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*Chiral Separation A Liquid  
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## PORTER SHARP

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*Chiral HPLC* Wiley

Prominent experts from around the world detail the chromatographic and electroseparation techniques they have developed for chiral separations on an analytical scale. Described in step-by-step detail to ensure successful experimental results, the procedures are presented as either general methods or as specific applications to substance classes and special compounds, with emphasis on high performance liquid chromatography and capillary electrophoresis techniques, but also including thin layer chromatographic, gas chromatographic, supercritical fluid chromatographic as well as recent electrochromatographic techniques.

**Chiral Analysis** Springer Science & Business Media

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.

*Chiral Liquid Chromatography* 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 Separations Springer Science & Business Media

This research explores the application of a new technique, termed electrochemically modulated liquid chromatography (EMLC), to the chiral separations of pharmaceutical compounds. The introduction section provides a literature review of the technique and its applications, as well as a brief overview of the research described in each of the next two chapters. Chapter 2 investigates the EMLC-based enantiomeric separation of a group of chiral benzodiazepines with  $\beta$ -cyclodextrin as a chiral mobile phase additive. Chapter 3 demonstrates the effects of several experimental parameters on the separation efficiency of drug enantiomers. The author concludes with a general summary and possible directions for future studies. Chapters 2 and 3 are processed separately.

*Chiral Chromatography* Springer Science & Business Media

This volume represents the proceedings of the second international meeting on chiral separations held at the University of Surrey between the 12th and 15th of September 1989. Like the preceding meeting, it was jointly organised by the Chromatographic Society and the Robens Institute of the University of Surrey in response to the continued interest in this area of separation science. Of particular interest to the organisers was the very clear change in the nature of the delegates attending this second symposium as compared with the first. At the previous meeting the majority of the delegates were composed of chromatographers with problems in the area of chiral separations who were keen to learn as much as possible about these techniques from the handful of recognised experts in this area. In this second symposium the divide between expert and novice was much less apparent, with the latter providing many interesting and useful contributions to the scientific programme in terms of both oral and poster presentations.

Chiral Analysis Springer Science & Business Media

The design of chiral separations in liquid chromatography (LC) and capillary electrophoresis (CE) involves the selection of chiral selectors and eluent parameters, often on a purely empirical

basis. It would be desirable if rapid screening methods could be designed to rationalise the choice of these chiral selectors. With reference to the use of cyclodextrin (CD) derivatives as chiral selectors, nuclear magnetic resonance spectroscopy (NMR) can play an important role in screening the extent of interactions with chiral solutes, and in probing the nature of the stereoselective interactions involved. Data from high-field NMR on drugs and their derivatives have been explored for screening a number of potential chiral recognition agents, as an aid to the rational design of chiral separations by LC and CE, based on cyclodextrins (alpha, beta, gamma, hydroxypropyl-beta and hydroxyethyl-beta) bonded to silica (LC) and in free solution (CE). In this investigation high-field FT-NMR is used to examine the interaction mechanism between these cyclodextrins and the calcium channel blocker Amlodipine together with a series of its structural analogues. Enantiomeric interactions between the cyclodextrins and Amlodipine are explored using ROESY (rotating frame nuclear Overhauser effect spectroscopy) in order to determine the inclusion mechanism involved.....

*Recent Advances in Chiral Separations* John Wiley & Sons

From the contents: Chiral chromatographic separations based on ligand exchange (A. Kurganov). - Chiral separations using the macrocyclic antibiotics: a review (T.J. Ward, A.B. Farris III). - High-performance liquid chromatographic and capillary electrophoretic enantioseparation of plant growth regulators and related indole compounds using macrocyclic antibiotics as chiral selectors (Review) (F. Hui et al.). - Polysaccharide-based chiral stationary phases for high-performance liquid chromatographic enantioseparation (Review) (E. Yashima).

