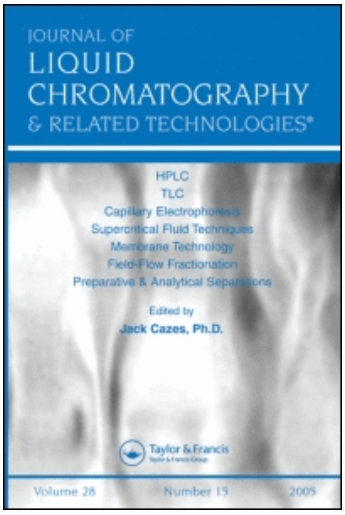


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# The Book Corner

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# The Book Corner

**Preparative Layer Chromatography,** T. Kowalska and J. Sherma, Eds., Chromatographic Science Series, No. 95, CRC Press-Taylor and Francis Group, Boca Raton, 2006, 424 pp. ISBN 0-8493-4039-X.



Chromatography, since its beginnings, has been used for the separation and isolation of compounds from their mixtures. In column chromatography, M.S. Tswett (1903) separated plant pigments, and N.A. Izmailov and M.S. Schraiber (1938) applied thin layers of adsorbents for pilot experiments for preparative column chromatography. The yield of planar chromatography is much lower than that of column separations which are applied even on an industrial scale; however, for separations on a microgram or milligram scale, planar chromatography has its advantages, such as simplicity and low cost, especially as sample sizes for physicochemical investigations (spectrophotometry, nuclear magnetic resonance, and mass spectrometry) have been strongly diminished.

Therefore, the monograph edited by Kowalska and Sherma is a valuable and important supplement to the existing vast chromatographic literature, demonstrating the potential of planar chromatography for separation and isolation of pure compounds, even from very complex mixtures.

The contributors to the book are scientists who are well known from the chromatographic literature, whose experience integrated in the monograph forms a good basis for the readers.

The book is composed of two sections. The first eight chapters are concerned with the general foundations of preparative layer chromatography (PLC) – theoretical basis, experimental technique, and method development.

After the first introductory chapter by the Editors, the second chapter is concerned with adsorption planar chromatography in the nonlinear range (of the adsorption isotherm): in preparative chromatography, much larger sample sizes and higher concentrations of the mixtures to be separated are applied for higher yield. The physical chemistry of adsorption in these overloaded systems is more complex than in analytical chromatography of dilute solutions – the competition of solute molecules for adsorption sites and lateral interactions must be taken into account. For polar solutes, association due to H-bonding belongs to decisive factors.

The next chapter reports the currently available sorbents and precoated layers for preparative layer chromatography, e.g., tables containing important parameters of the materials (pore size, particle size range, pore volume, surface area, layer thickness – usually 0.5–2 mm, and excitation wavelength). For silica and octadecyl silica, references to applications of PLC to separation of various classes of compounds are given.

In Chapter 5, sample application and chromatogram development are discussed, including manual, semiautomatic, and automatic formation of starting bands and applicators commercially available. The methods discussed could be supplemented by simple formation of the starting band by immersion of the plate in the solution to be separated; in this frontal chromatography stage, the components are partly separated according to their adsorption affinities. The plate is then put in a second chamber on a strip of paper wetted with the eluent; more eluent is added after the starting band is removed from the edge of the layer and, in this way, dissolution of the sample components in the eluent is avoided (cf. Fig. 3.4, p. 46). This technique of frontal + elution preparative chromatography can also be carried out in on-line mode in some types of horizontal sandwich chambers (Fig. 6.29, p. 159). For mixtures of few components and sufficient selectivity, very wide starting bands can be formed in the frontal stage (e.g., to $R_F = 0.3$), considerably increasing the yield. The separation efficiency is, in this technique, further improved by displacement effects between the sample components.

In Chapter 6, the application of horizontal chambers of various types for planar chromatography is discussed. Sandwich chambers are very economical and the consumption of solvents is strongly reduced, even by a factor of ten; they can also be used for pre-washing of adsorbent layers and their regeneration (especially when no visualizing reagent is used). Horizontal sandwich chambers also have some additional possibilities such as band application of large sample volumes from the edge of the layer, in the frontal + elution mode, without additional equipment and gradient development, which is more efficient than isocratic elution and permits the isolation of pure components, even from complex mixtures such as plant extracts.

In the next two chapters (Ch. 7, 8) the localization of separated zones on the developed plate is discussed. In Chapter 7, the popular location of zones by scanning, in the absorption, fluorescence, and fluorescence quenching modes, are described, including their theoretical basis; recently available diode array scanners are especially efficient. Dyeing reagents are also employed; in case of destructive reagents, these are applied onto the marginal lanes of the plate, leaving the separated components in the main area unchanged. In Chapter 8, some special detection methods, including biological detection and detection of radioactive zones are discussed, as well as isolation of separated components from the layer.

