

Tingyue Gu

Mathematical Modeling and Scale-Up of Liquid Chromatography

With Application Examples

Second Edition



 Springer

Mathematical Modeling And Scaleup Of Liquid Chromatography

RS Peters

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Mathematical Modeling And Scaleup Of Liquid Chromatography:

Mathematical Modeling and Scale-up of Liquid Chromatography Tingyue Gu, 2012-12-06 Liquid chromatography has proved to be one of the most important tools for separations. Rapid development in biotechnology has increased the demand for chromatography in analytical, preparative and large scale applications. The understanding of the dynamics of chromatography is imperative for the scale up. This book is a systematic treatment of the general rate models for various forms of liquid chromatography including adsorption, size exclusion, affinity, reversed phase, hydrophobic interaction and radial flow chromatography. Thermodynamic and mass transfer effects in liquid chromatography are discussed. Applications of computer programs for the rate models are described and the procedures for the scale up of preparative and large scale liquid chromatography using the general rate models are given.

Mathematical Modeling and Scale-Up of Liquid Chromatography Tingyue Gu, 2015-04-06 Tingyue Gu's second edition provides a comprehensive set of nonlinear multicomponent liquid chromatography (LC) models for various forms of LC such as adsorption, size exclusion, ion exchange, reversed phase, affinity, isocratic gradient elution and axial radial flow LC. Much has advanced since the first edition of this book and the author's software described here is now used for teaching and research in 32 different countries. This book comes together with a complete software package with graphical user interface for personal computers offered free for academic applications. Additionally, this book provides detailed methods for parameter estimation of mass transfer coefficients, bed voidage, particle porosity and isotherms. The author gives examples of how to use the software for predictions and scale up. In contrast to the first edition, authors do not need to deal with complicated math. Instead, they focus on how to obtain a few parameters for simulation and how to compare simulation results with experimental data. After reading the detailed descriptions in the book, a reader is able to use the simulation software to investigate chromatographic behavior without doing actual experiments. This book is aimed at readers who are interested in learning about LC behaviors and at those who want to scale up LC for preparative and large scale applications. Both academic personnel and industrial practitioners can benefit from the use of the book. This new edition includes new models and software for pellicular cored beads in liquid chromatography. Introduction of user friendly software with graphical user interface. Detailed descriptions on how to use the software. Step by step instructions on parameter estimation for the models. New mass transfer correlations for parameter estimation. Experimental methods for parameter estimation. Several actual examples using the model for product development and scale up. Updated literature review.

Mathematical Modeling and Scale-Up of Liquid Chromatography Tingyue Gu, 2015 Tingyue Gu's second edition provides a comprehensive set of nonlinear multicomponent liquid chromatography (LC) models for various forms of LC such as adsorption, size exclusion, ion exchange, reversed phase, affinity, isocratic gradient elution and axial radial flow LC. Much has advanced since the first edition of this book and the author's software described here is now used for teaching and research in 32 different countries. This book comes together with a

complete software package with graphical user interface for personal computers offered free for academic applications. Additionally, this book provides detailed methods for parameter estimation of mass transfer coefficients, bed voidage, particle porosity, and isotherms. The author gives examples of how to use the software for predictions and scale up. In contrast to the first edition, authors do not need to deal with complicated math. Instead, they focus on how to obtain a few parameters for simulation and how to compare simulation results with experimental data. After reading the detailed descriptions in the book, a reader is able to use the simulation software to investigate chromatographic behavior without doing actual experiments. This book is aimed at readers who are interested in learning about LC behaviors and at those who want to scale up LC for preparative and large scale applications. Both academic personnel and industrial practitioners can benefit from the use of the book. This new edition includes new models and software for pellicular cored beads in liquid chromatography. Introduction of user friendly software with graphical user interface. Detailed descriptions on how to use the software. Step by step instructions on parameter estimation for the models. New mass transfer correlations for parameter estimation. Experimental methods for parameter estimation. Several actual examples using the model for product development and scale up. Updated literature review.

Bioprocess and Analytics Development for Virus-based Advanced Therapeutics and Medicinal Products (ATMPs) Saurabh Gautam, Abhilash I. Chiramel, Roland Pach, 2023-08-10. This book reviews the knowledge, methods, and available techniques in the rapidly advancing field of virus-based vaccines and gene therapeutics. It also highlights new innovative tools and interdisciplinary techniques for bioprocess development and analytics of viruses and viral vectors. As such, it provides a timely and highly relevant resource since current advances in pharmaceutical research have seen the rise of vaccines and advanced therapeutics and medicinal products (ATMPs) that rely on the power of viruses. However, developing bioprocesses and analytics required to create this often called magic bullet, i.e., gene therapy, remains an extremely challenging and costly task. This book offers strategies for overcoming hurdles and difficulties within all the necessary steps of viral vector development, from scalability to purification methods and quality control. The book is intended for researchers working in academia or industry as well as graduate students pursuing a career in virology.

