

EFCE Spotlight Talks

5-14
November
2024

by the Working Parties
and Sections

12 webinars



EFCE

European Federation of Chemical Engineering

Welcome to the seventh spotlight talks series Fall Series 2024

This fall, a total of twelve sessions of spotlight talks will be organized with involvement from thirteen of the working parties and sections of the EFCE. These sessions offer a valuable opportunity to learn more about very specific topics, without having to travel. We consider these Spotlight Talks as a low-barrier opportunity to get involved (or stay involved) in EFCE activities and they complement the in-person activities such as the ECCE-ECAB conferences that are organized in odd years. Next year, ECCE-ECAB will be in Lisbon, but this year we do not have the ECCE-ECAB, and therefore we have next to the annual Spring Spotlight Talk Sessions, also a Fall Series. Covering a wide range of working parties and sections, there will likely be one or more sessions with topics of your interest.

We hope that you enjoy some of this year's Fall Sessions of the Spotlight Talks!

- 5 November • 14:00
Sustainable production and recycling of plastics: process, product and technological innovations
- 6 November • 9:20
Reduced order modelling for mixing processes
- 6 November • 13:00
Electrifying the chemical industry: challenges and perspectives in green hydrogen and electrochemical CO₂ conversion
- 7 November • 9:30
High pressure technologies for a sustainable energy sector
- 7 November • 14:00
Innovative insect solutions: breeding, processing, and sustainability for future food and feed
- 8 November • 14:00
Safety challenges in the era of energy and digital transition
- 12 November • 9:30
Multiphase flows in gases and liquids - similarities and differences of particles and bubbles in gases and liquids. Can we utilise synergies?
- 12 November • 14:00
Electrostatic charging of particles in flows
- 13 November • 9:00
How to teach sustainabil(it)y
- 13 November • 14:00
Circularity and sustainability in the light of polymer reaction engineering
- 14 November • 10:00
Role of applied thermodynamics in a changing world (sustainability, energy transition, circularity)
- 14 November • 14:00
Elevating your career: essential skills for professional growth



Sustainable production and recycling of plastics: process, product and technological innovations

Production of plastics continues to consume large amounts of virgin fossil feedstocks that are responsible for significant volumes of waste discarded on landfills, contaminating oceans or finishing up their product lives at incineration units. In contrast to the make, use, then dispose business model of linear economy, in the circular economy we are challenged to keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of their life. The seminar highlights industrial challenges, points to promising renewable paths, and shares promising evidence on process, product and technological innovations towards the circular economy model and a sustainable-by-design supply chain.

PROGRAM

- 14:00 **Welcome and introduction**
Prof. Antonis Kokossis, Chair Section on Sustainability
Boelo Schuur, EFCE Scientific Vice-President
- 14:10 **Tackling plastic waste in the framework of the new circular economy action plan**
Prof. Antonis Kokossis, National Technical University of Athens - Greece
- 14:40 **Biodegradability 2.0: a holistic approach towards polymer biodegradation in natural and engineered environments**
A. Kuenkel, Vice President Biopolymer Research, BASF
- 15:10 **Technologies for circular economy of polymers**
Prof. D. Collias, Former Senior Director & Research Fellow, Circular Economy, P&G
- 15:40 **Round-table and Conclusion**
Prof. Antonis Kokossis, Chair Section on Sustainability

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Reduced order modelling for mixing processes

Reduced Order Modeling (ROM) is a mathematical technique used to simplify complex systems by reducing the number of variables or equations needed to describe them. This is achieved by identifying key features of the system that dominate its behavior while ignoring less significant details. In this way, it captures the essential features of the system while ignoring less significant details, allowing for faster calculations with minimal loss of accuracy.

ROM can be highly beneficial for industrial mixing processes, since these typically involve complex fluid dynamics that are computationally expensive to simulate in full detail. ROM allows for faster and more efficient simulations by capturing the key characteristics of the flow patterns and other related characteristics, enabling engineers to optimize processes, predict performance, and scale up operations without sacrificing accuracy. This can lead to cost savings, improved product quality, and more efficient design of industrial mixing equipment.

This webinar aims at presenting two examples of using ROM for predicting process characteristics and performance in mixing applications.

