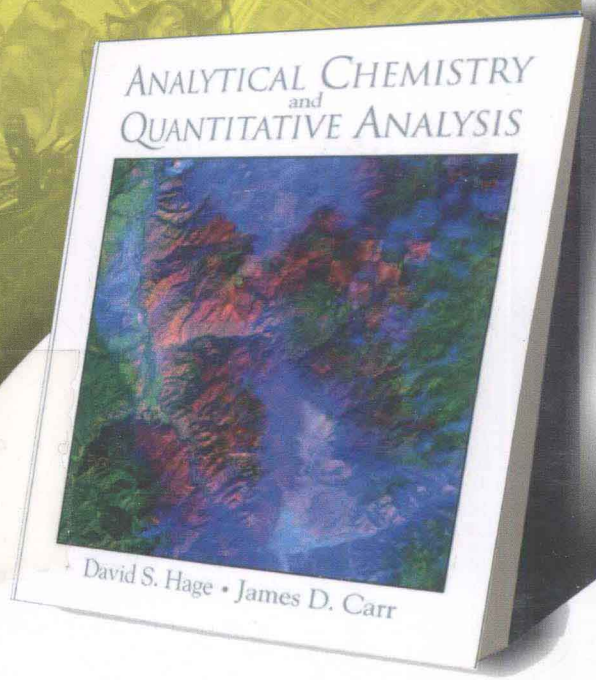
时代教育·国外高校优秀教材精选

分析化学和定量分析

（英文版）

ANALYTICAL CHEMISTRY and QUANTITATIVE ANALYSIS

(美) David S.Hage
James D.Carr 著



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Analytical Chemistry and Quantitative Analysis

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本教材内容包括：分析化学纵览，好的实验室实践，质量和体积的测量，根据数据作决定，分析方法的特性描述和选择，化学活性和化学平衡，化学溶解性和沉淀物，酸碱反应，络合物形成法，氧化反应，重量分析，酸碱滴定法，络合物滴定法和沉淀滴定法，电气化学分析简介，氧化还原滴定法，库仑法、伏安法和相关方法，光谱分析法概论，分子光谱，原子光谱，化学分离简介，气相色谱法，液相色谱法，电泳。

本书适合作为化学化工类专业，医药、生物、食品等专业的教材。

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出 版 说 明

随着我国加入 WTO，国际间的竞争越来越激烈，而国际间的竞争实际上也就是人才的竞争、教育的竞争。为了加快培养具有国际竞争力的高水平技术人才，加快我国教育改革的步伐，国家教育部近来出台了一系列倡导高校开展双语教学、引进原版教材的政策。以此为契机，机械工业出版社陆续推出了一系列国外影印版教材，其内容涉及高等学校公共基础课，以及机、电、信息领域的专业基础课和专业课。

引进国外优秀原版教材，在有条件的学校推动开展英语授课或双语教学，自然也引进了先进的教学思想和教学方法，这对提高我国自编教材的水平，加强学生的英语实际应用能力，使我国的高等教育尽快与国际接轨，必将起到积极的推动作用。

为了做好教材的引进工作，机械工业出版社特别成立了由著名专家组成的国外高校优秀教材审定委员会。这些专家对实施双语教学作了深入细致的调查研究，对引进原版教材提出了许多建设性意见，并慎重地对每一本将要引进的原版教材一审再审，精选再精选，确认教材本身的质量水平，以及权威性和先进性，以期所引进的原版教材能适应我国学生的外语水平和学习特点。在引进工作中，审定委员会还结合我国高校教学课程体系的设置和要求，对原版教材的教学思想和方法的先进性、科学性严格把关，同时尽量考虑原版教材的系统性和经济性。

这套教材出版后，我们将根据各高校的双语教学计划，举办原版教材的教师培训，并及时地将其推荐给各高校选用。希望高校师生在使用教材后及时反馈意见和建议，使我们更好地为教学改革服务。

机械工业出版社

影印版序

本教材层次分明，条理清楚，阐述了定量分析化学、分析实验室及分析研究的科学理论的概念，理论与实际相结合，符合人才培养目标及课程教学的要求。书中对各部分知识归纳总结得很好，分类明确，由浅入深，适合于各个层次的读者。对于教师来说，这本书也可以当做很好的教材，编写灵活，适合多种教学方式。

这本教材的编写比较有特色，它采用了先提出问题的方式，学生带着问题去学习基础理论，让学生认识到每种分析方法的价值和用途。在讲解过程中穿插习题，让学生很快地将理论知识用于为解决实际问题所设计的“挑战性问题”和“讨论与报告”部分，进一步提高了学生的创新能力和开放性研究能力，对于学生综合素质的提高比较有帮助。

教材内容主要包括实验玻璃器具、实验记录本和对实验数据进行评价和对比，综述了化学平衡中的基础问题，并用基础知识来说明经典分析方法，如重量分析法、滴定法的原理和适当的应用，同时也引导学生学习一些常见的仪器分析技术，像光谱学、色谱学和电化学方法。

