



Institut für Biotechnologie
Technische Universität Berlin
Bioverfahrenstechnik

BioProScale
DEVELOP · IMPROVE · SUSTAIN



IfGB

Institut für
Gärungsgewerbe
und Biotechnologie
zu Berlin

8th BioProScale Symposium

Scaling Down and Up of Bioprocesses: Strategies, Tools and Process Performance

APRIL 9-11, 2024

LANGENBECK-VIRCHOW-HAUS, BERLIN, GERMANY

- Industrial scale process performance and optimization
- Scale down and scale up of bioprocesses
- Process-driven cell performance
- Integrated bioprocesses
- Process analytical technologies (PAT)



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VENUE: LANGENBECK-VIRCHOW-HAUS, BERLIN, GERMANY

LANGUAGE: ENGLISH



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TUESDAY, 9 APRIL 2024

WELCOME ADDRESS AND PLENARY TALK

12:00 **Welcome address & introduction***Peter Neubauer, Technische Universität Berlin, Germany*12:20 **Plenary Talk: Proper scale down – a prerequisite for engineering robust microbial chassis and for model-based prediction of industrial scale performance (PL01)***Ralf Takors, University of Stuttgart, Germany*

SESSION 1: INDUSTRIAL SCALE PROCESS PERFORMANCE AND OPTIMIZATION

Chair Michael Schlüter / Lucas Kasperetz

13:05 **Model applications in scale-up of mammalian cell culture (CHO) processes (L01)***Emmanuel Anane, Fujifilm Diosynth Biotechnologies, Denmark*13:30 **Valorising syngas in a coupled fermentation via acetate: Techno-economic analysis for SCP production and pilot-scale implementation (L02)***Elodie Vlaeminck, Ghent University, Belgium*13:55 **Industry talks**14:15 *Coffee break & exhibition*14:45 **Optimizing bioreactors for microbial gas fermentation: An approach for sustainable valorization of industrial off-gas (L03)***Carolin Bokelmann, University of Stuttgart, Germany*15:10 **Analytical modeling of large-scale bioreactors with diffusion equations (L04)***Pauli Losoi, Tampere University, Finland*15:35 **Resolved particle Lattice-Boltzmann Large Eddy Simulation in a 15,000 L bioreactor to mimic Lagrangian sensor particles (L05)***Ryan Rautenbach, Hamburg University of Technology, Germany*

SESSION 2: PROCESS-DRIVEN CELL PERFORMANCE

Chair Robert Spann / Isabel Thiele

16:00 **Ecological forces dictate microbial community assembly processes in bioreactor systems (L06)***Susann Müller, Helmholtz Centre for Environmental Research, Leipzig, Germany*16:25 **Morphology control for supporting scalability of *Aspergillus niger* cultures (L07)***Tolue Kheirkhah, Technische Universität Berlin, Germany*16:50 *Coffee break & exhibition*17:20 **Transport-controlled growth decoupling for self-induced protein expression with a glycerol-repressible genetic circuit (L08)***Alvaro Lara, Aarhus University, Denmark*17:45 **Phenotypical heterogeneity in bioprocesses: Better think positive!? (L09)***Anna-Lena Heins, Hamburg University of Technology, Germany & Alexander Grünberger, Karlsruhe Institute of Technology, Germany*18:10 **Plenary Talk: Managing cell population entropy: Navigating from ecosystems to bioprocesses (PL02)***Frank Delvigne, University of Liège, Belgium*

EVENING PROGRAM

18:55 **Poster Session, Exhibition, Get-together for all participants***Langenbeck-Virchow-Haus, Foyer**We encourage all poster authors to be at their posters at least from 19:30-20:15 (even poster numbers) and 20:15-21:00 (odd poster numbers).*

21:00 End of day 1

WEDNESDAY, 10 APRIL 2024

9:00 Welcome & introduction*Peter Neubauer, Technische Universität Berlin, Germany***9:05 Plenary Talk: The role of bioeconomy on the path to net-zero (PL03)***Daniela Thrän, Helmholtz Centre for Environmental Research, Leipzig, Germany***SESSION 3: SCALE DOWN AND SCALE UP OF BIOPROCESSES**

