

Elmar Heinzle, Irving J. Dunn,
John Ingham, and Jiří E. Přenosil

Biological Reaction Engineering

Dynamic Modeling Fundamentals
With 80 Interactive Simulation Examples
Third, Completely Revised and Enlarged Edition



Biological Reaction Engineering Dynamic Modelling Fundamentals With Simulation Examples

Irving J. Dunn



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Biological Reaction Engineering Elmar Heinzle, Irving J. Dunn, John Ingham, Jiří E. Přenosil, 2021-04-06 Die Dynamik biotechnologischer Produktionsprozesse ist u erst komplex Ziel des Buches ist es diese Vorg nge durch systematische Modellbildung und Computersimulation verst ndlich und durchschaubar zu machen Es werden ohne viel mathematisches R stzeug Grundprinzipien erkl rt und anhand von zahlreichen praxisrelevanten Beispielen alle wichtigen Aspekte der Bioverfahrenstechnik ausf hrlich beschrieben Modellerte biologische Systeme reichen vom einzelnen Enzym bis zu ganzen metabolischen Netzwerken und Multi Organismen Systemen Die kinetischen Modelle werden mit Reaktormodellen kombiniert was oft mit verschiedenen Konfigurationen von Zu und Abl ufen und Stofftransportprozessen kombiniert ist In vielen Beispielen werden Regelung und Optimierung der Prozesse behandelt Die Simulationsbeispiele reichen von theoretischen Schulbeispielen bis zu aktuellen Forschungsarbeiten Die verwendete Simulationssprache Berkeley Madonna erlaubt nach einer sehr kurzen Einarbeitung ein schnelles interaktives ben Der Leser kann die vorgegebenen Beispiele beliebig ver ndern um sie seinem Problemfall anzupassen Die langj hrige Lehrerfahrung der Autoren an Hochschulen und Weiterbildungskursen spiegelt sich in dem Buch wider und macht es geeignet f r alle Biochemiker Biotechnologen Bioingenieure und Verfahrenstechniker die an Modellierung und Simulation interessiert sind Die eingesetzte Software Berkeley Madonna f r Mac und PC kann direkt von der Berkeley Madonna Webseite bezogen werden www.berkeleymadonna.com Zus tzliches Online Material d h Programme f r alle Simulationsbeispiele eine kurze Beschreibung der Verwendung der eingesetzten Simulationssoftware Berkeley Madonna und L sungen von bungsaufgaben kann als Zusatzmaterial Zip Datei direkt von dieser Webseite heruntergeladen werden Alle Beispiele k nnen auch mit der kostenlosen Demo Version von Berkeley Madonna ben tzt werden F r K ufer des Buches ist Berkeley Madonna zu einem reduzierten Preis erh ltlich Hinweise dazu gibt es im Anhang des Buches

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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 Optimization of Biological Sulphate Reduction to Treat Inorganic Wastewaters Joana Cassidy, 2020-04-27 This work investigated two different approaches to optimize biological sulphate reduction in order to develop a process control strategy to optimize the input of an electron donor and to study how to increase the feasibility of using a cheap carbon source Feast famine regimes applied to design the control strategy were shown to induce the accumulation of storage compounds in the sulphate reducing biomass This study showed that delays in the response time and a high control gain can be considered as the most critical factors affecting a sulphide control strategy in bioreactors The delays are caused by the induction of different metabolic pathways in the anaerobic sludge including the accumulation of storage products On this basis a mathematical model was developed and validated This can be used to develop optimal control strategies In order to understand the microbial pathways in the anaerobic oxidation of methane coupled to sulphate reduction AOM SR diverse potential electron donors and acceptors were added to in vitro incubations of an AOM SR enrichment at high pressure Acetate was formed in the control group probably resulting from the reduction of CO₂ These results support the hypothesis that acetate may serve as an intermediate in the AOM SR process **Comprehensive Biotechnology**, 2019-07-17 Comprehensive Biotechnology Third Edition Six Volume Set unifies in a single source a huge amount of information in this growing field The book covers scientific fundamentals along with engineering considerations and applications in industry agriculture medicine the environment and socio economics including the related government regulatory overviews This new edition builds on the solid basis provided by previous editions incorporating all recent advances in the field since the second edition was published in 2011 Offers researchers a one stop shop for information on the subject of biotechnology Provides in depth treatment of relevant topics from recognized authorities including the contributions of a Nobel laureate Presents the perspective of researchers in different fields such as biochemistry agriculture engineering biomedicine and environmental science **Simultaneous**

