

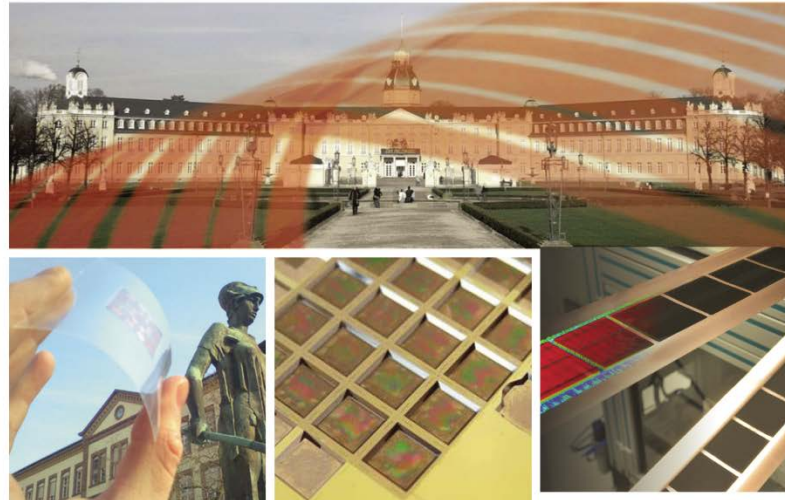
Organized by Gesellschaft für Chemische Technik
und Biotechnologie e.V.



supported by DECHEMA

4th Thin Film Technology Forum

with 10 years TFT anniversary

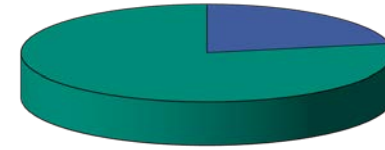


The 4th Thin Film Technology Forum will take place linked to the 11th Short Course Coating and Drying of Thin Films. Renowned scientists will present and discuss new trends in industry and academia with a focus on Printing, Batteries, Smart Processes & Coatings.

Welcome 4th Thin Film Technology Forum 2019 with TFT anniversary intro (2009-2019)

2019: Participants from 10 countries

79 %
(Industry)



21 %
(Academia)

(11 countries: Germany, France, Korea, Switzerland, Austria, Netherlands, UK, Belgium, Taiwan, Czech Republic, China)

TFT Forum program

Schedule 16.05.2019 – TFT Forum Thursday

12:40 *TFT Forum get-together with finger food*

13:10 *Forum registration and materials handout*

13:40 *Welcome with TFT anniversary intro (2009 - 2019)*
Prof. Dr.-Ing. W. Schabel / Dr.-Ing. P. Scharfer

14:00 *Welcome address to the 4th TFT Forum at KIT*
Prof. h.c. Dr. Joachim Knebel (KIT)
Head of Division 3 (Mechanical & Electrical Engineering)



Thin Film Technology group @ KIT

Locations



TFT@InnovationLab-Heidelberg
www.innovationlab.de/en/research/printing/tft
TFT-Printing Competence Center
(since 2012)



Institute of Thermal Process Engineering (TVT)
- Thin Film Technology

Institute of Micro Structure Technology (IMT)
- Thin Film Technology



KIT – Campus North
Thin Film Technology Coating & Printing Lab
(since 2009)



New lab space
(since 2019)

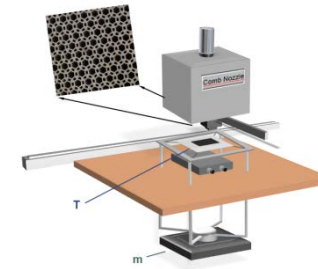


KIT – Campus South
TFT @ Materials Center for Energy (MZE)
new office, lab space with cleanroom (since 2016)

TFT - Coating & Printing Lab

(@ KIT Campus North)