Chair Alvaro Lara / Tolue Kheirkhah

9:50 Integrating hybrid modelling and transfer learning for novel bioprocess predictive modelling (L10)*Harry Kay, University of Manchester, United Kingdom***10:15 Small scale models for process intensification: How to migrate a months-long perfusion process to intensified fed-batch (L11)***Lena Tholen, FyoniBio GmbH, Berlin, Germany***10:40 Industry talks**10:55 *Coffee break & exhibition***SESSION 4: SCALE DOWN AND SCALE UP OF BIOPROCESSES**

Chair Ralf Takors / Annina Kemmer

11:25 Scale-up of stem cell cultures from shake flask to bioreactor: A CFD-based comparison of hydrodynamic stress (L12)*Ramon van Valderen, Delft University of Technology, The Netherlands***11:50 Fully automated growth media optimization employing a new Machine Learning algorithm (L13)***Frédéric Lapiere, Munich University of Applied Sciences, Germany***12:15 Robustness of microbial functions in dynamic environments: A microfluidic approach (L14)***Luisa Blöbaum, Bielefeld University, Germany*12:40 *Lunch break, poster session & exhibition***14:00 Plenary Talk: Towards closed-loop bioprocess development: Robotic workflows for automated Design-Build-Test-Learn cycle (PL04)***Marco Oldiges, Forschungszentrum Jülich, Germany***SESSION 5: SCALE DOWN AND SCALE UP OF BIOPROCESSES**

Chair Klaus Pellicer / Niels Krausch

14:45 Human induced pluripotent stem cell scale-up and expansion under consideration of bioengineering aspects (L15)*Misha Teale, Zurich University of Applied Sciences, Switzerland***15:10 Workflow automation for reproducible high-throughput cultivations (L16)***Lucas Kaspersetz, Technische Universität Berlin, Germany*15:35 *Coffee break & exhibition***SESSION 6: PROCESS ANALYTICAL TECHNOLOGIES (PAT)**

Chair Regine Eibl-Schindler / Simon Täuber

16:05 Innovative sensor solutions for bioprocess monitoring: Design and implementation (L17)*Aliyeh Hasanzadeh, Technical University of Denmark, Copenhagen, Denmark***16:30 Gasphase-based bioprocess monitoring by untargeted volatilomics with gas chromatography – ion mobility spectrometry (GC-IMS) (L18)***Joscha Christmann, Mannheim University of Applied Science, Germany*

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16:55	Lensfree microscopy for real-time bioprocess monitoring in PAT: Holographic reconstruction and fluorescence integration (L19) <i>Phil Thiel, Leibniz University Hannover, Germany</i>
17:20	Online monitoring of protein refolding in inclusion body processing using intrinsic fluorescence (L20) <i>Eva Prada, TU Wien, Austria</i>
17:45	Multi parameter sensors and dissolved oxygen (DO) sensor pills for shake flasks: Removing black boxes for improved bioprocess development (L21) <i>Christina Dickmeis, Scientific Bioprocessing Inc., Baesweiler, Germany</i>
18:00	Off-gas analysis in shake flasks (L22) <i>Andreas Schulte, Kuhner Shaker GmbH, Herzogenrath, Germany</i>
18:15	End of presentation program

EVENING PROGRAM

19:30	Symposium Dinner <i>ERDINGER am Gendarmenmarkt, Jägerstraße 56, 10117 Berlin, erdingerberlin.de (by invitation or separate booking only)</i>
22:30	End of day 2

THURSDAY, 11 APRIL 2024

9:00	Welcome & introduction <i>Peter Neubauer, Technische Universität Berlin, Germany</i>
9:05	Plenary Talk: How fundamental research on multiphase flows can support a reliable scale up (PL05) <i>Michael Schlüter, Hamburg University of Technology, Germany</i>

SESSION 7: INTEGRATED BIOPROCESSES

Chair Marco Oldiges / Saskia Waldburger

9:50	Towards a circular bioeconomy: Polyhydroxyalkanoate bioplastic production (L23) <i>Sebastian Riedel, Berliner Hochschule für Technik, Germany</i>
10:15	Multiscale modelling of polyhydroxyalkanoate biopolymer production (L24) <i>Stefanie Duvigneau, MPI for Dynamics of Complex Technical Systems, Magdeburg, Germany</i>
10:40	Coffee break & exhibition