Sulfate Reduction and Metal Precipitation in an Inverse Fluidized Bed Reactor Denys Kristalia Villa Gómez, 2022-01-26 Industrial activities like textile processing and mining are typical sources of heavy metal rich wastewaters The sulfate reducing process has become an attractive method for the production of sulfide to precipitate metals since most of these streams also contain sulfate which is the electron acceptor and in less common cases chemical oxygen demand which is the electron donor of sulfate reducing bacteria The inverse fluidized bed IFB reactor is a system for the production of biogenic sulfide and metal precipitation in the same unit due to its configuration the biomass floats on top of the reactor whereas metal sulfide precipitates settle and thus can be recovered at the bottom The main objective of this thesis was to elucidate the factors affecting simultaneous sulfate reduction and precipitation of heavy metals in an IFB reactor in order to optimize the metal recovery from wastewaters such as acid mine drainage Therefore this thesis focused on varying different

operational conditions to study their effect on the solid liquid separation and purity of the metal sulfide precipitates as well as on their effect on the sulfate reducing process Furthermore one chapter was focused on the study of strategies for sulfide control in the IFB reactor In addition recommendations for further research to improve the recovery of the metal sulfides in bioreactors are given

Chemical Engineering Tanase Gh. Dobre, José G. Sanchez Marcano, 2007-06-27 A description of the use of computer aided modeling and simulation in the development integration and optimization of industrial processes The two authors elucidate the entire procedure step by step from basic mathematical modeling to result interpretation and full scale process performance analysis They further demonstrate similitude comparisons of experimental results from different systems as a tool for broadening the applicability of the calculation methods Throughout the book adopts a very practical approach addressing actual problems and projects likely to be encountered by the reader as well as fundamentals and solution strategies for complex problems It is thus equally useful for student and professional engineers and chemists involved in industrial process and production plant design construction or upgrading

Bioprocess Engineering and Technology Biswanath Bhunia, Navneet Joshi, Muthusivaramapandian Muhuraja, 2025-11-26 This book discusses the various cellular interventions that are required for the upstream processes in bioprocess engineering such as growth requirement of different cell types their maintenance and various recombinant strategies tools available to identify and develop a cellular factory for high level synthesis of a desired product Bioprocess Engineering and Technology Upstream Process also deals with the various types of reactors process design and development media conditions mode of operation sterilisation selectivity reactor design and construction scale up process analytical technologies and process control The book examines upstream processes which include the selection of cell factories and strain engineering approaches enzyme kinetics growth kinetics fermentation downstream processing process design reactor design and scale up It also includes case studies that will assist readers to develop the upstream processes involved in an industrial scale bioprocess This book is intended for students and researchers looking to develop the upstream processes involved in an industrial scale bioprocessing operation

Handbook of Hydrogen Energy S.A. Sherif, D. Yogi Goswami, E.K. (Lee) Stefanakos, Aldo Steinfeld, 2014-07-29 Can hydrogen and electricity supply all of the world's energy needs Handbook of Hydrogen Energy thoroughly explores the notion of a hydrogen economy and addresses this question The handbook considers hydrogen and electricity as a permanent energy system and provides factual information based on science The text focuses on a large cross section of
Cooperative Design, Visualization, and Engineering Yuhua Luo, 2011-09-01 This book constitutes the refereed proceedings of the 8th International Conference on Cooperative Design Visualization and Engineering CDVE 2011 held in Hong Kong China in September 2011 The 33 revised full papers presented were carefully reviewed and selected from numerous submissions The papers address all aspects of distributed computing and were organized in topical sections on cooperative design cooperative applications cooperative engineering cooperative visualization and basic theory and technology

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