PROGRAM

- | | |
|-------|---|
| 09:20 | Welcome and introduction
Joelle Aubin, Chair Working Party on Mixing
Jarka Glassey, EFCE Executive Vice-President |
| 09:30 | AI-derived reduced order models and their applications in the formulation industries
Christopher Windows-Yule, University of Birmingham - UK |
| 10:10 | Reconstruction of the large-scale structures in stirred vessels using reduced order models and limited sensor data
George Papadakis, Imperial College London - UK |
| 10:50 | Conclusion
Joelle Aubin, Chair Working Party on Mixing |

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EFCE Spotlight Talks

Working Party on
Electrochemical Engineering

6
November
2024

13:00-15:30
CET



Electrifying the chemical industry: challenges and perspectives in green hydrogen and electrochemical CO₂ conversion

The transition to a net-zero chemical industry is one of the biggest challenges of our modern society, since the current industry mostly relies on fossil-based feedstock and fuels. In this context, industrial electrolysis is recognized as a promising solution for the production of green hydrogen and chemicals from CO₂. However, despite a fast-growing interest from industry and academia, several technical and engineering challenges are still ahead for a full roll-out of the electrolysis industry. In this spotlight talk we will discuss the latest developments, technical challenges, and perspectives on the production of green hydrogen via water electrolysis, and the production of green chemicals via electrochemical CO₂ conversion. We will discuss technical aspects related to technology performance and scale-up, with a strong emphasis on the industrial point of view.

PROGRAM

- 13:00 **Welcome and introduction**
Prof. Karel Bouzek, Chair Working Party on Electrochemical Engineering, UCT Prague – Czech Republic
Dr. Michele Tedesco, Netherlands delegate Working Party on Electrochemical Engineering, TNO - The Netherlands
Giorgio Veronesi, EFCE President
- 13:15 **Next generation electrolyzers: why future electrolyzers will still be much better**
Dr. Arend de Groot, TNO - The Netherlands
- 13:45 **Challenges of implementing water electrolysis at large scale, the end-user perspective**
Dr. Paola Granados Mendoza, HyCC - The Netherlands
- 14:15 **System and process development for industrial carbon-dioxide electroreduction**
Dr. Czaba Janáky, University of Szeged/eChemicles - Hungary
- 14:45 **An engineering perspective on the development of electrochemical CO₂ reduction for sustainable chemicals and fuels**
Dr. Gareth Williams, Johnson Matthey - UK
- 15:15 **Discussion and closing remarks**
Prof. Karel Bouzek, Chair Working Party on Electrochemical Engineering
Dr. Michele Tedesco, Netherlands delegate Working Party on Electrochemical Engineering

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EFCE Spotlight Talks

Working Party on
High Pressure Technology

7
November
2024

09:30-11:30
CET



High pressure technologies for a sustainable energy sector

High-pressure technologies offer special benefits in certain aspects connected to creating a sustainable energy sector. The webinar shows three examples ranging from large-scale industrial applications to emerging technologies. When talking about carbon dioxide, one of the first concerns is its role in climate change. The techniques presented in the webinar do not produce carbon dioxide, but they may use it or even create the possibility of negative emissions. Pressurized fluids are essential in utilizing heat sources and increasing energy efficiency. Carbon Capture and Storage (CCS) is a scaled process to collect and store the carbon dioxide produced during energy production or other industrial processes instead of releasing it to the atmosphere. CCS projects already in operation and close to commissioning will be presented, as well as emerging techniques to utilize carbon dioxide as a carbon source in the future.

PROGRAM

- 09:30 **Welcome and introduction**
Edit Székely, Budapest University of Technology and Economics - Hungary
Jarka Glassey, EFCE Executive Vice-President
- 09:40 **Super- and trans-critical power cycles – how to utilize heat sources for the generation of electric power by using supercritical fluids**
Attila R. Imre, Centre for Energy Research, Budapest Univ. of Tech. and Economics - Hungary
- 10:10 **CCS projects in the North Sea, from high pressure to low pressure**
Lars Erik Øi, University of Southeastern Norway, Porsgrunn - Norway
- 10:40 **Development of processes for the hydrothermal transformation of CO₂**
Maria Dolores Bermejo Roda, University of Valladolid - Spain
- 11:10 **Discussion and conclusion**
Edit Székely, Budapest University of Technology and Economics - Hungary