SESSION 8: INTEGRATED BIOPROCESSES

Chair Stefan Junne / Lara Santolin

11:10	Production of PUFAs from dark fermentation effluent with <i>Schizochytrium limacinum</i> SR21 (L25) <i>Simon Täuber, Technische Universität Berlin, Germany</i>
11:35	Bioprocess optimization for lactic and succinic acid production from a pulp and paper industry side stream (L26) <i>Agata Olszewska-Widrat, Leibniz Institute for Agricultural Engineering and Bioeconomy, Potsdam, Germany</i>
12:00	Is it possible to produce cultured meat at a farm? Scale-up strategy and realization aspects (L27) <i>Nico Oosterhuis, Respect Farms BV, Den Haag, The Netherlands</i>
12:25	Lunch break, poster session & exhibition
14:00	Plenary Talk: Single-use bioreactors: Applications and scaling-up (PL06) <i>Regine Eibl-Schindler, Zurich University of Applied Sciences, Switzerland</i>

SESSION 9: SCALE DOWN AND SCALE UP OF BIOPROCESSES

Chair Cees Haringa / Sarah Westarp

14:45 **Scalable microbioreactor system enabling efficient *Pichia pastoris* clone screening for production of biopharmaceuticals (L28)***Eva Maria Palmqvist, Sanofi-Aventis GmbH, Frankfurt, Germany*15:10 **Automating the DBTL-cycle for *E. coli*: Integration of modular cloning, CRISPR-Cas9 and proteomics for advanced strain engineering (L29)***Tim Stoltmann, Forschungszentrum Jülich, Germany*15:35 **Model-based scaling strategies of *Pseudomonas putida* fed-batch fermentations (L30)***Helena Junicke, Technical University of Denmark, Copenhagen, Denmark*16:00 **Closing remarks and awards for the three best posters and talks by young scientists***Peter Neubauer, Technische Universität Berlin*16:20 *End of symposium*

AFTER SYMPOSIUM EXCURSION

17:30 **Visit to the laboratory of the Chair of Bioprocess Engineering, TU Berlin, Ackerstraße 76, 13355 Berlin***For those interested to visit the Pilot Plant and High Throughput Bioprocess Development (KIWI-biolab) at TU Berlin, we will organize a small tour following the closure of the symposium. The tour includes:**Pilot Plant includes stainless steel bioreactors from 1L to 100L and a 200 L CELL-tainer single use system for pilot-scale production, a Flonamics automatic sampling system and cutting-edge process analytical tools (PAT, e.g. in-situ / in-line technologies for particle / cell analysis, namely Photon Density Wave spectroscopy and SOPAT microscopy). Also new approaches for process monitoring systems are developed.**At KIWI-biolab we are pioneering the development of innovative bioprocesses through automation, AI integration and advanced analytics. During your visit, we will share insights, discuss potential collaborations, and explore how our expertise can complement each other. If you have any questions or would like to explore something specific during your visit, please feel free to contact mariano.n.cruzbournazou@tu-berlin.de.**The number of participants is limited to 40. Please register before (no extra charge) at*18:30 *End*

Attendance fees

	Full conference ticket
Participant from industry	1290 € incl. VAT
Participant from a scientific institution	690 € incl. VAT
PhD/MSc Student (against valid proof)	350 € incl. VAT