High Performance Liquid Chromatography & Capillary Electrophoresis John Wiley & Sons

The development of chiral liquid chromatography, facilitating the straightforward separation of enantiomers, was a significant advance in chromatography, leading to widespread application in analytical chemistry. Application in preparative chromatography has been less rapid, but with the development of single enantiomer pharmaceuticals its use is increasingly common in chemical synthesis at laboratory, pilot plant and even full production scale. Brings non-experts up to speed quickly and comprehensively, facilitating the rapid development of effective separations of enantiomeric mixtures on a range of process scales

Presents case studies drawn from within the pharmaceutical industry to clearly illustrate the utility and value of preparative scale enantioselective chromatography in chemical research, development and production. Key reference source and entry to the literature so the reader does not have to engage in expensive and time-consuming literature searching.

Chiral Pollutants Elsevier

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.

Liquid Chromatography Springer Science & Business Media

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.

*Chiral Separations By Liquid Chromatography And Related Technologies* Elsevier

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. *Chiral separation by liquid chromatography* Wiley-VCH. 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.

*High Performance Liquid Chromatography Diastereomeric Separation for Chiral Analysis and Kinetic Analysis* Elsevier Science Limited

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

**Chiral Separation Methods for Pharmaceutical and Biotechnological Products** Chiral Separation Techniques

A single source of authoritative information on all aspects of the practice of modern liquid chromatography suitable for advanced

students and professionals working in a laboratory or managerial capacity Chapters written by authoritative and visionary experts in the field provide an overview and focused treatment of a single topic Comprehensive coverage of modern liquid chromatography from theory, to methods, to selected applications Thorough selected references and tables with commonly used data to facilitate research, practical work, comparison of results, and decision making Extensive original tables and figures, placing recent research developments into a general context Worked examples, intuitive explanations, and clear figures reinforce learning

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

"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 [ $\beta$ ]-cyclodextrins ([ $\beta$ ]-CD) were used as chiral stationary phases in reverse phase and normal phase HPLC, respectively. This study marked the first use of derivatized [ $\beta$ ]-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-[ $\beta$ ]-CD and hydroxypropyl-[ $\beta$ ]-CD were employed as CMAs in reverse phase TLC. A study was conducted with hydroxypropyl-[ $\beta$ ]-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.

Enantiomer Separation John Wiley & Sons

While changes in the E[<sub>subscript appl</sub>] to the stationary phase play a major role in the alteration of efficiency and elution order of the enantiomers, results also show that the enantioselectivity and retention are influenced by the identity and the concentration of the organic additive, and by the pH and flow rate of the mobile phase. The observations are discussed in terms of chemical structure and retention relationships.

*Chiral Separation of Drugs and Related Compounds by High-performance Liquid Chromatography* Elsevier Inc. Chapters 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. The Use of Liquid Chromatography and Subcritical Fluid Chromatography for Chiral Separations Using Macrocyclic Chiral Stationary Phases Wiley-VCH

What drives a scientist to edit a book on a specific scientific subject such as chiral mechanisms in separation methods? Until December 2005, the journal Analytical Chemistry of the American Chemical Society (Washington, DC) had an A-page section that was dedicated to simple and clear presentations of the most recent techniques or the state of the art in a particular field or topic. The "A-page" section was prepared for a broad audience of chemists including industrial professionals, students as well as academics looking for information outside their field of expertise. 1 Daniel W. Armstrong, one of the editors of this journal and a twenty-year+ long friend, invited me to present my view on chiral recognition mechanisms in a simple and clear way in an "A-page" article. In 2006, the "A-page" section was maintained as the first articles at the beginning of each first bi-monthly issue but the pagination was no longer page distinguished from the regular research articles published by the journal. During the time between the invitation and the submission, the A-page section was integrated into the rest of the journal and the article appeared as (2006) Anal Chem (78):2093-2099.

**Chiral Separation Techniques** John Wiley & Sons

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

**Resolution of Chiral Drugs and Their Related Substances by High-performance Liquid Chromatography and Capillary Electrophoresis** 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.