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Special Issue Reprint

Hybrid Modelling and Multi-Parametric Control of Bioprocesses

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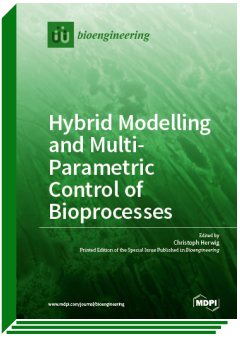

The goal of bioprocessing is to optimize process variables, such as product quantity and quality, in a reproducible, scalable, and transferable manner. However, bioprocesses are highly complex. A large number of process parameters and raw material attributes exist, which are highly interactive, and may vary from batch to batch. Those interactions need to be understood, and the source of variance must be identified and controlled.

While purely data-driven correlations, such as chemometric models of spectroscopic data, may be employed for the understanding how process parameters are related to process variables, they can hardly be deployed outside of the calibration space. Currently, mechanistic models, models based on mechanistic links and first principles, are in the focus of development. They are perceived to allow transferability and scalability, because mechanistics can be extrapolated. Moreover, the models deliver a large range of hardly-measureable states and physiological parameters.

The current Special Issue wants to display current solutions and case studies of development and deployment of hybrid models and multi-parametric control of bioprocesses. It includes:

- Models for Bioprocess Monitoring
- Model for Bioreactor Design and Scale Up
- Hybrid model solutions, combinations of data driven and mechanistic models.
- Model to unravel mechanistic physiological regulations
- Implementation of hybrid models in the real-time context
- Data science driven model for process validation and product life cycle management

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