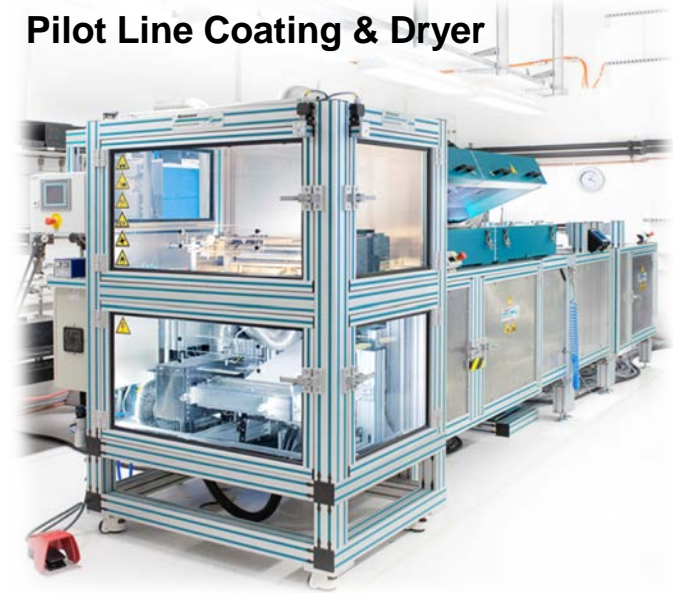
Batch Coating & Drying



Development Coating (High Speed)



Pilot Line Coating & Dryer



TFT Forum program 2019

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- 14:10 **Presentations of TFT research highlights & discussion**
 - Marangoni flows in films (M. Tönsmann)
 - Drying of particle polymer composite films (V. Gracia)
 - Processing of perovskite PV films (S. Ternes)
 - Multilayer printing and interdiffusion in films (L. Merklein)

15:20 Coffee break (with exhibition)

Printed and organic electronics processing

- 16:00 *Advances in organic & printed electronics processing*
Ir. Ike de Vries (Holst Centre, NL)
- 16:45 *Advances in digital direct printing*
Prof. Fritz Bircher (iPrint, CH)

19:30 Get-together at BESITOS (Karlsruhe town square)

Schedule 17.05.2019 – TFT Forum Friday

Batteries

- 09:00 *Challenges and advances in processing of battery cells*
Prof. Dr.-Ing. Arno Kwade (TU Braunschweig)
- 09:30 *Industrial production of lithium-ion battery cells*
Dr. Armin Modlinger (Volkswagen AG)
- 10:00 *Simulation approaches in mixing of battery slurries*
Prof. Dr.-Ing. habil. Hermann Nirschl (KIT)
- 10:30 *Advances in coating and drying of multilayer Li-ion battery electrodes*
Dipl.-Ing. Ralf Diehm, Jana Kumberg M. Sc. (KIT)
- 11:10 *Coffee break (with posters and exhibition)*

Smart Coatings

- 11:50 *Applications in solution-processed functional films*
Prof. Dr. Frank Kleine Jäger (BASF SE)
- 12:20 *Shear-induced wetting phenomena of interfaces*
Prof. Dr.-Ing. Cameron Tropea (TU Darmstadt)
- 12:50 *Microfluidic and coating technology for biomedical film applications*
Prof. Dr. An-Bang Wang (NTU, Taiwan)
- 13:20 *TFT Forum closing session lunch (Finger Food)*

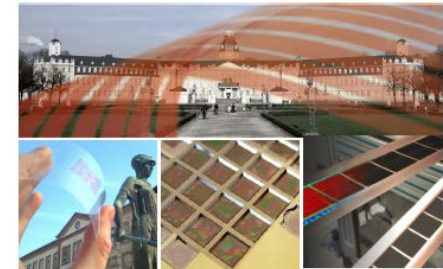


7:30 pm - Besitos
Weinbrennerhaus, Town square
Karl-Friedrich-Str. 9, 76133, Karlsruhe

„TFT Forum get-together“
@ Tapas & Cocktail Bar „BESITOS“

4th Thin Film Technology Forum

with 10 years TFT anniversary



[karlsruhe.besitos.de]

TFT Forum 2019: Speakers



Prof. Dr.-Ing. Dr. h. c. Wilhelm Schabel (KIT) received his doctoral degree in the field of film drying. He worked as R&D engineer at Lonza High Tech Film GmbH in 2007 and was honored with esteemed awards such as Carl-Freudenberg Award 2006 by the University of Karlsruhe (TH), Arnold-Eucken Award 2007 by the VDI-GVC and the L. E. Scriven Y. I. Award 2008 by the ISCST. Within the KIT Elite Future Concept he was appointed in 2009 to the first Professorship in Thin Film Technology in Germany, financially supported by an industrial consortium of BASF, BAYER and ROCHE. In 2014 he refused a Professorship offer (W3) to TU Dresden. Since 2018 Prof. Schabel is Vice President of the new European Coating Society and in 2019 the Chairman of the next ECS Conference in Heidelberg-Karlsruhe.