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Innovative insect solutions: breeding, processing, and sustainability for future food and feed

This webinar explores and addresses the potential of edible insects, focusing on their breeding and processing, as well as their transformative impact in agriculture and the circular economy. The event will cover the latest advancements in insect breeding, innovative separation technologies, diverse applications of insects in food and feed, and the critical aspects of sustainability and circularity. Join us and discover how insects can play a pivotal role in addressing global food security challenges, reducing environmental impact, and promoting sustainable agricultural practices.

PROGRAM

- 14:00 **Welcome and introduction**
Prof. Henry Jäger, BOKU – Univ. Natural Resources and Life Sciences, Vienna - Austria
Prof. Kemal Aganovic, DIL German Institute of Food Technologies, Quakenbrück; Univ. of Veterinary Medicine, Hannover - Germany
Jarka Glassey, EFCE Executive Vice-President
- 14:10 **Advancements in insect breeding and processing: techniques and technologies**
Prof. Athanassiou Christos, Department of Agriculture Crop Production and Rural Environment, University of Thessaly - Greece
- 14:30 **Innovative separation technologies for insect-based products**
Andriy Revva, Agro & Protein Systems, Alfa Laval - Sweden
- Break*
- 14:55 **Insects as a sustainable source for food and feed: applications and benefits**
Dr.-Ing. Oliver Schlüter, System Process Engineering, Leibniz Institute of Agricultural Engineering and Bio-economy (ATB) - Germany
- 15:15 **Sustainability and circularity in insect production: maximizing side streams and environmental impact**
Prof. Sergiy Smetana, DIL German Institute of Food Technologies, Quakenbrück; University of Veterinary Medicine Hannover – Germany
- 15:35 **Discussion and conclusion**
Prof. Henry Jäger Univ. Natural Resources and Life Sciences, Vienna - Austria
Prof. Kemal Aganovic, DIL German Institute of Food Technologies, Quakenbrück; Univ. of Veterinary Medicine, Hannover - Germany

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EFCE Spotlight Talks

Working Party on Loss Prevention
and Safety Promotion in the
Process Industries

8
November
2024

14:00-16:30
CET



Safety challenges in the era of energy and digital transition

While embracing renewable energy sources yields benefits such as decreased environmental impact and enhanced energy efficiency, it presents novel and evolving risks needing effective management. The new technologies and processes entail new hazards and much effort is going into renewal, with improvements in the concept of hazard identification and scenario definition becoming possible due to the digitization of the industry and the availability of data. The ongoing transformation requires that industrial organizations adapt their strategies and processes to harness the best new technologies while also making the most of the assets and resources already deployed. The rapid growth of AI in operational safety highlights future improvement areas while posing challenges like data availability, quality, trust, and explainability. The spotlight talk will give a flavor of the topics that will be covered in the 18th EFCE International Symposium on Loss Prevention and Safety Promotion in the Process Industries planned in Italy in 2025, to stimulate the development of new methods to reduce the risk of incidents/accidents in the process industries.

World-class experts will provide you with a vision of new approaches, examples of good practice, current thinking and lessons learned in process safety, including main challenges and technologies that align with sustainability goals, with a focus on:

- the transformative journey of safety culture management, highlighting the alignment of the strategic goals with effective management practices;*
- the management of process risk and lessons learned from practical experience to prioritize safety and operational excellence;*
- emerging risks and challenges of new energy carriers, like ammonia and liquid hydrogen, and new technologies involved;*
- AI approaches in safety and reliability and interpretative analysis based on data type statistics, preprocessing, and algorithms.*

Participants from both academia and industry are very welcome.