The eight chapters provide sound theoretical and methodological foundations of PLC. Numerous applications of PLC are reviewed in the second section, in Chapters 9–16, based on extensive literature data. This section

of the monograph contains reviews of applications in biomedical research, separations of hydrophilic vitamins, natural mixtures, lipids, natural pigments, inorganic and metalloorganic compounds, geochemical samples, and a special case of identification of unknown compounds from frankincense resin (olibanum). The application reviews provide numerous examples of solving experimental difficulties for the separation of complex mixtures.

It can be expected that the monograph will promote wider application of preparative layer chromatography in separation and isolation of substances from their mixtures for physicochemical investigations, analysis, and preparation of reference standards. In its simplest form, PLC is much less expensive than HPLC.

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**Analytical Techniques in DNA Sequencing,** Edited by Brian K. Nunnally, 2005, Taylor & Francis, Boca Raton, FL, 256 pages. Price: $189.95

The analytical chemistry of DNA sequencing is fascinating; the technology is impressive. When the Human Genome Project was commissioned in 1990, the goal was to complete the project in 15 years for less than U.S. $3 billion. This was considered a difficult set of goals by the originators of the project. Not only was the project completed in 10 years, but it was also completed under budget, a rarity for any government endeavor. The lasting impact of the Human Genome Project will be not only the 3 billion DNA bases, but also the analytical technology that allowed the project to be completed faster than expected. From the early days of radioisotope sequencing, a wide variety of new techniques have emerged to meet the needs of biotechnology. The modern era of DNA sequencing began in late 1977 with the introduction of the most common DNA sequencing method, the Sanger method. The Sanger method involves the use of radioactive dideoxynucleotides, a deoxynucleotide with the 3′ hydroxyl group from the deoxyribose sugar removed. The Sanger method relies on statistics to create fragments that are terminated at every position of the DNA. The presence of a band indicates the base position and identity.

Fluorescence-based sequencing was introduced in 1986. Four different fluorescent dyes were attached to the dideoxynucleotides allowing for spectral discrimination of the fragments. The first multiplex fluorescence-based sequencing systems used a four-channel approach, similar to the

radioactive-based sequencing, in which a set of four dyes with different emission maxima were used. The signal was selected using different interference filters based on the different dye emission maxima.

The original DNA sequencing systems were based on the standard slab polyacrylamide gel electrophoresis equipment, which allowed numerous samples to be analyzed on the same gel. Not long after the introduction of the slab-gel sequencing systems, a capillary electrophoresis (CE)-based sequencing system was developed. The CE system permitted increased speed, ease of use, and increased accuracy, although the CE system had a much lower throughput than the slab-gel system until the development of multicapillary systems. These systems are now commercially available and use from 8 to 96 capillaries in large arrays. Other techniques such as MALDI MS have been tried with modest success, but have no significant application. The future of DNA sequencing may lie in the use of microfabricated sequencing systems. These chip-based techniques will allow DNA sequencing to expand into a variety of new environments.

DNA sequencing involves a reaction, a separation, and detection and data analysis. The sequencing reactions can involve base-specific reactions or enzymatic extensions utilizing DNA polymerases. Separation methodology is commonly polyacrylamide gel electrophoresis (PAGE) or capillary electrophoresis (CE). The most common detection methodologies include fluorescence, although radioactivity has been used previously. All these topics are discussed in detail in this book.



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Chapter 9. Ancient DNA, W. Goodwin, (195).
Chapter 10. Forensic DNA Sequencing, T. Melton and V.W. Weedn, (217).

*Haleem J. Issaq, Ph.D.*
*Book Corner Editor*

**Handbook of Affinity Chromatography**, Second Edition, Edited by David S. Hage, 2006, Taylor & Francis, Boca Raton, FL, 994 pages. Price: $195.95

*Handbook of Affinity Chromatography* is Volume 92 of the successful Chromatography Science Series edited by Dr. Jack Cazes. This is a massive volume made up of 944 pages divided into 30 chapters organized into six different sections dealing with all aspects of affinity chromatography, one of the oldest forms of chromatography, which witnessed a revival in the last couple of decades. This is one book that I recommend without a reservation. It is well written and presented with up to date references and excellent illustrations. It is worth the price and should be used as a reference for all interested in this topic, analytical chemists, chromatographers, biochemists, and mass spectrometrists.

The *Handbook of Affinity Chromatography* reflects upon important factors to consider in the development of affinity methods such as the choice of support material, immobilization methods, and application or elution conditions. It reviews common affinity methods and explores the latest preparative, analytical, and biophysical applications, including the use of affinity chromatography with other separation techniques and analytical systems. This basis seamlessly supports the discussion of recent developments in techniques including the use of affinity ligands in capillary electrophoresis, mass spectrometry, microanalytical systems, and optical biosensors. New chapters feature expanded discussions on molecularly imprinted polymers and biomimetic ligands, chromatographic immunoassays, affinity-based immunoassays, affinity-based chiral stationary phases, and affinity ligands in multidimensional systems.