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. Dr. Scharfer is member of the scientific committee of the European Coating Symposium (ECS) and 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. In 2019, Dr. Scharfer will be one of the Chairmen of the next ECS Conference in Heidelberg-Karlsruhe.



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.



Max
Tönsmann
(since 2015)



Victor
Gracia
(since 2017)



Simon
Ternes
(since 2017)



Ir. Ike de Vries (HOLST CENTRE, NL) studied Chemistry at the Wageningen University, Netherlands. From 1988 to 2006 Ike was a project leader and process/research engineer in the field of extrusion coating and substrate development for ink jet and photographic paper at Fuji Photo Film. Since 2006, he is a research scientist at the Holst Centre in Eindhoven. Inventing and developing new (R2R) processes and slot die coating technologies, especially intermittent coating, are his main core competences. This to enable large scale production for flexible electronics, like for example organic light emitting diodes (OLEDs) and photovoltaic (PV).



Prof. Fritz Bircher (iPrint, CH) studied electrical engineering at ETH Zurich. After graduating he worked as an 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, (3D) material printing and bio printing.



Prof. Dr.-Ing. Arno Kwade (TU Braunschweig) graduated from the Institute of Mechanical Engineering, TU 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).



Dr. Armin Modlinger (Volkswagen AG) graduated in Chemistry at the University of Bayreuth in 2000, followed by a doctoral degree in 2004 at the Technical University Munich. After a Postdoctoral fellowship at the University of Bristol he started his career in the chemical industry at Evonik Industries in 2006, working at different positions in R&D departments associated with Li-Ion Technology. 2013 he became head of process technology at Litarion GmbH and later in 2017 he took over responsibility for Product and Process Development at Litarion GmbH. In April 2018 he joined the Center of Excellence BatterieZelle within the Volkswagen Group.



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.



die coating.

Dipl.-Ing. Ralf Diehm (KIT) graduated in Process Engineering at KIT in 2014. Already during his studies, he specialized on thin film coatings for organic electronics and Li-Ion batteries. Since 2014 he is working as research assistant at the KIT/TFT group, focusing on (intermittent) slot die 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



battery electrodes.

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



Prof. Dr.-Ing. Frank Kleine Jäger (BASF SE) is currently Senior Research Manager 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 University, Germany. 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.-Ing. Cameron Tropea (TU Darmstadt) received his Masters degree in Mechanical Engineering from University of Toronto (1977). He completed his Dr.-Ing. in Civil Engineering at TU 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 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. An-Bang Wang (NTU, Taiwan) received the Dr.-Ing.-degree at the Institute of Fluid Mechanics (LSTM), University of Erlangen-Nürnberg in 1991 and is a full professor at the Institute of Applied Mechanics at NTU Taiwan. He has served as the director of Optomechanics Education Resource center, chairman of the display technology Education Program and counselor of advisory office, Ministry of Education, Taiwan; vice president of International Society of Coating Science and Technology. He was honored with the Distinguished Engineering Professor Award of Chinese Institute of Engineers, Taiwan. His current research interests include advanced coating & microfluidic platform for biomedical/industrial applications and biomimetics.

TFT – 10 years anniversary (2009 – 2019)

13:40 *Welcome with TFT anniversary intro (2009 - 2019)*
Prof. Dr.-Ing. W. Schabel / Dr.-Ing. P. Scharfer



TFT – 2009 ... 10 years ago

Frankfurter Allgemeine

NEUE ELITE-UNIVERSITÄT IN KARLSRUHE

„KIT Elite Future Concept“



2009 KIT was founded

Bald ein Paar: Die Universität Karlsruhe ...
... und das Forschungszentrum werden zum
Karlsruher Institut für Technologie - kurz:
KIT