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SCIENTIFIC POSTERS

- P01: Towards a biological-driven bioprocess development**
Nadja Alina Henke, Karlsruhe Institute of Technology, Germany
- P02: Creating a closed process semi-automated workflow for human MSC Expansion, harvest, and final fill**
Julien Muzard, Entegris
- P03: Mimicking large-scale mixing times in a laboratory scale single multi compartment bioreactor**
Jonas Barczyk, Stuttgart University, Germany
- P04: CFD-guided scale-down for end-in-mind bioreactor development: from 2000 L to 2 L**
Miki Segami, Delft University of Technology, Biotechnology
- P05: CFD simulation of pH gradients and their effect on ester hydrolysis by *Candida antarctica* lipase B**
Caroline Hamelmann, Technical University of Denmark - DTU, Denmark
- P06: Challenges of bioprocess scale-down on an automated platform**
Linda Lantian Cai, TU Berlin, Germany
- P07: Microfluidic single-cell cultivation: A game-changer in predicting bioprocess scalability?**
Julian Schmitz, Bielefeld University, Germany
- P08: Bridging the protein gap using single cell protein**
Koen Verhagen, dsm-firmenich, Science, Research & Innovation
- P09: Robustness characterization of AMP producing *C. glutamicum* strains on single-cell level**
Yannick Scholz, Karlsruhe Institute of Technology, Germany
- P10: Analysis and control of expression heterogeneity of microbial gene circuits on a single-cell level**
Boris Yermakov, Karlsruhe Institute of Technology, Germany
- P11: Scaling-up of microbial biomass production, with immunomodulating potential**
Mihaela Palela, The National Institute of Medical-Military Research and Development, Bucharest, Romania
- P12: Design and optimization of animal component-free media for plasmid DNA production in *E. coli***
Kyle Probst, Kerry, Beloit, WI, USA
- P13: From microtiter plate to fermenter: Scale-up of a *Vibrio natriegens* fed-batch process**
Clara Lühtrath, RWTH Aachen University, Germany
- P14: Process characterization across scales of an industrial *Aspergillus oryzae* aerobic fed-batch fermentation Process**
Mariana Albino, Technical University of Denmark - DTU, Denmark
- P15: Intensified proliferation of BY-2 plant cells in structurally modified culture bags for wave-mixed single-use bioreactor**
Mateusz Bartczak, Warsaw University of Technology, Poland
- P16: Development of an automated online flow cytometry method to quantify cell density and fingerprint bacterial communities**
Juan Lopez Galvez, Helmholtz-Zentrum für Umweltforschung, Angewandte Mikrobielle Ökologie
- P17: To feed or not to feed? The challenges of glycerol fed-batch for *Pichia pastoris* expression in shake flasks**
Christina Dickmeis, Scientific Bioprocessing Inc., Baesweiler, Germany
- P18: Effect of cell culture production methods on the survival of probiotic yeast *Saccharomyces cerevisiae* var. *boulardii* in gut-like conditions**
Dorotea Rzechonek, Chalmers University of Technology, Sweden
- P19: Elementary Flux Mode Analysis predicts co-culture stability in continuous bioprocesses**
Juan Andres Martinez Alvarez, Université de Liège, Belgium
- P20: Benefits of Off-gas Analysis – Improved volume calculation for fermentations by monitoring the absolute humidity**
Nils Arto, BlueSens gas sensor GmbH, Development
- P21: Oxygen transfer in non-Newtonian liquids**
Emilie Overgaard Willer, Technical University of Denmark - DTU, Denmark
- P22: Membrane-free dissolved hydrogen monitoring in hydrolytic and methanogenic bioprocesses**
Eike Janesch, TU Berlin, Germany
- P23: Investigating signal attenuation in raman spectra of bacterial fermentations**
Christoph Lange, TU Berlin, Germany
- P24: Mathematical modelling of the oxygen transfer rate (OTR) as a first step towards the development of a digital twin**
Marc Lemperle, Technical University of Denmark - DTU, Denmark
- P25: Digital twin modeling of a pilot-plant disk centrifuge in GFPUV production downstream**
Alina Anamaria Malanca, Technical University of Denmark - DTU, Denmark
- P26: Robust tube-based MPC for controlling bioprocesses under uncertainty**
Niels Krausch, TU Berlin, Germany
- P27: Potential of predictive model-based dissolved oxygen control for intermittent fed-batch processes**
Philipp Pably, Technical University of Denmark - DTU, Denmark
- P28: Machine learning based compartment models for dynamic simulation of heterogeneous fed-batch processes**
Hector Maldonado, Delft University of Technology, The Netherlands
- P29: Accelerating Bioprocess Optimization and Scale-Up for a CHO Cell Culture Process Using Digital Models**
Jannik Richter, Leibniz University Hannover, Germany
- P30: Enzyme-Mediated Exponential Glucose Release: A Model-Based Strategy for Continuous Defined Fed-Batch in Small-Scale Cultivations**
Annina Kemmer, TU Berlin, Germany
- P31: Real-time Analysis of Multicomponent Bioprocesses Using Raman Spectroscopy and RAMANMETRIXTM**
Jörg Weber, Biophotonics Diagnostics GmbH
- P32: An open access platform for bioreactor**
Xiyang Li, Technical University of Denmark - DTU, Denmark
- P33: Data Management in Automated transdisciplinary laboratories**
Simon Seidel, TU Berlin, Germany
- P34: Silicon-based photonic biosensors for label-free detection of microorganisms**
Philipp Schrenk, TU Berlin, Germany

