

Development of Sustainable **Bioprocesses**

Modeling and Assessment



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**Mette Ramsgaard Thomsen, Carlo
Ratti, Martin Tamke**



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Development of Sustainable Bioprocesses Elmar Heinzle, Arno P. Biwer, Charles L. Cooney, 2007-01-11 Bioprocess technology involves the combination of living matter whole organism or enzymes with nutrients under laboratory conditions to make a desired product within the pharmaceutical food cosmetics biotechnology fine chemicals and bulk chemicals sectors Industry is under increasing pressure to develop new processes that are both environmentally friendly and cost effective and this can be achieved by taking a fresh look at process development namely by combining modern process modeling techniques with sustainability assessment methods *Development of Sustainable Bioprocesses Modeling and Assessment* describes methodologies and supporting case studies for the evolution and implementation of sustainable bioprocesses Practical and industry focused the book begins with an introduction to the bioprocess industries and development procedures Bioprocesses and bioproducts are then introduced together with a description of the unit operations involved Modeling procedures a key feature of the book are covered in chapter 3 prior to an overview of the key sustainability assessment methods in use environmental economic and societal The second part of the book is devoted to case studies which cover the development of bioprocesses in the pharmaceutical food fine chemicals cosmetics and bulk chemicals industries Some selected case studies include citric acid biopolymers antibiotics biopharmaceuticals Supplementary material provides hands on materials so that the techniques can be put into practice These materials include a demo version of SuperPro Designer software used in process engineering and models of all featured case studies excel sheets of assessment methods Monte Carlo simulations and exercises Previously available on CD ROM the supplementary material can now be accessed via <http://booksupport.wiley.com> by entering the author name book title or isbn and clicking on the desired entry This will then give a listing of all the content available for download Please read any text files before downloading material

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Biopharmaceutical Manufacturing Ralf Pörtner, 2024-01-10 This volume Cell Engineering 11 Biopharmaceutical Manufacturing Progress Trends and Challenges is a source of the latest innovative research and technical development in biomanufacturing systems It is organised into 2 parts 1 Manufacturing of recombinant therapeutic proteins e g therapeutic antibodies biosimilars biogenerics and 2 Manufacturing aspects of cell and gene therapy Each with selected chapters on the following topics for both up and downstream such as Advanced process strategies especially continuous manufacturing Advanced culture techniques especially single use systems Process transfer scale up scale down models Processing advances Manufacturing productivity efficiency Model assisted process understanding and development Digital Twins Process controls and analytics Quality control Quality by design Facility design and full scale commercial systems manufacturing technology innovation The book comprises contributions of experts from academia and industry active in the field of cell culture development for the production of recombinant proteins cell therapy and gene therapy with consideration of Digital Twin s and facility design The

knowledge and expertise of the authors cover disciplines like cell biology engineering biotechnology and biomedical sciences. Inevitably some omissions will occur in the text but the authors have sought to avoid duplications by extensive cross referencing to chapters in other volumes of this series and elsewhere. We hope the volume provides a useful compendium of techniques for scientists in industrial and research laboratories active in this field.

Continuous Manufacturing of Pharmaceuticals Peter Kleinebudde, Johannes Khinast, Jukka Rantanen, 2017-07-14. A comprehensive look at existing technologies and processes for continuous manufacturing of pharmaceuticals. As rising costs outpace new drug development the pharmaceutical industry has come under intense pressure to improve the efficiency of its manufacturing processes. Continuous process manufacturing provides a proven solution. Among its many benefits are minimized waste energy consumption and raw material use, the accelerated introduction of new drugs, the use of smaller production facilities with lower building and capital costs, the ability to monitor drug quality on a continuous basis and enhanced process reliability and flexibility. *Continuous Manufacturing of Pharmaceuticals* prepares professionals to take advantage of that exciting new approach to improving drug manufacturing efficiency. This book covers key aspects of the continuous manufacturing of pharmaceuticals. The first part provides an overview of key chemical engineering principles and the current regulatory environment. The second covers existing technologies for manufacturing both small molecule based products and protein peptide products. The following section is devoted to process analytical tools for continuously operating manufacturing environments. The final two sections treat the integration of several individual parts of processing into fully operating continuous process systems and summarize state of art approaches for innovative new manufacturing principles. Brings together the essential know how for anyone working in drug manufacturing as well as chemical food and pharmaceutical scientists working on continuous processing. Covers chemical engineering principles regulatory aspects primary and secondary manufacturing process analytical technology and quality by design. Contains contributions from researchers in leading pharmaceutical companies the FDA and academic institutions. Offers an extremely well informed look at the most promising future approaches to continuous manufacturing of innovative pharmaceutical products. Timely comprehensive and authoritative. *Continuous Manufacturing of Pharmaceuticals* is an important professional resource for researchers in industry and academe working in the fields of pharmaceuticals development and manufacturing.