Frankfurter Allgemeine
Campus

Die geteilte Professur

In Karlsruhe können Forscher für die Industrie arbeiten

ben hat, ist der Verfahrenstechniker
Wilhelm Schabel. Er erforscht die
"Technologie dünner Schichten" und
hat vor kurzem die nunmehr dritte ge-
teilte Professur in Karlsruhe angetreten;

Forschung
& Lehre

02-2009

New Shared Professorship „Thin Film Technology“ (5 years)

funded by „KIT Elite Future Concept I“ & BASF, BAYER, ROCHE



supported by



Süddeutsche Zeitung vom 15. 06. 2009

Süddeutsche Zeitung
MÜNCHENER SONNENTAGS-NACHRICHTEN AUS POLITIK, KULTUR, WIRTSCHAFT UND SPORT

beitet, hält sich Schabel bei Bayer,
BASF und Hoffman-LaRoche jeweils
projektbezogen auf. "Die konkrete Aus-
gestaltung ist bewusst offen gelassen",
sagt er. Es sei gar nicht einfach, alles
unter einen Hut zu bringen. Schabel be-

Roche unterstützt Forschungsplattform „Thin Film Technology“

Filmreife Kooperation

Karlsruhe/Mannheim. Als Industriepartner
unterstützt Roche in den nächsten fünf
Jahren eine Professur für die Erforschung
der „Technologie dünner Schichten“ am
Karlsruhe Institute of Technology (KIT).

Der Lehrauftrag für Professor Wilhelm
Schabel und die TFT-Plattform am
KIT der TH Karlsruhe sollen die Erforschung
dünner Schichten als Grundlage
für optische Folien, Lacke, Sensormatri-
zen sowie Halbleiterschichten



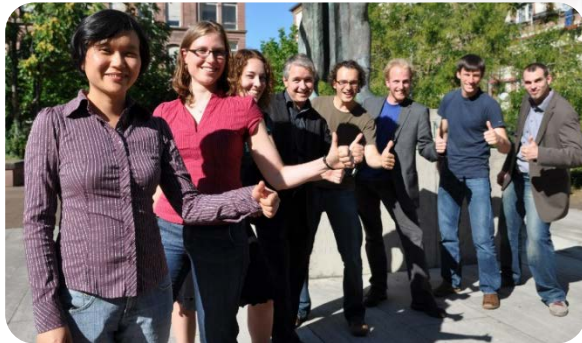
Professor Wilhelm Schabel ist Inhaber
der Shared Professorship „Thin Film Tech-
nology“, unterstützt vom KIT und einem
Konsortium von BASF, BAYER und
ROCHE.

TFT group 2009 ...

Prof. Dr. -Ing.
Wilhelm Schabel
(02/2009)



Dr.-Ing.
Philip Scharfer
(03/2009)



June 2009 ...



K. Peters
PhD Student
(CIW)
(04/2009)



Sibylle Kachel
PhD Student
(BIW)
(02/2009)



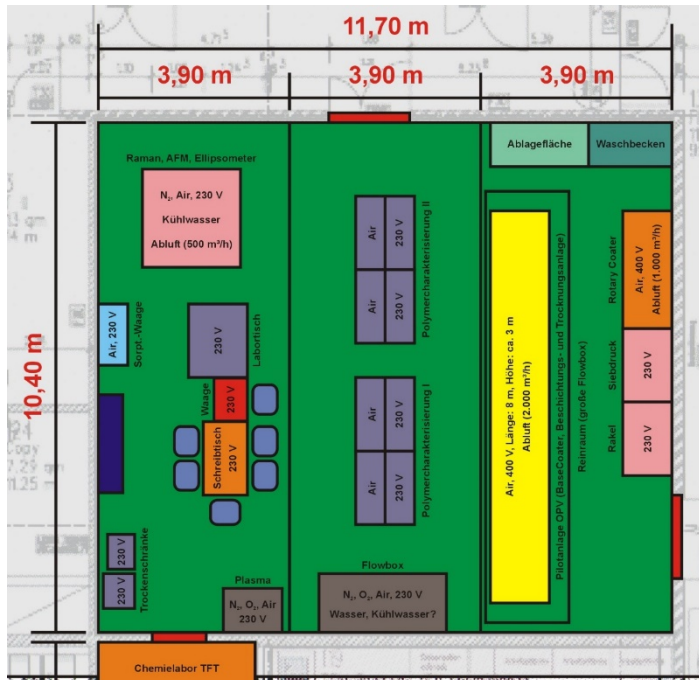
L. Wengeler
PhD Student
(MACH/RWTH)
(03/2009)



May 2009: New Laboratory at KIT Campus North

TFT Blog: May 13, 2009 - KIT Campus North
10:30 AM: Work started 7:30 AM. this morning

The other two lab tables are mounted and almost all the installation work for electricity and air supply is done ...



