
Chiral Separation A Liquid Chromatography Approach Concepts Methods New Developments

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Chiral Analysis LAP Lambert Academic Publishing

Enantiomeric separations are an essential component of pharmaceutical drug development, not only at the analytical scale, but also to separate usable quantities for further analysis. The field of asymmetric synthesis is also heavily dependent on chromatographic methods to separate and quantitate the results of asymmetric transformations as well as characterize new ligands and catalysts. This dissertation focuses on the use of macrocyclic chiral stationary phases for use in high performance liquid chromatography as well as subcritical fluid chromatography to separate individual enantiomers of molecules of importance to the scientific community. Optimized separation conditions are provided for many of these important analytes, which

will expedite the evaluation of their usefulness in a variety of applications. Particular emphasis is put on elucidating the mechanism of interaction between analyte and stationary phase. In chapters two and three, principle component analysis is applied to the chromatographic data to gain better understanding of the factors contributing to retention and enantioselectivity. It was shown that optimized separation conditions are also provided for newly synthesized isochromene and Tröger base derivatives using cyclodextrin and cyclofructan based chiral stationary phases. The fourth chapter provides separation conditions for a variety of novel synthetic biaryl atropisomers, which have the potential to serve as useful ligands in asymmetric transformations as well as possessing antibiotic/antimicrobial properties. Preparative scale separation conditions are also provided allowing for these important analytes to be prepared and evaluated in their enantiomerically pure form. Insight into the mechanism of analyte retention is provided indicating that dipolarity/polarizability is the primary retentive interaction between substituted biaryls and derivatized cyclofructans. Chapter five provided a valuable comparison of commonly used chromatographic

conditions for the separation of primary amines using cyclofructan based chiral stationary phases. The effect of various additives and polar modifiers was investigated and the results indicate that a combination of acidic and basic additives is necessary to obtain optimal separations. The advantages of individual chromatographic modes are also provided. Normal phase separations provided the greatest selectivities at the cost of longer analysis times while modified carbon dioxide mobile phases provided excellent peak profiles and short analysis times. Preparative scale separations are also provided using modified carbon dioxide mobile phases allowing for enantiopure compounds to be prepared in an environmentally friendly manner without the use of petroleum based solvents.

Enantiomer Separation CRC Press
Covers the Fundamentals of Chiral Separation, Available Chiral Selectors, and Numerous

Applications of Chiral Separation by Capillary Electrophoresis Since the 1980s, modern analytical tools have enabled capillary electrophoresis to become a standard part of the chemist's toolkit. With contributions from international experts, *Chiral Separations by Capillary Electrophoresis* provides a general overview of the principles of chiral separation by capillary electrophoresis and the different chiral selectors available. The book discusses the most important as well as several new chiral selectors used in capillary electrophoresis. It reviews recent pharmaceutical and biomedical applications and explores novel techniques, such as capillary electrophoresis coupled to mass spectrometry and microchip

technology. The book also examines the quantitative aspects of capillary electrophoresis, the possibilities of capillary electrochromatography, and the various chiral columns available. Capillary electrophoresis has proven to be an effective tool for chiral separation. This book explains how this technique can be used in the separation of molecules, offering insight into both existing and emerging applications.

Resolution of Chiral Drugs and Their Related Substances by High-performance Liquid Chromatography and Capillary Electrophoresis John Wiley & Sons

Today, among the various chiral discrimination methods, chromatography and capillary electrophoresis techniques have become powerful tools in environmental analysis. Therefore, there is a need to describe the art of the determination of the chiral pollutants in the environmental matrices. This book provides the complete information on the types of the chiral pollutants, their toxicities and methods of determination by chromatography and capillary electrophoresis.