Written by 48 scientists and students from 23 laboratories and organizations to present the latest information on affinity methods, the *Handbook of Affinity Chromatography* illustrates a wide range of applications and theory for scientists, students, and laboratory workers throughout the fields of chemistry and biology.

- Presents the latest research in the theory and practical use of affinity chromatography.
- Details common affinity methods such as bioaffinity, immunoaffinity, DNA, boronate, dye-ligand, biomimetric, and metal-ion affinity chromatography.

- Discusses techniques used in clinical, environmental, and pharmaceutical analyses.
- Illustrates the use of affinity chromatography for applications in biotechnology and molecular biology.
- Explains quantitative approaches for the analysis of biological interactions.
- Contains nearly 500 figures and tables while providing useful examples of affinity methods and their applications.
- Offers over 3000 references to original papers available on topics of interest.

This essential handbook guides investigators in the theory, applications, and practical use of affinity chromatography in a variety of fields including biotechnology, biochemistry, molecular biology, analytical chemistry, proteomics, pharmaceutical science, environmental analysis, and clinical chemistry.



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*Book Corner Editor*

**Ion Mobility Spectrometry,** Second Edition, G.A. Eiceman and Z. Karpas, 2005, 350 pages. Price: $159.95

This second edition begins with a thorough discussion of the fundamental theories and physics of ion mobility, *Ion Mobility Spectrometry*, Section Edition describes the recent advances in instrumentation and newly pioneered applications.

The book is divided into three sections, the first presents a history of technological developments, basic principles, theories, and other factors that govern the response in IMS. The second edition describes aspects of IMS technology including sample introduction methods, draft tubes, modern methods for data analysis and display, the combination of mobility spectrometers with chromatographic methods, miniaturized IMS sensors, alternative ionization sources, and advances in computational capabilities that improved the acquisition and treatment of data. The final section emphasizes rapidly developing and exciting applications of IMS. The section is subdivided into existing, proven and potential applications encompassing the traditional forensic, military, and counter-terrorism applications and the now well-developed methods for detect biological agents and characterizing bio-molecules. It also highlights other applications found in clinical and environmental venues and await further development.

This new edition of *Ion Mobility Spectrometry* offers a complete analysis of the technological and contextual developments surrounding the chemistry, instrumentation and growing number of applications of IMS that incorporate and depend upon the latest innovations in the field. Some of the key features are:

1. Includes a CD-ROM containing spectral libraries, schematics for electronics for power supplies, amplifiers and ion shutter controllers, bibliographies and drawings of drift tube components,
2. Presents new chapters covering biological IMS, IMS and mass spectrometry, and field asymmetric IMS,
3. Explains Mobility Theory, relevant ion chemistry, and the effect of high electric fields on ion motion,
4. Contains over 200 accessible tables offering the most reliable and accurate mobility data needed for both new and old applications.

The book will be of value for analytical chemists; mass spectrometrists; physical chemists; engineers; and students.

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*Book Corner Editor*

**CRC Handbook of Fundamental Spectroscopic Correlation Charts,** Thomas J. Bruno and Paris D. N. Svoronos, 2005, Taylor & Francis, 224 pages. Price: $99.95

The *CRC Handbook of Fundamental Spectroscopic Correlation Charts* provides a collection of spectroscopic information and unique correlation charts for use in the interpretation of spectroscopic measurements.

From forensics and security to pharmaceuticals and environmental applications, spectroscopic detection is one of the most cost-effective methods for identifying chemical compounds in a wide range of disciplines. For spectroscopic information, correlation charts are far more easily used than tables, especially for scientists and students whose own areas of specialization may lie elsewhere.

The handbook provides useful analysis and assignment of spectra and structural elucidation of organic and organometallic molecules. The correlation charts are compiled from an extensive search of spectroscopic literature and contain current, detailed information that includes new results for many compounds. The handbook includes graphical data charts for nuclear magnetic resonance spectroscopy of the most useful nuclei, as well as infrared and ultraviolet spectrophotometry. Because mass spectrometry data is not best represented graphically, the data are presented in tabular form, where mass spectrometry can be used for analyses and structural determinations in tandem with other techniques. In addition to presenting adsorption bands and intensities for a variety of important functional groups and chemical families, the book also discusses instrument calibration, diagnostics, common solvents, fragmentation patterns, several practical conversion tables, and laboratory safety.

The book is not intended to replace reference works that provide exhaustive spectral charts on specific compound classes, only to fill the need for fundamental charts that are needed on a general, day-to-day basis.



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