PRINCIPLES AND APPLICATIONS OF GAS CHROMATOGRAPHY IN FOOD ANALYSIS

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FOOD BIOCHEMISTRY
CHARLES ALAIS and GUY LINDEN, Laboratory of Biochemistry, University of Nancy, France

Concentrating on a biochemical approach to food science and technology this book will be valuable to all those from undergraduate [illegible] involved in biochemistry and biology, including professionals in the food industry. The book emphasizes practical aspects: the first part of the book being devoted to [illegible] the peculiarities in the biochemistry of the principal foods used [illegible]

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Research Centre, Adria, Quimper, Brittany, France
Translated by MARY DEEGAN
[illegible] and work[illegible]

APPLIED HUMAN NUTRITION
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[illegible] ALLEN, ALIKER, Lecturer in Human [illegible]
[illegible]ology, University of Reading.

[illegible] by five eminent authors, all specialists [illegible] approachable level, of human nutrition [illegible]ce. Subjects of particular importance to [illegible] the food industry or closely with consumer [illegible] at healthy eating, obesity, infant feeding [illegible] diabetes.

FOOD HANDBOOK
C. M. E. CATSBERG and G. M. KEMPEN-VAN [illegible]
Nijmegen, The Netherlands
Translator: F. H. OUTER-LEEFTINK, Reading, [illegible]
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This book provides comprehensive information on foods and allied products and covers food production and quality, technology, additives, preservation and nutritional aspects. Information on Institute for Food Information, legislation, [illegible] and methods of [illegible] amounts of consumption are also given.

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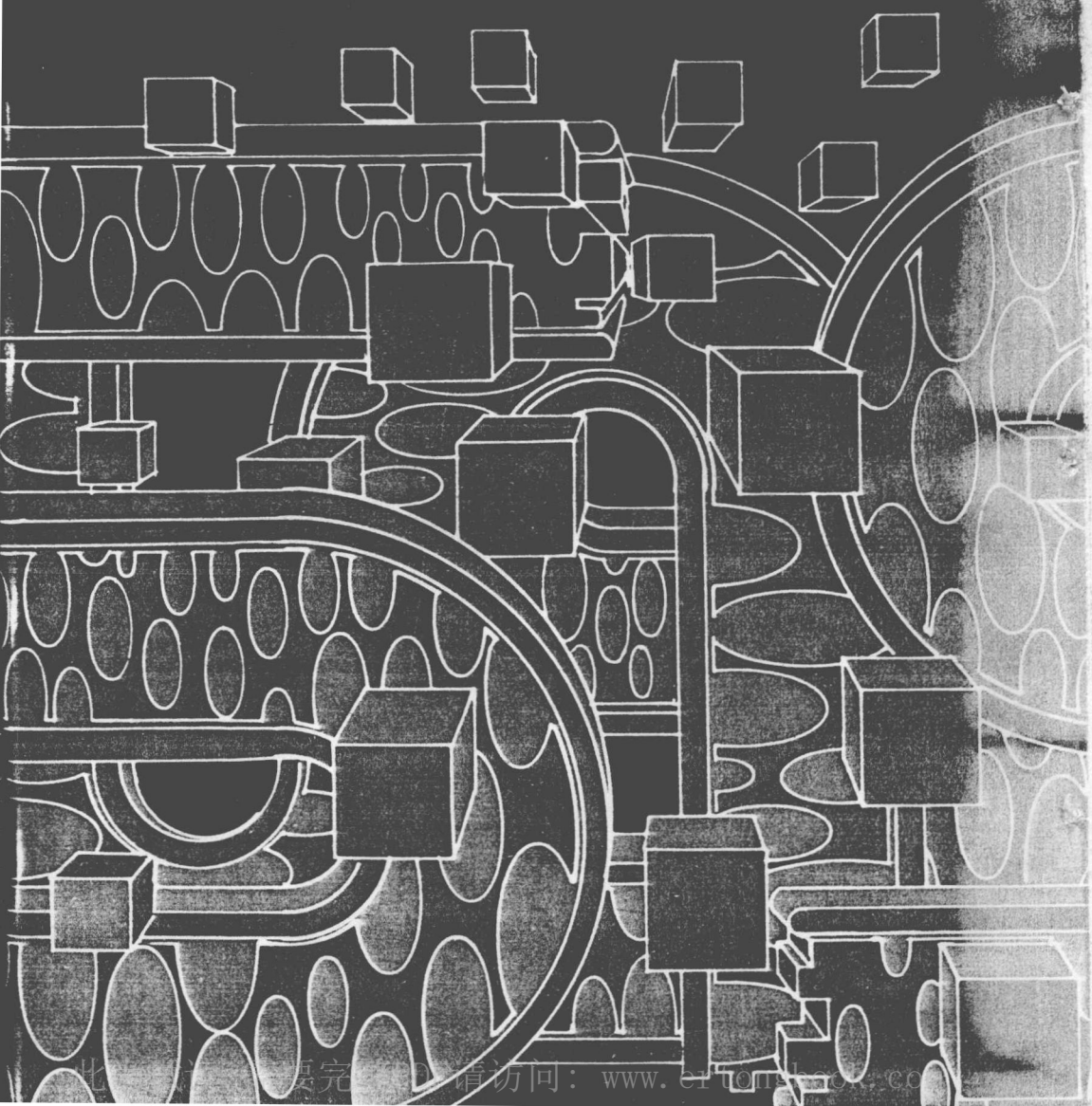