Modified Cyclodextrins for Chiral Separation John Wiley & Sons
HPLC and CE: Principles and Practice presents the latest information on the most powerful separation techniques available: high-performance liquid chromatography (HPLC) and capillary electrophoresis (CE). Fundamental theory, instrumentation, modes of operation, and optimization of separations are presented in a concise, non-technical style to help the user in choosing the

appropriate technique quickly and accurately. Well-illustrated and containing convenient end-of-chapter summaries of the major concepts, the book provides in-depth coverage of trouble-shooting, improvement of resolution, data manipulation, selectivity, and sensitivity. Graduate students, technicians, and researchers who must use separations with little or no background in analytical chemistry can overcome separation anxiety and get started in obtaining the best possible separations in minimal time. The book will also be useful to analytical chemists who need a better understanding of theory and processes. Fully up-to-date information on both HPLC and CE includes troubleshooting and comparisons of the two techniques. Applicable to a wide variety of separation problems. Covers basic concepts governing any separation as well as instrumentation and how to use it. Helps the user to obtain optimal resolution in minimal time. Contains information on special procedures such as chiral separations, affinity chromatography, and sample preparation. Includes information on upcoming trends such as miniaturization. Major concepts in each chapter are organized to allow access to information easily and quickly. Contains practical bibliography for accessing the literature.

High Performance Liquid Chromatography & Capillary Electrophoresis Springer Science & Business Media

This book is a resource for scientists with interests in chiral separation using high-performance liquid chromatography (HPLC). The practical approach helps chromatographers in the lab so that they may be able to deal with this aspect of their job. It

provides extensive coverage of up-to-date development, applications and information in the area of chiral HPLC that are useful for analytical chemists, organic chemists, chemical engineers, professionals in pharmaceutical, biotech and other industry as well as regulatory bodies and policy makers.

Chiral Liquid Chromatography Springer Science & Business Media

Both analytical and preparative-scale enantioseparation techniques are covered in a down-to-earth practical way. The most important aspects of design, economics and safety are considered with emphasis on current European and North American legislation. In addition, the theory of chiral separation is covered in sufficient detail to guide the practising chromatographer interested in developing new techniques. A team of experts from academic and industrial laboratories throughout the world have compiled their findings and experience to make this book an exceptionally timely and unique contribution to the field.

The Use of Liquid Chromatography and Subcritical Fluid Chromatography for Chiral Separations Using Macrocyclic Chiral Stationary Phases Wiley

Biological in vivo processes are stereochemically controlled and rate limited by proper selection of enantiomers. Wrong selection can have deleterious effects, therefore, more than 40% of drugs (over the retail counters and prescribed) are indeed chiral, and of these 25% are supplied as pure enantiomers. So chiral separation has remained interesting and still a challenging task for oneself to develop the new, simple, reproducible and sensitive methods. This book focuses on the chiral separation of some important pharmaceuticals using two major approaches; one is pre-column derivatization with a chiral reagent followed by separation of resulting diastereomers known as 'indirect approach'. The other one is 'direct approach' which may use a chiral mobile phase additive (CMPA) or a chiral stationary phase (CSP) or the chiral selector is immobilized/ impregnated with the stationary phase.

Liquid Chromatography Elsevier Science Limited

Discusses chiral separations and offers guidance for selecting the optimum method for desired results Chiral separations represent the most intriguing and, by some measures, most difficult separations of chemical compounds. This book provides researchers and students an understanding of chiral separations and offers a convenient route to selecting the best separation method, saving considerable time and cost in product development. Considering chiral separations in the biotechnological and pharmaceutical industries, as well as for food applications, Dr. Ahuja provides insights into a broad range of topics. Opening with a broad overview of chiral separations, regulatory considerations in drug product development, and basic issues in method development, the book: Covers a variety of modern methods such as gas chromatography, high performance liquid chromatography, supercritical fluid chromatography, and capillary electrophoresis Deals with the impact of chirality on the biological activity of small and large molecules Provides detailed information on useful chiral stationary phases (CSPs) for HPLC Includes handy information on selection of an appropriate CSP, including mechanistic studies Offers strategies for fast method development with HPLC, SFC, and CE Discusses preparatory methods utilized in the pharmaceutical industry With in-depth discussions of the current state of the field as well as suggestions to assist future developments, Chiral Separation Methods for Pharmaceutical and Biotechnological Products is an essential text for laboratory investigators, managers, and regulators who are involved in chiral separations in the pharmaceutical industry,

as well as students preparing for careers in these fields.