→ www.tft.kit.edu



2009

European Coating Symposium 2009 in Karlsruhe
New Professorship TFT@KIT is Organizer



2010



2011

TFT SKI Seminar 2011



TFT group increases ...



2013

Workshop 2013



2016

Short Course 2016



2017

Doktores 2012 ... 2017

10 years TFT – Facts and Figures

11 Dr.-Ing.

> 120 ISI listed publications

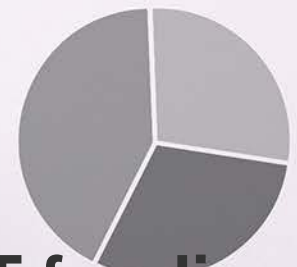
> 25 Research awards
(15 Best Poster/Talk Awards)

> 190 Bachelor & Master students

4 patents

> 20 average number of
research presentations
(per Phd student)

> 750 proceedings, abstract
conference presentations



TFT funding
> € 13 million €

10 years – 11 x Dr.-Ing. @ Thin Film Technology

2012

Dr.-Ing. Benjamin
Schmidt Hansberg
(BASF)



2013

Dr.-Ing. Joachim Erz
geb. Krenn
(Evonik)



2014

Dr.-Ing. Lukas
Wengeler
(BASF)



2015

Dr.-Ing. Katharina
Peters
(McKinsey)



2015

Dr.-Ing. Marcel
Schmitt
(BASF)



2016

Dr.-Ing. Felix
Buss
(BAYER)



2017

Dr.-Ing. David
Siebel
(Roche / BASF)



2017

Dr.-Ing. Sibylle
Kachel
(Evonik)



2017

Dr.-Ing. Susanna Baesch
Dr.-Ing. Stefan Jaiser
(2 x Bosch)



2017

Dr.-Ing. Sebastian
Raupp
(BASF)



10 years – TFT @ conferences (e.g. ECS & ISCST)

presentations, networking, fun with **21 awards!**

ECS 2009

Karlsruhe

(Germany)

ECS 2011

Turku

(Finland)

ECS 2013

Mons

(Belgium)

ECS 2015

Eindhoven

(Netherlands)

ECS 2017

Fribourg

(Switzerland)



ISCST
2010

St. Paul

ISCST 2012

Atlanta

ISCST 2014

San Diego

ISCST 2016

Pittsburgh

ISCST 2018

Long Beach

10 years - TFT Short Courses

"MILESTONES"

ECS SHORT
COURSE 2009

KURZLEHRGANG
2011, 2012-1, 2012-2, 2013

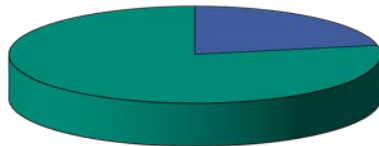
SHORT COURSE
2014, 2015



"TYPICAL DISTRIBUTION"

~ 80 %
(Industry)

~ 20 %
(Academia)



SHORT COURSE 2016 - 2019,...

& TFT FORUM 2016 – 2019, ...

10 years participants & experts from all over the world

... from Germany, France, Netherlands, UK, Belgium, Netherland, Spain, Austria, Sweden, Switzerland, US, South-Korea, Taiwan, Israel, Japan, Thailand, Finland, Sweden, Italy, China, ...)

2009 – 2019 @TFT - more than 25 Research awards !