PROGRAM

- | | |
|-------|---|
| 14:00 | Welcome and introduction
Bruno Fabiano, Chair of Working Party on Loss Prevention - DICCA Univ. of Genova - Italy
Boelo Schuur, EFCE Scientific Vice-President |
| 14:10 | Safety Culture: challenging emotional biases with data
Alexis Pey, STAHL HOLDINGS B.V., Barcelona - Spain |
| 14:35 | Explosion in a wastewater tank - consequences - causes - measures
Marc Steinkrauss, PELEVEN AG, Basel - Switzerland |
| 15:00 | Safety Challenges in the exploitation of the Liquified Hydrogen value chain
Alessandro Tugnoli, University of Bologna - Italy |
| 15:25 | Examining safety risks of ammonia-fuelled ships. New Hazards related to the energy transition
Ming Yang, Rostam Abubakirov, Delft University of Technology, Delft - The Netherlands |
| 15:50 | How is artificial intelligence used for safety and reliability across industry?
Nicola Paltrinieri, NTNU - Norway |
| 16:15 | Concluding remarks
Bruno Fabiano, Chair of Working Party on Loss Prevention |

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EFCE Spotlight Talks

Working parties on Agglomeration
and Multiphase Fluid Flow

12
November
2024

09:30-12:00
CET



Multiphase flows in gases and liquids - Similarities and differences of particles and bubbles in gases and liquids Can we utilise synergies?

For several decades, the experimental analysis, modelling and numerical simulation of multiphase flows has been intensively developed for the design, scale-up and process control of industrial equipment such as bubble column and stirred tank reactors as well as fluidised beds and spray dryers. Major advances in computing power and miniaturisation have made it possible to gain deep insights into local phenomena, and interaction forces between particles and highly dynamic processes can be considered in modelling and numerical simulations. However, as the level of detail increased, the experiments and simulations became more and more complex, so that the two disciplines for the continuous gaseous and the continuous liquid phase developed largely independently of each other. Today, with high performance computing and artificial intelligence we might have the chance to use synergies between both disciplines more intensively than ever before. The experimental and numerical analysis of streamlines is one of the examples where local effects and fluid-particle interactions in gases and liquids can show interesting similarities that are worth discussing in detail [1, 2]. With our Spotlight Talk, we want to bring together international experts, interested scientists and the next generation of multiphase researchers from academia and industry to uncover the potential synergies.

[1] Hoffmann, Arne and Meinicke, Sebastian: Streamline analysis of CFD simulations to evaluate the process performance of stirred tank reactors, EFCE Spotlight Talk, 25.05.2023.

[2] Weiland, Christian and von Kameke, Alexandra and Schlüter, Michael: Trajectory-Based Breakup Modelling for Dense Bubbly Flows. Available at SSRN: <https://ssrn.com/abstract=4849246>.

PROGRAM

- 09:30 **Welcome and introduction**
Prof. Stefan Heinrich, Chair of the Working Party on Agglomeration
Prof. Michael Schlüter, Chair of the Working Party on Multiphase Fluid Flow
Giorgio Veronesi, EFCE President
- 09:40 **Recurrence Computational Fluid Dynamics (rCFD): from slow offline simulations to digital twins of industrial processes.**
Stefan Pirker, Daniel Queteschiner, Stefan Puttinger, Johannes Kepler Univ., Linz - Austria
- 10:10 **Flowsheet modelling of solids in the chemical industry**
Frank Kleine Jäger, BASF SE, Ludwigshafen - Germany
- 10:40 **Bubble column reactors : scale-up, modeling, and similarities with fluidized beds**
Frederic Augier, Mathieu Morin, IFP Energies Nouvelles, Lyon - France
- 17:40 **Nuclear techniques for detailed investigation of cohesive particle flows**
Gabrie Meesters, Ruud van Ommen, TU Delft - The Netherlands
- 11:40 **Discussion – what can we learn from each other?**

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EFCE Spotlight Talks

Working Party on
Static Electricity in Industry

12
November
2024

14:00-16:00
CET



WP Static Electricity in Industry

Electrostatic charging of particles in flows

We are excited to announce an upcoming webinar on "Electrostatic Charging of Particles in Flows," which will be given by two renowned experts in the field. The webinar focuses on how electrostatic charging contributes to loss processes in various powder handling industries such as pharmaceuticals, food processing, and chemical engineering. Electrostatic charges can lead to significant losses through wall fouling, material clinging, clumping, and dust explosions. Addressing these issues is crucial for optimizing production and ensuring workplace safety.