Synthesis, Characterization [sic] and Chiral Separation of Ranolazine Using Polar Organic Phase Liquid Chromatography Elsevier

Chiral Analysis covers an important area of analytical chemistry of relevance to a wide variety of scientific professionals. The target audience is scientific professionals with an undergraduate background in chemistry or a related discipline, specifically organic chemists, researchers in drug discovery, pharmaceutical researchers involved with process analysis or combinatorial libraries, and graduate students in chemistry. Chapters have been written with the nonspecialist in mind so as to be self-contained. * Broad coverage - spectroscopic and separation methods covered in a single volume * Up-to-date and detailed review of the various techniques available and/or under development in this field * Contributions from leading experts in the field

A Practical Approach to Chiral Separations by Liquid Chromatography Elsevier

This is a completely revised and updated sequel to 'A Practical Approach to Chiral Separations by Liquid Chromatography' by the same editor. The scope has been extended to further chiral separation techniques like electrophoresis, membrane separations, or biological assays. More emphasis is put on preparative separation techniques. From reviews of the previous edition: 'A team of experts from academic and industrial laboratories throughout the world have compiled their findings and experience to make this book an exceptionally timely and unique

contribution to the field' European Journal of chromatography (HPLC) is today the leading technique for chemical analysis and Drug Metabolism 'The dense mass of information contained in this book will make it a valuable resource ...' Chemical Engineering Research '... this is a worthwhile addition to the expanding chiral literature and the book should be of value to those working in this field' The Analyst Chiral Pollutants Springer Science & Business Media

This volume represents the proceedings of a two-day international meeting on chiral chromatography held at the University of Surrey between 3-4 September 1987. The meeting was jointly organized by the Chromatographic SOciety and the Robens Institute of the University of Surrey in response to the burgeoning interest in this rapid maturing field of chromatography. Nowhere is this interest more evident than in the agrochemical and pharmaceutical industries where the implications of different pharmacological and toxicological activity for the individual enantiomers present in a racemic drug or insecticide is an increasing area of concern. Developments in the area of chiral separations are at last beginning to provide Scientists with the necessary tools to study how animals and man handle racemates and relate their observations to the observed biological effects of these substances. The development of robust and Simple methods for the separation of enantiomers will therefore have a profound Impact on safety evaluation and drug design. The meeting proved to be very successful. with over 160 delegates from thirteen countries in Europe and America present to learn from the experiences of experts in the field of chiral chromatography and to hear about the latest developments. Hopefully. in future symposia on chiral separations at the University of Surrey.

Design of Chiral Separations by Liquid Chromatography and Capillary Electrophoresis for Amlodipine and Derivatives Elsevier

The latest edition of the authoritative reference to HPLC High-performance liquid chromatography (HPLC) is today the leading technique for chemical analysis and related applications, with an ability to separate, analyze, and/or purify virtually any sample. Snyder and Kirkland's Introduction to Modern Liquid Chromatography has long represented the premier reference to HPLC. This Third Edition, with John Dolan as added coauthor, addresses important improvements in columns and equipment, as well as major advances in our understanding of HPLC separation, our ability to solve problems that were troublesome in the past, and the application of HPLC for new kinds of samples. This carefully considered Third Edition maintains the strengths of the previous edition while significantly modifying its organization in light of recent research and experience. The text begins by introducing the reader to HPLC, its use in relation to other modern separation techniques, and its history, then leads into such specific topics as: The basis of HPLC separation and the general effects of different experimental conditions Equipment and detection The column—the "heart" of the HPLC system Reversed-phase separation, normal-phase chromatography, gradient elution, two-dimensional separation, and other techniques Computer simulation, qualitative and quantitative analysis, and method validation and quality control The separation of large molecules, including both biological and synthetic polymers Chiral separations, preparative separations, and sample preparation Systematic development of HPLC separations—new to this edition Troubleshooting tricks, techniques, and case studies for both equipment and chromatograms Designed to fulfill the needs of the full range of HPLC users, from novices to experts, Introduction to Modern Liquid Chromatography, Third

Edition offers the most up-to-date, comprehensive, and accessible survey of HPLC methods and applications available.

