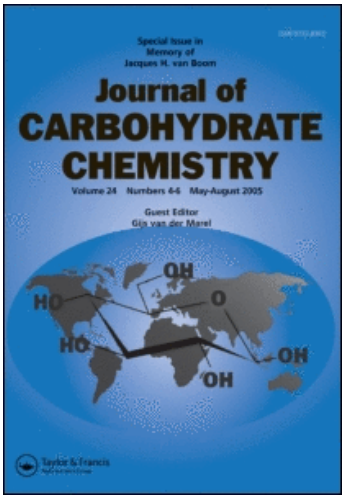


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# A Review of: Pulsed Electrochemical Detection in High-Performance Liquid Chromatography

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*BOOK REVIEW*

**Pulsed Electrochemical Detection in High-Performance Liquid Chromatography**, by William R. LaCourse. John Wiley & Sons, Inc. New York, Techniques in Analytical Chemistry Series, 1997, xvii + 324 pp. $59.95. Cloth. ISBN 0471119148

William LaCourse, of the University of Maryland Baltimore County, is without question one of the leading pioneers and innovators in the field of pulsed electrochemical detection (PED). This fact is readily apparent in this superbly written, comprehensive book on the theory and practice of PED in high performance liquid chromatography (HPLC).

The book focuses on the theory and use of pulsed electrochemical detection methods for all classes of carbohydrates (including simple sugars, oligosaccharides, alditols, aminosugars, sugar acids and glycosides) and many other polar aliphatic compounds such as alcohols, polyols, various amino alcohols, simple amines, amino acids, peptides, proteins and sulfur-containing compounds.



The purpose for this book is best described by the author in the preface: "I wrote this book in order to assemble a comprehensive and relevant review of PED and its applications. Since my intent was to write a book for anyone interested in PED, it was important to write this text in a style that would be readable and useful to both the expert and novice". This reviewer is happy to say that this intent has been met in this easy to read, scholarly, and quite useful book.

The book contains nine informative chapters that lead the reader from the bare fundamentals of electrochemistry to a thorough understanding of pulsed electrochemical techniques and finally to the practical application of these methods in the laboratory. Two subsequent appendices contain a computer program for pulsed voltammetry and seven separate tables of references to applications for different classes of compounds. The carbohydrate and alditols section contains 165 references alone and that includes important work up to the publication date of the book. The value of information in these sections alone could justify the book's purchase for many potential buyers.

Chapter 1 provides an insightful perspective on the history of pulsed electrochemcial detection, giving due credit to those researchers who, against conventional "wisdom", proved that electrochemically "inactive" polar aliphatic compounds could, in fact, be detected electrochemically. Chapter 2 provides a complete overview of the fundamentals of electrochemistry so that the reader does not need to consult a specialized text to understand these principles. Chapter 3 then discusses the fundamental principles of amperometry and its application to HPLC detection. Chapter 4 begins with a detailed discussion of pulsed amperometric detection, explaining the interactions between noble metal electrode and analyte during the application of the "magical" triple pulse (detection, oxidation, reduction) waveform that leads to reproducible analyte detection. Here, the importance of waveform parameters (applied potentials and time parameters) are

discussed. The author provides insight into the probable molecular species being generated when, for instance, glucose is oxidized and detected under these conditions. Chapter 5 covers advanced waveforms that are useful for detection of amino acids, proteins and other nitrogen and sulfur containing compounds. Here one learns the difference between PAD, IPAD, RPAD, and APAD and that for simplicity, we can refer to them all as PED. Chapter 6 describes the use of pulsed voltammetry as a method for obtaining optimum waveform parameters for any compound of interest, thus allowing optimum selectivity and sensitivity of detection.

Chapter 7 will be read with great interest by the carbohydrate chemist/analyst because it links PED with chromatography of carbohydrates under the highly alkaline mobile phases of high performance anion exchange chromatography (HPAEC). The author explains why HPAEC and PED are ideally suited and also provides guidance on important questions frequently asked: How does carbohydrate structure affect chromatographic retention? Will carbohydrates degrade at pH >12 during HPAEC and if so, how can accurate analyses be accomplished? What are the detection limits and the linear range of detection for various compounds? Can carbohydrates, especially oligosaccharides be quantified without the use of pure standards? Then, PED of amines, amino acids, peptides, proteins and sulfur-containing compounds is covered. While about 65% of past publications on PED involve carbohydrates, this chapter shows the potential of PED for numerous other important classes of compounds.

Chapter 8 covers instrumental considerations and should be very useful for those interested in setting up, maintaining, and troubleshooting HPLC-PED systems. Chapter 9 discusses the future of PED and describes innovative detection methods that may provide qualitative as well as quantitative information in the near future. The application of PED in capillary electrophoresis, microbore-, and capillary HPLC is also discussed.

As stated earlier, the appendices are useful and well designed. One can find references to specific applications by searching analyte class, and titles and authors of publications are also given. An eight page index ends the volume. It has sufficient detail to guide the reader to specific points of interest.

Who would benefit from reading this book? According to the author, those likely to benefit are "analytical chemists, biochemists, carbohydrate chemists, separation scientists, biologists, biotechnologists, and others working in academia and industries, that include biochemical, medical, pharmaceutical, and food industries."

This book would make an excellent addition to all institutional chemistry libraries and should be on the personal bookshelf of every scientist considering PED techniques for any type of polar aliphatic compound, especially carbohydrates!

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