The first Invited Speaker is Prof. Mojtaba Ghadiri, who will discuss the measurement and modeling of charge distribution resulting from aerodynamic dispersion, handling and conveying, and fluid bed operations. His talk will shed light on the underlying mechanisms of charge distribution and how the use of antistatic agents can significantly reduce charge levels.

The second Invited Speaker, Prof. Poupak Mehrani, will present her research on electrostatic charge generation in gas-solid processes, with a particular emphasis on gas-solid fluidized beds. Her current research areas cover multiphase reactor engineering and the challenges posed by electrostatic charges in these systems.

PROGRAM

- 14:00 **Welcome and introduction**
Prof. Pedro Llovera, Chair Working Party on Static Electricity in Industry, Energy Technological Institute, Polytechnic University of Valencia - Spain
Holger Grosshans, Physikalisch-Technische Bundesanstalt (PTB) - Germany
Giorgio Veronesi, EFCE President
- 14:15 **Triboelectrification of powders: measuring, modelling and manipulating**
Prof. Mojtaba Ghadiri, School of Chemical and Process Engineering, Univ. of Leeds - UK
- 15:00 **Operational challenges due to triboelectrification in gas-solid fluidized beds and potential mitigation techniques**
Prof. Poupak Mehrani, Faculty of Engineering, University of Ottawa - Canada
- 15:45 **Conclusion**
Holger Grosshans, Physikalisch-Technische Bundesanstalt (PTB) - Germany
Prof. Pedro Llovera, Chair Working Party on Static Electricity in Industry

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EFCE Spotlight Talks

Working Party on Education
Section on Sustainability

13
November
2024

09:00-11:15
CET



How to teach sustainabil(it)y

With an expected 9 billion people sharing this Earth in the future, sustainability and sustainable development are more important today than ever before. Chemical engineering in particular must provide tools to build not only an economically viable but also environmentally benign chemical industry. This Spotlight will focus on how the need for sustainability impacts what and how we teach the current and the next generation of chemical engineers.

PROGRAM

- 09:00 **Welcome and introduction**
Dr. Hermann Feise, Chair Working Party on Education
Prof. Juraj Kosek, Coordinator sub-section Education of the Section on Sustainability
Prof. Boelo Schuur, EFCE Scientific Vice-President
- 09:15 **Teaching sustainability for t-shaped chemical engineers: experiences from the Italian university system**
Prof. Piero Salatino, University of Naples Federico II - Italy
- 09:45 **Using the sustainability toolkit to support your teaching**
Dr Sarah Jayne Hitt, Engineering Professors Council
- 10:15 **Teaching transition technologies to third cycle students and industrial engineers**
Prof. Boelo Schuur, U. Twente – The Netherlands
- 10:45 **Wrap-up**
Dr. Hermann Feise, Chair Working Party on Education
Prof. Juraj Kosek, Coordinator sub-section Education of the Section on Sustainability

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EFCE Spotlight Talks

Working Party on
Polymer Reaction Engineering

13
November
2024

14:00-17:00
CET



Circularity and sustainability in the light of polymer reaction engineering

In 2022 more than 400 Mt of polymers were produced worldwide.¹ At the same time, fossil-based raw materials have to be replaced by renewables. This demonstrates the pressing need to establish a circular and sustainable economy for plastics. Research and development are progressing fast in this area. This includes investigation of various recycling technologies, like mechanical or chemical recycling, which finally have to be realized on huge scales. Moreover, bio-based materials as additional feedstock are of interest as well as biodegradable materials for specific applications. This Spotlight Talk Series presents current research activities in that field from the polymer reaction engineering community.

1 - Plastics Europe, Plastics – the fast facts 2023.