本教材的每一章都安排有几个小组，每个小组有常见的问题。这种设计可以使读者用多种方式从一个主题浏览到另一个主题，比如，一个学生需要化学平衡和相关计算的训练，他可以在第 6 章第 3 节中学习这部分知识。然而，那些对这部分知识已经有很好基础的同学可以跳到后面的章节来学习其他分析技术，比如重量分析法和滴定法。如果教师想在讲经典分析方法前先介绍一些仪器分析方法的话，可以利用前几章介绍一下化学分析的大体背景，然后再介绍电化学、光谱学或者色谱学。我们认为这个版本给了教师在运用这本书时最大的灵活性，不管他是用一学期来讲解分析化学，还是用传统的两学期中的一部分以先讲定量分析，后讲仪器分析的顺序来讲授。

本教材的目的是想让学生了解分析化学在科学的发展和日常生活中所起的作用，并运用实际的例子来帮助说明已经讨论过的原理。书中包含了环境科学、污染监测、制药科学、工业处理、食品检测和临床分析等领域的例子。

本教材包括了最常用的理论知识，同时也有学生未来发展所必须深化和拓展的知识，使学生能由基础理论向专业知识以及实践转化，体系结构可以和国内课程及教材相结合，有较好的适应性。

复旦大学化学系
杨芃原

主 要 内 容

PREFACE

The purpose of this text is to acquaint the student with basic laboratory techniques for chemical analysis and the appropriate selection and use of these methods. This includes such items as the proper use and maintenance of balances, laboratory glassware, and notebooks, as well as mathematical tools for the evaluation and comparison of experimental results. Basic topics in chemical equilibria are reviewed and used to help demonstrate the principles and proper use of classical methods of analysis like gravimetry and titrations. Students are also introduced to common instrumental techniques, such as spectroscopy, chromatography and electrochemical methods. One important change made from other texts is that we have tried to organize and weight this material in a manner that better reflects the relative importance of these methods in today's analytical laboratories.

The chapters in this textbook are arranged into several groups with common themes. This design makes it possible to easily flow from one topic to the next in a variety of ways. For instance, students who require training in chemical equilibria and related calculations can learn about this topic in Chapters 6 through 10, while students who already have a solid background in this area can move on to later chapters that deal with techniques such as gravimetry or titrations. An instructor who wishes to discuss some instrumental methods before classical methods can use the first set of chapters to provide a general background on chemical analysis, followed by a discussion on electrochemistry, spectroscopy, or chromatography. We believe this format gives the instructor the greatest flexibility in using this text as either a one-semester introduction to analytical chemistry or as part of a more traditional two-semester sequence that begins with quantitative analysis and later moves on to instrumental methods. This format makes this textbook a flexible but practical tool that can be utilized to provide foundation coursework in analytical chemistry, in line with recent ACS guidelines outlined in a 2008 report entitled "Undergraduate Professional Education in Chemistry: ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs."

An underlying goal that we had in writing this textbook was to give students an appreciation of the role analytical chemistry has played in the development of science and continues to play in everyday life. To do this, we use real examples in each chapter to help illustrate the principles that are being discussed. This format also meets recent guidelines that encourage the use of problem- or inquiry-based learning. Special sections are also included as sideboxes to indicate important developments in the history of chemical analysis and/or common applications of analytical chemistry to real-world problems. In illustrating the methods in this textbook, we have gone beyond the standard inorganic and organic analyses that are common in many texts and have included examples from fields that range from environmental science, pollution monitoring and industrial processes to pharmaceutical science, food testing, and clinical analyses. In doing this, it is our hope that students who read this textbook will come away with a view of analytical chemistry as an important, living, and ever-changing science. These students should also have a greater appreciation of how the creation and use of methods for chemical analysis are important in the scientific process of discovery.

One key difference between this textbook and others is the way in which the students learn about each topic. For example, many of the chapters begin with an opening scenario in which the student is presented with a problem or group of problems that require the use of a particular analytical method. The student is then introduced to the method and guided through a series of topics that are needed for him or her to understand and use this technique. This format allows us to cover the same topics as other quantitative analysis texts but employs a more student-friendly style than the traditional topic-oriented approach. Another advantage of this format is that it will help students to more easily see the value and utility of each topic as it is presented. This is reinforced by exercises that are scattered throughout the text and by related homework problems that appear at the end of each chapter. Most of these problems can be solved using elementary algebra; however, sections are also included at the end of each chapter with "Challenge Problems," some of which involve the use of spreadsheets and all of which allow the student to address the chapter's material on a more in depth level. There is also a section at the end of each chapter entitled "Topics for Discussion and Reports" which provides the instructor and students with opportunities to explore material and methods that are related to those presented in the chapter but that are normally not covered in a traditional course on quantitative analysis. The "Challenge Problems" and "Topics for Discussion and Reports" are designed to develop the abilities of a student in inquiry-based and open-ended investigations into the area of analytical chemistry. Within these sections there are also many opportunities for writing, critical thinking and reasoning in topics related to chemical analysis.