SCIENTIFIC POSTERS

- P35: Mechanistic soft-sensor design for protein refolding processes based on intrinsic fluorescence measurements**
Florian Gisberg, TU Wien, Austria
- P36: Developing a low cost, highly parallel, scalable, bacterial protein production workflow based on single-use bubble column reactors**
Nathan Wright, University of Oxford, United Kingdom
- P37: Secretory production of bifunctional proteins with *Corynebacterium glutamicum***
Vera Waffenschmidt, Forschungszentrum Jülich, Germany
- P38: Accelerated secretion efficiency screening for the production of microplastic-binding peptides in *C. glutamicum***
Rebecca Hamel, Forschungszentrum Jülich, Germany
- P39: Development of a non-canonical amino acid-labeled [NiFe]-hydrogenase production system in *Escherichia coli***
Qin Fan, TU Berlin, Germany
- P40: Heterologous production of an active hydrogenase using lactose-based autoinduction**
De La Fuente Kratzborn Francisco, TU Berlin, Germany
- P41: Bioprocess development to produce a hyperthermostable S-methyl-5'-thioadenosine phosphorylase in *Escherichia coli***
Julia Schollmeyer, TU Berlin, Germany
- P42: Characterization and optimization of peroxidase production in *Komagataella phaffii* with accelerated bioprocess development through automation and miniaturization**
Christian Wagner, Forschungszentrum Jülich, Germany
- P43: Automated strain library screening and bioprocess optimization of heterologous production of sakacin P in *Corynebacterium glutamicum***
Lisa Prigolovkin, Forschungszentrum Jülich, Germany
- P44: Advanced workflows for the systematic identification of metabolic optimization targets in DBTL-cycles: A demonstrator for producing aromatic compounds in *C. glutamicum***
Niels Hollmann, Forschungszentrum Jülich, Germany
- P45: Trans-cinnamic acid production by whole-cell biotransformation of recombinant *Pseudomonas putida* KT2440**
Sompot Antimanon, Technical University of Denmark - DTU, Denmark
- P46: Biosynthesis of phenazine-1-carboxylic acid in *Pseudomonas chlororaphis* DSM19603 through media factor optimization and genetic engineering**
Anne Clausen, Aalborg University Esbjerg, Denmark
- P47: Lactic acid production from tropical agro-food waste. An overview to opportunities in Cuba**
Anabel V Sánchez-Díaz, Universidad Tecnológica de La Habana José A. Echeverría, Cuba
- P48: Purine nucleoside antibiotics: recent synthetic advances harnessing chemistry and biology**
Jonas Motter, TU Berlin, Germany
- P49: Biocatalytic nucleobase diversification of 4'-thianucleosides and de novo RNA synthesis detection with 5-ethynyl-4'-thiouridine in proliferating HeLa cells**
Sarah von Westarp, TU Berlin, Germany
- P50: Design of a production process for resistance structures and metabolites of *Metarhizium robertsii* MT008 for the control of *Anastrepha obliqua* through submerged fermentation on a laboratory scale using agroindustrial waste**
Ginna Quiroga, Agrosavia, Bioproducts
- P51: Opportunities of waste bioprocessing towards a circular approach in Cuba**
Ileana Pereda-Reyes, Universidad Tecnológica de La Habana José A. Echeverría, Cuba
- P52: Substituting raw materials: Animal by-product streams for polyhydroxyalkanoate production**
Saskia Waldburger, TU Berlin, Germany
- P53: Polyhydroxyalkanoate production by *Cupriavidus necator* using apple juice residues**
Lena Kranert, Otto-von-Guericke-Universität Magdeburg, Germany
- P54: Microbially produced monomers for biopolymers: Bioprocess development for 2-oxoglutarate production with *Corynebacterium glutamicum***
Lars Halle, Forschungszentrum Jülich, Germany
- P55: A comparative study of Python and Julia programming for downstream process simulation**
Fiammetta Caccavale, Technical University of Denmark, Lyngby
- P56: Optimisation of the oxygen regime for the accelerated production of kombucha with defined co-cultures**
Marie Ludszuweit, VLB Berlin
- P57: Cost-to-go model predictive control for enhanced optimization of bioprocesses**
Don Fabian Müller, Competence Center CHASE GmbH, Linz, Austria

Best Poster & Presentation Award supported by:

