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INM COLLOQUIUM

"MECHANISTIC MODELS ACROSS SCALES FOR BIO-BASED PRODUCTION PROCESSES"

Prof. Dr. Krist V. Gernaey
Technical University of Denmark, Lyngby, DNK

Tuesday, April 02, 2019, 11:00 am

INM, Leibniz-Saal, Campus D2 5
Gastgeber: Dr. Marcus Koch

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Mechanistic models have the drawback that they require a significant investment of time and resources before a validated mathematical model is available, and this has traditionally been used as one of the arguments to discourage mechanistic modelling studies. However, we believe that application of such mechanistic models to multiple stages of fermentation process development and operation can anyhow make this investment highly valuable for industry and academia:

In industry, an established fermentation model may be adapted for application to different stages of fermentation process development: planning, process design, monitoring, and control. Although a longer development time is required, this wide range of applications makes these models a highly valuable tool for fermentation research and development.

In a research environment, collaboration is important, and developing mechanistic models provides a platform for knowledge sharing and consolidation of existing process understanding.

The presentation will be built around a few recent case study examples, where each case study serves the purpose of illustrating a specific aspect of the mathematical modelling of bio-based production processes:

Mechanistic modelling of electrochemical biosensors, where the model is used to unravel the exact mechanism driving the electrochemical reactions, and to identify critical system parameters affecting the biosensor response. The latter information can then be used in the search for improved device designs.

Computational Fluid Dynamics (CFD), generally used as a tool for the description of reactor hydrodynamics, but will here be presented as a modelling framework forming the basis for the development of compartment and scale-down models.

In conclusion, the practical usefulness of mathematical modelling and the need for model validation is illustrated on the basis of the case studies, and aspects such as model modularity and model reuse are highlighted in view of achieving an efficient and streamlined model-building process.

SHORT BIO

MSc (1993) and PhD (1997) from Ghent University (Belgium). PhD research focused on monitoring of wastewater systems.
Postdoc positions at Ghent University, École Polytechnique de Montreal, DTU Chemical Engineering and Lund University from 1998 until 2005, mainly performing research on modelling, simulation and control of wastewater systems.
Associate professor at DTU Chemical Engineering since 2005.
Professor in industrial fermentation technology ("The Novozymes professor") since 2013.
Head of the Process and Systems Engineering Center (PROSYS) (http://www.kt.dtu.dk/english/research/prosys) since 2014.
CEO of Bioscavenge ApS since 2017, a company with focus on sustainability and resource recovery. Currently supervising 10 PhD students and 8 postdocs / senior researchers.
Current research with focus on large-scale fermentation, mathematical modelling, investigation of mass transfer issues across scales, application and development of computer-aided tools for elucidation of (bio)process kinetics, and process simulation.

You are invited to have coffee with the speaker 15 minutes before the talk starts.

KONTAKT

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