PROGRAM

- 14:00 **Welcome and introduction**
Markus Busch, Chair Working Party on Polymer Reaction Engineering, TU Darmstadt - Germany
Boelo Schuur, EFCE Scientific Vice-President
- 14:10 **Enabling sustainable polymers at scale**
Hannah Mangold, BASF SE - Germany
- 14:40 **Lignin and celluloses oxidation reactions – A new approach to reduce diffusional limitations**
João Moura Bordado, IST – Lisbon University - Portugal
- 15:10 **Progress in sustainability-driven polyolefin reaction engineering**
Pingwei Liu, Zhejiang University - China
- 15:40 **Mathematical modeling for biodegradable polymers**
Alexandr Zubov, UCT Prague - Czech Republic
- 16:10 **Polyolefin solutions for a sustainable future**
Ugur Agkün, LyondellBasell - Germany
- 16:40 **Panel discussion and final remarks**
Markus Busch, Chair Working Party on Polymer Reaction Engineering
Kristina Zentel, Secretary Working Party on Polymer Reaction Engineering

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EFCE Spotlight Talks

Working Party on Thermodynamics
and Transport Properties

14
November
2024

10:00-12:00
CET



Role of applied thermodynamics in a changing world (sustainability, energy transition, circularity)

Related to the resurrection of the Section on Sustainability, the theme of sustainability has been chosen as general umbrella for the talks.

We are living in times of strong focus on sustainability and energy transition. The products and services we want as consumers must be produced in more sustainable less energy demanding processes, making use of renewable feedstock, and emitting less waste and reducing the carbon footprint.

Thermodynamics is the science relating energy and matter, and as such it is instrumental in process & product design, in the end defining the sustainability profile of the targeted process and product.

In this context, the WP-TTP has chosen as topic for these Spotlight Talks: "Role of applied thermodynamics in a changing world (sustainability, energy transition, circularity)".

Three presentations will be given on various topics, emphasizing the role that (applied) thermodynamics plays in many areas of relevance to sustainability.

PROGRAM

- 10:00 **Welcome and introduction**
Prof. Maria-Grazia de Angelis, Chair Working Party on Thermodynamics, U. Edinburgh - UK
Dr. Christoph Held, TU Dortmund - Germany
Dr. Antoon ten Kate, Vice-Chair Working Party on Thermodynamics, ChemSpiration, Arnhem - Netherlands
Prof. Boelo Schuur, EFCE Scientific Vice-President
- 10:15 **Engineering of intensified CO₂ capture and electrocatalytic reduction systems: from solvent selection to pilot plant testing**
Dr. Athanasios Papadopoulos, PSDI,CPERI,CERTH, Thessaloniki - Greece
- 10:45 **Use of exergy for process retrofit and optimisation**
Dr. Raphaelle Thery, Laboratoire Génie Chimique, INP-ENSIACET, Toulouse - France
- 11:15 **Role of (applied) thermodynamics in the area of refrigerants**
Prof. Fèlix Llovell, Dep. Chemical Engineering, Univ. Rovira i Virgili (URV), Tarragona - Spain
- 11:45 **Discussion and conclusion**
Prof. Maria-Grazia de Angelis, Chair Working Party on Thermodynamics
Dr. Christoph Held, TU Dortmund - Germany
Dr. Antoon ten Kate, Vice-Chair Working Party on Thermodynamics
- 12:00 **Closure**

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EFCE Spotlight Talks

Section on
Early Career Chemical Engineers

14
November
2024

14:00-16:15
CET



Elevating your career: essential skills for professional growth

Are you an early career professional looking to complement your foundational knowledge in chemical engineering?

Join our Spotlight talk designed to help you identify essential skills and competencies for success in today's dynamic industry and academia. Expert speakers will share valuable insights and guide you on some of the necessary tools needed in the professional environment. Key topics include Lean & Six Sigma, Effective Communication, Design Thinking, and Startup Journey.

Don't miss this opportunity to invest in your career development and take your skills to the next level.

PROGRAM

- 14:00 **Welcome and introduction**
Silvie Mueller, Vice-Chair Section Early Career Chemical Engineers
Giorgio Veronesi, EFCE President
- 14:10 **Precision in practice: the impact of lean & six sigma methodologies**
Silvia Hinken, Merck KGaA
- 14:40 **Engineers communicating for fun and profit**
Dr. Jamie Cleaver
- 15:10 **Design thinking - an important bridge between research and industry**
Dr. Ann Shirin Mirsanaye, Likeminds
- 15:40 **The startup journey: from idea to company**
Dr. Francesco Maria Benedetti, Osmoses
- 16:10 **Conclusion**
Silvie Mueller, Vice-Chair Section Early Career Chemical Engineers

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