No.	Year	Award	TFT Group member
1	2010	Best Poster Award, ProcessNet, Aachen:	Katharina Peters
2	2010	Best Poster Award, ProcessNet, Aachen:	Joachim Krenn
3	2010	Ed Cohen Technology Award, ISCST, USA	Schmidt-Hansberg, Lemmer, Scharfer, Schabel
4	2011	Innovation Lab AWARD – Forum Organische Elektronik, Heidelberg	Benjamin Schmidt-Hansberg
5	2011	Emil Kirschbaum Preis, KIT	David Siebel
6	2012	Dr. honoris causa, TU Iasi, Romania	Wilhelm Schabel
7	2013	Fakultätspreis, Student Engagement, KIT-CIW	Sebastian Raupp
8	2013	Emil Kirschbaum Preis, KIT	Sebastian Raupp
9	2013	Best Research Talk: ProcessNet, Würzburg	Sibylle Kachel
10	2013	Best Poster Award, ProcessNet, Baden-Baden	Anna-Lena Riegel
11	2013	Best Poster Award, European C. Symposium, Eindhoven	Marcel Schmitt
12	2013	Best Research Talk, ProcessNet,	Michael Baunach
13	2014	L.E. Scriven Y. Investigator Award (ISCST) - USA)	Philip Scharfer
14	2015	Best Poster Award (European Coating Symposium), Eindhoven	Stefan Jaiser
15	2016	KIT NEULAND Innovation Award (1. Prize), KIT	Schabel, Scharfer, Schmitt, Diehm
16	2016	Emil Kirschbaum Preis, KIT	Max Tönsmann
17	2016	Best Poster-Award, ProcessNet, Weimar	Jochen Eser
18	2016	ISCT Best Poster Award, ISCST, Pittsberg, USA	Stefan Jaiser
19	2016	3. Prize Research Award @ Batterieforum, Berlin	Schabel, Scharfer, Schmitt, Jaiser, Baunach, Diehm
20	2017	Best Talk ProcessNet Drying Technology, Bruchsal	Sebastian Raupp
21	2017	Best Poster Award, ProcessNet, Heat & Mass Transfer	Max Tönsmann
22	2018	Peter und Luise Hager Award, KIT	Stefan Jaiser
23	2018	Best Poster Award, ProcessNet, Halle	Sandro Spiegel
24	2018	Best Poster Award, Long Beach, ISCST, USA	Börnhorst, Merklein
25	2018	Best Poster Award, Long Beach, ISCST, USA	Diehm, Kumberg
26	2019	Best Research Presentation, ProcessNet, Essen	Max Tönsmann

- Best Poster / Best Talk Awards
- Esteemed Research Awards



TFT Awards 2009 -2019

www.tft.kit.edu/784.php

TFT-Awards

TFT Forum program 2019

TFT Forum program

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4th Thin Film Technology Forum

with 10 years TFT anniversary



We wish you an inspiring
4th Thin Film Technology Forum
with **open discussions!**

on Recent Advances in Research & Technology





Surprise: Congratulation to Margit Morvay

10 years @TFT!



ECS 2019 – September 2019 in Heidelberg



EUROPEAN COATING SYMPOSIUM HEIDELBERG

13th ECS in Germany - Heidelberg - Karlsruhe

September 8th - 11th, 2019

Marriott Hotel, Vangerowstr. 16, Heidelberg



Advances in Coating & Drying of
Thin Films, Smart Coatings & Materials

- Li-Ion Battery Material Coatings
- New Anode / Cathode / Separator Material Coatings
- Printed Electronics for Energy Harvesting
- Digital Printing, Ink Jet Technology
- Liquid Drop Jetting and Aerosol Printing Technologies
- 3D Lithographic Printing and Additive Manufacturing
- 3D Multilayer Stacking Technologies
- Fundamentals in Film Drying, Diffusion, Heat & Mass Transfer
- Fundamentals in wetting
- Free surface flows
- Paints, Varnishes, Adhesives
- Superhydrophobic Materials, Self-assembling Coatings
- Bioactive Polymers, Coatings and Sensors
- Fundamentals in wetting
- Free surface flows
- Electroconductive Polymers and Coatings
- Thermo-Active, Stimuli Responsive & Photochromic Materials

ECS 2019 CHAIRS: Prof. Dr.-Ing. Dr. h.c. Wilhelm Schabel (KIT)
Dr.-Ing. Philip Scharfer (KIT)
organized by GVT (DECHEMA)



Registration

Online registration will be available soon at

<http://www.european-coating-symposium.eu>

Deadline for early bird registration is May 1st, 2019.