Biological Reaction Engineering Elmar Heinzle, Irving J. Dunn, John Ingham, Jiří E. Přenosil, 2021-04-14. This practical book presents the modeling of dynamic biological engineering processes in a readily comprehensible manner using the unique combination of simplified fundamental theory and direct hands on computer simulation. The mathematics is kept to a minimum and yet the 60 examples illustrate almost every aspect of biological engineering science with each one described in detail including the model equations. The programs are written in the modern user friendly simulation language Berkeley Madonna which can be run on both Windows PC and Power Macintosh computers. Madonna solves models comprising many ordinary differential equations using very

simple programming including arrays It is so powerful that the model parameters may be defined as sliders which allow the effect of their change on the model behavior to be seen almost immediately Data may be included for curve fitting and sensitivity or multiple runs may be performed The results can be viewed simultaneously on multiple graph windows or by using overlays The examples can be varied to fit any real situation and the suggested exercises provide practical guidance The extensive teaching experience of the authors is reflected in this well balanced presentation which is suitable for the teacher student biochemist or the engineer *Chemicals from Biomass* Debalina Sengupta,Ralph W. Pike,2012-07-05

Chemicals from Biomass Integrating Bioprocesses into Chemical Production Complexes for Sustainable Development helps engineers optimize the development of new chemical and polymer plants that use renewable resources to replace the output of goods and services from existing plants It also discusses the conversion of those existing plants into faci **Preparative**

Chromatography for Separation of Proteins Arne Staby,Anurag S. Rathore,Satinder Ahuja,2017-03-06 *Preparative Chromatography for Separation of Proteins* addresses a wide range of modeling techniques strategies and case studies of industrial separation of proteins and peptides Covers broad aspects of preparative chromatography with a unique combination of academic and industrial perspectives Presents Combines modeling with compliance using of Quality by Design QbD approaches including modeling Features a variety of chromatographic case studies not readily accessible to the general public Represents an essential reference resource for academic industrial and pharmaceutical researchers *21st European Symposium on Computer Aided Process Engineering* E. N. Pistikopoulos,Michael C. Georgiadis,Antonis C.

Kokossis,2011-07-21 The European Symposium on Computer Aided Process Engineering ESCAPE series presents the latest innovations and achievements of leading professionals from the industrial and academic communities The ESCAPE series serves as a forum for engineers scientists researchers managers and students to present and discuss progress being made in the area of computer aided process engineering CAPE European industries large and small are bringing innovations into our lives whether in the form of new technologies to address environmental problems new products to make our homes more comfortable and energy efficient or new therapies to improve the health and well being of European citizens Moreover the European Industry needs to undertake research and technological initiatives in response to humanity s Grand Challenges described in the declaration of Lund namely Global Warming Tightening Supplies of Energy Water and Food Ageing Societies Public Health Pandemics and Security Thus the Technical Theme of ESCAPE 21 will be Process Systems Approaches for Addressing Grand Challenges in Energy Environment Health Bioprocessing Nanotechnologies *Design for Rethinking Resources* Mette Ramsgaard Thomsen,Carlo Ratti,Martin Tamke,2023-11-16 The book provides new perspectives from leading researchers accentuating and examining the central role of the built environment in conceiving and implementing multifaceted solutions for the complex challenges of our understanding of planetary resources and circularity revealing critical potentials for architecture and design to contribute in more informed and long term ways to the urgent transition of

our society The book offers a compilation of peer reviewed papers that uniquely connects knowledge broadly across practice and academia from the newest technologies and methods such as the role of digital modelling analysis and fabrication in circular design i e material passports cyber physical augmentation and LCA to the potentials of growing and harvesting biomass materials engaging waste streams in material production and more all in context of economic social and ecological potentials and consequences The book is part of a series of six volumes that explore the agency of the built environment in relation to the SDGs through new research conducted by leading researchers The series is led by editors Mette Ramsgaard Thomsen and Martin Tamke in collaboration with the theme editors Design for Climate Adaptation Billie Faircloth and Maibritt Pedersen Zari Design for Rethinking Resources Carlo Ratti and Mette Ramsgaard Thomsen Eds Design for Resilient Communities Anna Rubbo and Juan Du Eds Design for Health Arif Hasan and Christian Benimana Eds Design for Inclusivity Magda Mostafa and Ruth Baumeister Eds Design for Partnerships for Change Sandi Hilal and Merve Bedir Eds

Lignin-driven Advanced Materials Meysam Madadi, Mahdy Elsayed, Mortaza Aghbashlo, Meisam Tabatabaei, 2025-10-31 Lignin driven Advanced Materials The State of the Art offers a pioneering approach to address the multifaceted challenges in the production of lignin derived materials This comprehensive book covers the creation of value added products such as carbon materials nanoparticles energy storage materials and bioplastics It promotes collaboration between academia and industry bridging the gap between theoretical knowledge and practical expertise Featuring advanced lignin isolation techniques tools for lignin characterization and pragmatic aspects of lignin based materials the book incorporates the latest research and industrial advancements Additionally the book addresses the contentious questions surrounding lignin isolation techniques providing advanced strategies that have the potential to replace conventional methods in the industry It serves as a comprehensive resource for analytical tools for lignin characterization and presents solutions for more in depth knowledge Furthermore it aims to improve economic viability and sustainability in lignocellulosic biomass utilization and guides sustainable decision making with environmental and economic assessments This book is a vital resource for those exploring advancements in lignin based materials Gives access to comprehensive insights and cutting edge knowledge in the field of lignin research characterization tools and sustainable lignin driven materials production processes Provides practical solutions and applications that bridge the gap between theoretical knowledge and real world industrial practices Offers tools and methodologies for conducting environmental and economic assessments empowering researchers and professionals to make informed sustainable decisions in lignin driven materials production processes

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