Chiral Recognition in Separation Methods

Elsevier Inc. Chapters

Modified Cyclodextrins for Chiral Separation offers a review of the latest advances in developing modified cyclodextrins as chiral selectors for various chromatographic and electromigration techniques. Over the years, many descriptions of chiral separation have appeared in academic journals and books, but most of them have been devoted to either the development of analytical methods and protocols or the summary of different chiral selectors, including cyclodextrins for chiral separation applications. This is in marked contrast to this volume which focuses on the research endeavors concerning the development of cyclodextrin derivatives specifically as either chiral mobile phases for capillary electrophoresis, or chiral stationary phases for various chromatographic techniques including gas chromatography, or high-performance liquid chromatography and supercritical fluid chromatography. The ongoing thread in this book is the synthesis of structurally-defined cyclodextrin derivatives and their applications in enantiomer separation by means of different analytical techniques. Modified Cyclodextrins for Chiral Separation is intended for those who are interested in expanding their knowledge of cyclodextrin chemistry and chiral separation, and in what cyclodextrin modification can be made to suit the needs of chiral selectors for different analytical techniques. It primarily focuses on the state-of-the-art cyclodextrin chemistry which is the basis for all chiral selectors used in these chiral separation techniques. Weihua Tang, PhD, is a professor at the Key Laboratory of Soft Chemistry and Functional Materials, Ministry of Education, Nanjing University of Science and Technology, China. Siu-Choon Ng, PhD, is a professor at the Division of Chemical and Biomedical Engineering, School of Chemical and Biomedical Engineering, Nanyang Technological University, Singapore. Dongping

Sun, PhD, is a professor at the Key Laboratory of Soft Chemistry and Functional Materials, Ministry of Education, Nanjing University of Science and Technology, China.

New Bio-analytical Separations Utilizing Chiral Mobile Phase Additives in Thin Layer Chromatography and Chiral Stationary Phases in High Performance Liquid Chromatography John Wiley & Sons

Chiral Separation Techniques Wiley-VCH

Chiral Separations John Wiley & Sons

Chiral Chromatography Thomas E.

Beesley Advanced Separation

Technologies Inc., Whippany, New

Jersey, USA Raymond P. W. Scott

Chemistry Department, Georgetown

University, Washington DC, USA and

Chemistry Department, Birkbeck

College, University of London, UK

Analytical techniques based on

separation processes, such as

chromatography and electrophoresis,

are finding a growing range of applications in chemical, pharmaceutical and clinical laboratories.

The Wiley Separation Science Series

provides the analyst in these

laboratories with well-focused books

covering individual techniques, so that

they can be applied more efficiently and

effectively to contemporary analytical

problems. The different enantiomers of

a drug can exhibit widely different

physiological activity in degree and

nature. As a result, the separation and

identification of enantiomers is now a

very important analytical problem and

chiral chromatography is the natural

technique to apply to the resolution of

such mixtures. Chiral Chromatography

provides the reader with a basic

understanding of the nature of

chromatographic separations and relates the principles specifically to the separation of enantiomers. The following information is included: * chiral separations involving both gas and liquid chromatography * descriptions of the apparatus used for both techniques * detailed discussion on the retention mechanism that results in chiral selectivity * the structure and synthesis of a wide range of chirally active stationary phases used in both gas and liquid chromatography * preparative applications for large scale purification of enantiomers * applications of capillary electrophoresis and capillary electrochromatography. In addition to the above, a large number of examples of the separation of both commercially and physiologically interesting chiral mixtures are given, as is a detailed discussion on the mechanism of selectivity of each example. Thomas Beesley was founder and is the CEO for a leading manufacturer of chiral stationary phases and has published papers on TLC, HPLC and chiral separations involving cyclodextrins. He has also coauthored papers with Daniel W. Armstrong, an expert on modern cyclodextrin columns. Raymond Scott has worked in the field of separation science for over 40 years and has contributed extensively to the development of both gas and liquid chromatography publishing over 160 papers on the subjects.

Chiral Separation Techniques Springer Science & Business Media

Chiral Analysis: Advances in Spectroscopy, Chromatography and Emerging Methods, Second Edition covers an important area of analytical chemistry of relevance to a wide variety of scientific professionals, including chemistry graduate students, analytical chemists, organic chemists, professionals in the pharmaceutical industry, and others with an interest in chirality and chiral analysis. This thoroughly revised second edition covers several new, important areas of chiral analysis that have emerged since the first edition. Three of the new methods provide higher sensitivity than can be realized with the current methods and are expected to become mainstream applications: cavity based methods offer vastly higher sensitivity than conventional polarimetric methods, microwave chiral detection provides unsurpassed sensitivity for identifying diastereomers, and the rotating electric field method offers a competing new approach for the separation of enantiomers. Another topic, chirality in extraterrestrial life, has not been discussed in any other book and is important for understanding the origin of life. Offers the only book to cover both spectroscopic and separation methods in a single volume Provides an up-to-date and detailed review of the various techniques available, including new techniques that have emerged since the first edition Includes contributions from a range of leading experts in the field, now edited by award-winning chirality researcher Prasad Polavarapu