SUPPLEMENTS

The supplemental materials listed below are available to support instructors and students as they use this textbook.

- Solutions Manual. This resource provides detailed answers for problems that appear at the end of each chapter.
- Test Bank. This resource can be used by instructors as a source of exam questions, complete with solutions.
- PowerPoint lecture slides. Each chapter of the book will be accompanied by a set of PowerPoint slides that can be used directly or after customization by an instructor to their individual preferences.
- Extended homework assignments. One extended homework assignment per chapter is available. These assignments are based on a key component in each chapter (e.g., describing the fraction of species for an amino acid during the discussion of acid-base reactions).
- In-class work sheets. Each chapter in the book is accompanied by a chapter summary hand-out with key focus points for one major topic. These worksheets will have blanks and/or problems to discuss and work on in class.
- Podcasts. Each chapter is accompanied by a podcast that summarizes the most important points in the chapter and highlights the points students should take away from the chapter.

The Solutions Manual has been developed by the authors, and the remaining supplemental materials have been prepared by Dr. Charles W. (Bill) McLaughlin of Montana State University. Please contact your local Pearson representative for more details about the supplements program that accompanies this textbook.

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Any effort such as writing a textbook is not just the result of work by the authors, but of many who contribute through their support, suggestions or insight. We would first like to thank our families for their support and help during this project. Jill, Ben, Brian and Bethany all helped in many ways as D.S. Hage worked on his portions of this project, and Rosalind gave her support to J.D. Carr as he worked on his sections. Many long days and hours were spent on putting this textbook together. The help by all of these family members with providing the time and support needed for this writing was crucial and is greatly appreciated. Their help with proofreading, preparing graphs, and acquiring photos is also appreciated. Jill is particularly acknowledged for all her help in editing and proofreading during the creation of this textbook.

Many students also have provided feedback, comments and assistance through the development of this textbook. These students include (in alphabetical order): Jeanethe Anguizola, John Austin, Omar Barnaby, Sara Basiaga, Raychelle Burks, Jianzhong Chen, Sike Chen, Mandi Conrad, Abby Jackson, Jiang Jang, Krina Joseph, Liz Karle, Ankit Mathur, Annette Moser, Mary Anne Nelson, Corey Ohnmacht, Efthimia Papastavros, Erika Pfaunmiller, Shen Qin, John Schiel, Matt Sobansky, Sony Soman, Stacy Stoll, David Stoos, Zenghan Tong, Michelle Yoo, and Hai Xuan. The input from these current and future teachers and leaders in analytical chemistry was greatly appreciated as we tried to create a textbook that could be effectively used by such individuals in the classroom.

There are also many current and former colleagues who have contributed in various ways to this textbook. The input and efforts by Carlos Castro-Acuna, Paul Kelter, and Jody Redepenning in the early phases of this project are acknowledged. We also thank Richard Stratton for his encouragement and support during the early phases of this project. Valuable comments on information on specific topics were also received from Daniel Armstrong, Chad Briscoe, Ronald Cerny, Carrie Chapman, Barry Cheung, William Clarke, Patrick Dussault, Don Johnson, Rebecca Lai, Robert Powers, Peggy Ruhn, Ed Schmidt, and John Stezowkski.

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Dr. Hage is the author of over 145 research publications, reviews and book chapters. He recently edited a book entitled the *Handbook of Affinity Chromatography* (Taylor Francis) and is a coauthor on the textbook *Chemistry: An Industry-Based Introduction* (CRC Press). He received the 1995 Young Investigator Award from the American Association for Clinical Chemistry and the 2005 Excellence in Graduate Education Award from the University of Nebraska, Lincoln. He was made a Bessey Professor of Chemistry in 2006 at the University of Nebraska.

James D. Carr is a professor of analytical chemistry in the Department of Chemistry at the University of Nebraska, Lincoln. He received his B.S. in chemistry from Iowa State University and his Ph.D. in chemistry from Purdue University. He was then a postdoctoral fellow at the University of North Carolina, Chapel Hill. He is a full professor at the University of Nebraska, Lincoln.

Dr. Carr is the author of approximately 50 research publications and articles. He is the coauthor of *Chemistry: A World of Choices* (McGraw-Hill), a liberal arts general chemistry textbook. He is also the author or coauthor of several versions of general chemistry and quantitative analysis lab manuals and study guides (gen chem only). He has won several teaching awards, including the University of Nebraska Distinguished Teaching Award in 1981; University of Nebraska Recognition Awards for Contributions to Students in 1992, 1993, 1994, 1995, and 2000; and the University of Nebraska Outstanding Teaching and Instructional Creativity Award in 1996. He is a member of the University of Nebraska, Lincoln Academy of Distinguished Teachers and received the Distinguished Teacher Award from the Nebraska Teaching Improvement Council in 2001.

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