**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 on 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 price of the KIT "Neuland" award for his innovations in high speed intermittent slot die coating.



**Tobias Börnhorst M. Sc. (KIT)** completed his studies in Chemical Engineering 2015 at TU Dortmund University. He wrote his Master's thesis on mass transport in membrane contactors at laboratory of fluid separation headed by Prof. Andrzej Górak. Since July 2015 he is working as research assistant at KIT in the Thin Film Technology group (TFT), headed by Prof. Wilhelm Schabel und Dr. Philip Scharfer. In his PhD project, he focuses on diffusional mass transport in nanolayers to develop up-scalable drying processes for printed and organic electronics.



**Jochen Eser M. Sc. (KIT)** graduated in Chemical Process Engineering at KIT in 2015, majoring in Thermal Process Engineering and Mechanical Process Engineering. During his studies he started to specialize in coatings of organic electronics in his Bachelor thesis and focussed on drying of porous thin films in his Master thesis. In an internship at tesa SE he dealt with drying of adhesive layers. Since 2015 he is working as research assistant in the group headed by Prof. Schabel and Dr. Scharfer. In his PhD he focusses on drying of thin films as well as sorption and mass transfer in porous layers for energy storage applications.



**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.



**Dipl.-Ing. Max Tönsmann (KIT)** studied Chemical Process Engineering at Karlsruhe Institute of Technology (KIT) until 2015, majoring in Technical Thermodynamics and Combustion Technology. During his studies, he was scholarship holder of the Deutschlandstipendium partially funded by BASF. After finishing his diploma thesis about the impact of drying conditions and mechanical stresses on the optical properties of cellulose triacetate films, he was honored with the Emil Kirschbaum award for excellent performance during his university studies. Since late 2015 he is working as research associate and PhD candidate at KIT/TFT. His work focuses on drying defects induced by surface tension effects in thin polymer films as well as small printed structures.



**Victor 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.



**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.



**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.

**Additional speakers and workshop instructors**



Julian Klemens (since 2019)



Thilo Heckmann (since 2019)



Philipp Quarz (since 2019)



Jonas Mohacsi (since 2020)