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Preface

The food analyst plays an important role in modern society. Stricter control over additives in food and concern about the effects of contamination of food by industrial and agricultural chemicals are among the developments which are leading to an increasing emphasis on detailed and accurate analysis of food. However, analysis of food is required for many reasons, including detection of toxic components, monitoring legislation, detecting adulteration, formulation of controlled diets, controlling formulation during product development and detecting changes in food during storage and processing.

Foods comprise a complex mixture of components and food analysis requires efficient methods of separation with high sensitivity or specificity of detection. Although many food components are involatile or thermally labile and therefore not suitable for analysis by gas chromatography, other components are volatile and this technique is the preferred analytical method. Developments in methods of derivatization, injector design and column technology have also extended the applicability of gas chromatography to the analysis of relatively involatile compounds.

Although it is less than 40 years since gas chromatography was first described, the technique is now relatively mature. It has developed to a stage where it is flexible, efficient, widely available, reliable, easy to use and readily automated. Therefore many laboratories employ gas chromatographic methods of analysis even where alternative techniques are equally acceptable. There are many general texts available that are concerned with the principles of gas chromatography, but the aim of this book is to emphasize the features of the technique that make it valuable in food analysis with copious examples to illustrate its application in this field. I wish to thank the contributors to this book for their hard work in distilling many years of experience into the chapters.

Michael H. Gordon

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Principles of gas chromatography

Michael H. Gordon

1.1 INTRODUCTION

Gas chromatography (GC) has developed rapidly since it was first introduced by James and Martin (1952). There have been many advances in column technology, detectors, injectors and data-handling techniques, and the suitability of GC for automated analyses has increased its attraction to analysts. Many food components can be analysed with great accuracy by GC and it has become one of the main techniques in analytical laboratories concerned with food analysis.

GC achieves separation of mixtures by partition of components between a mobile gas phase and a stationary phase. Although components must be stable and have significant volatility at the analytical temperature, the use of short columns and high temperatures allows the analysis of many compounds that would normally be considered relatively non-volatile. Triglycerides or steryl esters which have a vapour pressure of less than 0.05 mm at 300°C are commonly analysed by GC. Non-volatile molecules such as sugars may be converted to more volatile compounds by a simple derivatization reaction.

Since foods are complex materials, GC is usually the final stage in a series of steps in the analysis. Solvent extraction, solid-phase extraction, distillation, or other chromatographic procedures, including column chromatography, thin-layer chromatography, high-performance liquid chromatography (HPLC) or gel-permeation chromatography may be used in sample preparation preceding GC.

GC is only one of a number of instrumental procedures to be considered in the analysis of food products. In particular HPLC has developed very rapidly in recent years and has been applied in the analysis of a wide range of food components (Macrae, 1988). The development of flame ionization and mass detectors in addition to well-established detectors, such as ultraviolet and fluorescence, has extended the range of application of HPLC enormously. Analysts must consider whether HPLC or GC is the preferred technique for a particular analysis. While HPLC is clearly preferred for completely non-volatile or thermally labile molecules, and GC is better