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.

Journal of Chromatography, 1997 Handbook of Process

Chromatography Gail K. Sofer, Lars Hagel, 1997-06-24 This Handbook offers a practical approach to developing an optimal chromatographic process scaling it up and adapting it to comply with requirements set by world wide regulatory agencies The reader is led through every stage of the development process using examples from companies with established processes and approved biotherapeutics The aim is to help the reader to realize the scope of issues that must be evaluated and to avoid common pitfalls For the uninitiated separate chapters also deal with basic chromatography theory and properties of biological molecules The holistic and practical approach of the Handbook make it an essential reference for graduates and researchers in biochemical engineering and biotechnology as well as practitioners in the pharmaceutical industry The enclosed disk also makes the Handbook an excellent hands on teaching tool

The Canadian Journal of Chemical Engineering, 2006-08 *Nanoscale Fabrication, Optimization, Scale-up and Biological Aspects of Pharmaceutical Nanotechnology* Alexandru Mihai Grumezescu, 2017-12-11 *Nanoscale Fabrication Optimization Scale up and Biological Aspects of Pharmaceutical Nanotechnology* focuses on the fabrication optimization scale up and biological aspects of pharmaceutical nanotechnology In particular the following aspects of nanoparticle preparation methods are discussed the need for less toxic reagents simplification of the procedure to allow economic scale up and optimization to improve yield and entrapment efficiency Written by a diverse range of international researchers the chapters examine characterization and manufacturing of nanomaterials for pharmaceutical applications Regulatory and policy aspects are also discussed This book is a valuable reference resource for researchers in both academia and the pharmaceutical industry who want to learn more about how nanomaterials can best be utilized Shows how nanomanufacturing techniques can help to create more effective cheaper pharmaceutical products Explores how nanofabrication techniques developed in the lab have been translated to commercial applications in recent years Explains safety and regulatory aspects of the use of nanomanufacturing processes in the pharmaceutical industry

Downstream Industrial Biotechnology Michael C. Flickinger, 2013-07-17 **DOWNSTREAM INDUSTRIAL BIOTECHNOLOGY** An affordable easily accessible desk reference on biomanufacturing focused on downstream recovery and purification Advances in the fundamental knowledge surrounding biotechnology novel materials and advanced engineering approaches continue to be translated into bioprocesses that bring new products to market at a significantly faster pace than most other industries Industrial scale biotechnology and new manufacturing methods are revolutionizing medicine environmental monitoring and remediation consumer products food production agriculture and forestry and continue to be a major area of research The downstream stage in industrial biotechnology refers to recovery isolation and purification of the microbial products from cell debris processing medium and contaminating biomolecules from the upstream process into a finished product such as biopharmaceuticals and vaccines Downstream process design has the greatest impact on overall biomanufacturing cost because not only does the biochemistry of different products e g peptides proteins hormones antibiotics and complex antigens dictate different methods for the isolation and purification of these

products but contaminating byproducts can also reduce overall process yield and may have serious consequences on clinical safety and efficacy Therefore downstream separation scientists and engineers are continually seeking to eliminate or combine unit operations to minimize the number of process steps in order to maximize product recovery at a specified concentration and purity Based on Wiley's Encyclopedia of Industrial Biotechnology Bioprocess Bioseparation and Cell Technology this volume features fifty articles that provide information on down stream recovery of cells and protein capture process development and facility design equipment PAT in downstream processes downstream cGMP operations and regulatory compliance It covers Cell wall disruption and lysis Cell recovery by centrifugation and filtration Large scale protein chromatography Scale down of biopharmaceutical purification operations Lipopolysaccharide removal Porous media in biotechnology Equipment used in industrial protein purification Affinity chromatography Antibody purification monoclonal and polyclonal Protein aggregation precipitation and crystallization Freeze drying of biopharmaceuticals Biopharmaceutical facility design and validation Pharmaceutical bioburden testing Regulatory requirements Ideal for graduate and advanced undergraduate courses on biomanufacturing biochemical engineering biopharmaceutical facility design biochemistry industrial microbiology gene expression technology and cell culture technology Downstream Industrial Biotechnology is also a highly recommended resource for industry professionals and libraries **American Book Publishing Record** ,1995

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