Chiral Separation of Pharmaceutical Compounds Using Electrochemically Modulated Liquid Chromatography (EMLC). Springer Science & Business Media

In spite of important advances in asymmetric synthesis, chiral compounds cannot all be obtained in a pure state by asymmetric synthesis. As a result, enantiomer separation remains an important technique for obtaining optically active materials. Although asymmetric synthesis is a once-only procedure, an enantiomer separation process can be repeated until the optically pure sample is obtained. This book discusses several new enantiomer separation methods using modern techniques developed by experts

in the field. These methods consist mainly of the following three types: 1) Enantiomer separation by inclusion complexation with a chiral host compound 2) Enantiomer separation using biological methods 3) Enantiomer separation by HPLC chromatography using a column containing a chiral stationary phase. Separation of a racemic compound has been called "optical resolution" or simply "resolution". Nowadays, the descriptions "enantiomer resolution" or "enantiomer separation" are also commonly used. Accordingly, "Enantiomer Separation" is used in the title of this book. The editor and all chapter contributors hope that this book is helpful for scientists and engineers working in this field.

Chiral Separation Techniques Chiral Separation Techniques

Though many separation processes are available for use in today's analytical laboratory, chromatographic methods are the most widely used. The applications of chromatography have grown explosively in the last four decades, owing to the development of new techniques and to the expanding need of scientists for better methods of separating complex mixtures. With its comprehensive, unified approach, this book will greatly assist the novice in need of a reference to chromatographic techniques, as well as the specialist suddenly faced with the need to switch from one technique to another.

Wiley-VCH

This is a completely revised and updated sequel to 'A Practical Approach to Chiral Separations by Liquid Chromatography' by the same editor. The scope has been extended to further chiral separation techniques like electrophoresis, membrane separations, or biological assays. More emphasis is put on preparative separation techniques. From

reviews of the previous edition: 'A team of experts from academic and industrial laboratories throughout the world have compiled their findings and experience to make this book an exceptionally timely and unique contribution to the field' European Journal of Drug Metabolism 'The dense mass of information contained in this book will make it a valuable resource ...' Chemical Engineering Research '... this is a worthwhile addition to the expanding chiral literature and the book should be of value to those working in this field' The Analyst

Chiral Separations Elsevier

"The problem addressed by this dissertation is the separation of optical isomers in commercial as well as biological samples. The chromatographic separation of enantiomers is an important and rapidly developing field of study. Chiral separations of pharmaceutical compounds and important organic intermediates in high performance liquid chromatography (HPLC) and thin layer chromatography (TLC) were achieved. Two methods were employed for the direct liquid chromatographic resolution of chiral analytes: chiral stationary phases (CSPs) and chiral mobile phase additives (CMAs). Native and derivatized [β]-cyclodextrins ([β]-CD) were used as chiral stationary phases in reverse phase and normal phase HPLC, respectively. This study marked the first use of derivatized [β]-CDs for chiral separations in normal phase media. N-carbobenzoxy-glycyl-L-proline and (1R)-(-)-ammonium-10-camphorsulfonate were utilized as CMAs in normal phase TLC for the resolution of several aromatic amino alcohols. Maltosyl-[β]-CD and hydroxypropyl-[β]-CD were employed as CMAs in reverse phase TLC. A study was conducted with hydroxypropyl-[β]-CD to determine how the degree of substitution of a derivatized CD could effect development time, the

viscosity of the solution and the enantioselectivity. In addition, studies were initiated to determine the presence of trace levels of D-amino acids in: amniotic fluid, blood serum and urine. The blood and urine of healthy young adults were analyzed and found to contain trace to percent levels of D-amino acids. The human amniotic fluid samples did not have detectable levels of D-amino acids"--Abstract, page iv.