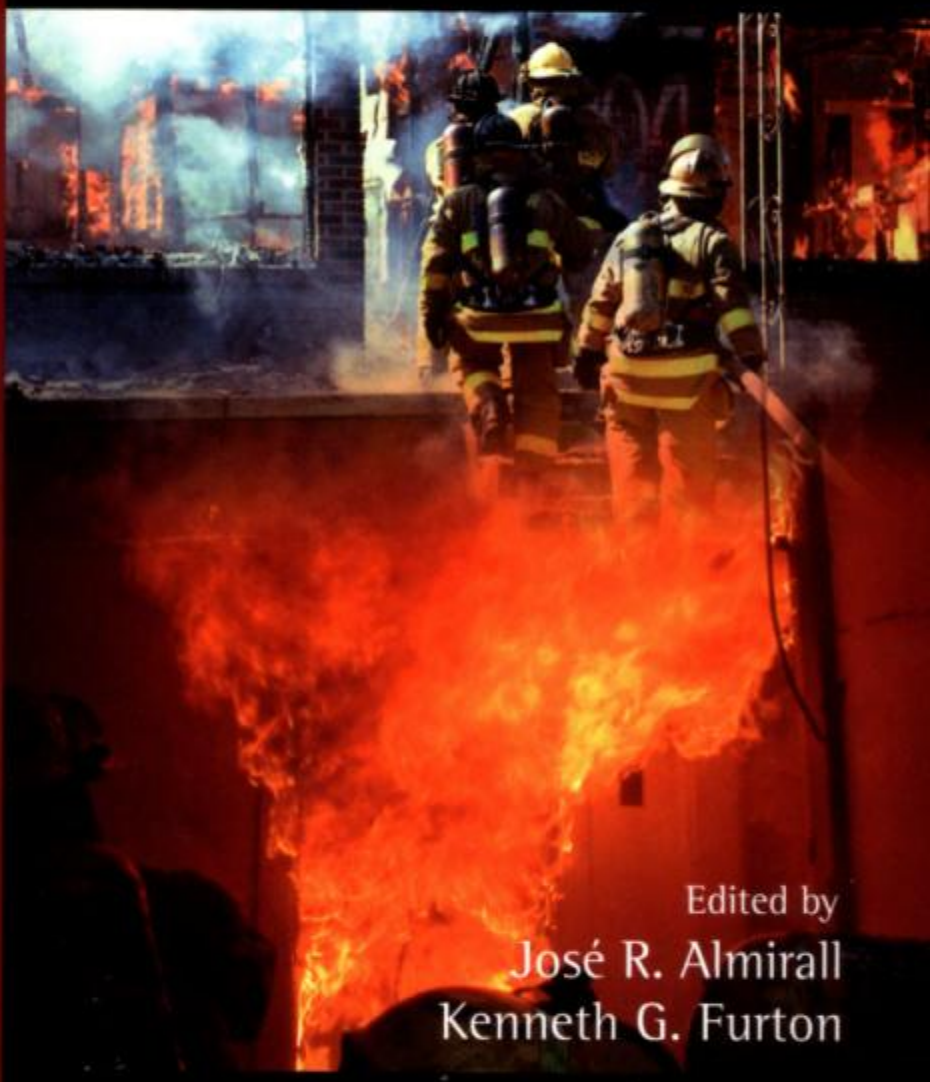
Analysis and Interpretation of Fire Scene Evidence



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Preface

The field of forensic science is a diverse, interdisciplinary field that is rapidly expanding in terms of public interest and importance in the administration of justice. A primary reason for the increasing importance of scientific evidence in the courtroom is the increasingly individualizing information being provided by advances in scientific techniques and instrumentation. This book represents the inaugural volume of a new series entitled "Forensic Science Techniques," which will focus on recent developments in the rapidly expanding realm of forensic sciences and emphasize the improvements in the scientific techniques utilized. This book focuses on advances in the analysis and interpretation of fire scene evidence used to help solve arson crimes.

The word "arson" comes from the Latin *ardere*, to burn, and the willful setting of fires has been a recognized crime for thousands of years. The earliest attempt by the Romans to create a code of law was the Laws of the Twelve Tables (c. 455 B.C.). This law detailed *incendium,* the crime of setting any object on fire and resulting in endangering a person's property. Severe punishments were dispensed to those found guilty of this crime, including the sentence of death possibly by burning alive. Of course, the methods of detecting malicious burning of property at that time were rudimentary. Today, the sentences for arson are significantly less severe and the methods for detecting indications of arson are becoming increasingly sophisticated and more selective and sensitive than ever before.

This first book in the series focuses on the scientific advances in the analysis and interpretation of fire scene evidence for the investigation of suspicious fires. It is written to assist those who conduct the chemical analysis and interpretation of physical evidence found at the scene of a fire to determine whether there is a presence of ignitable liquid residues (ILRs). The detection and identification of an ILR at the scene of a fire, in and of itself, does not necessarily result in the conclusion that a crime has been committed. The presence of an unexplained ILR at the scene of a fire often does assist the investigation of an arson. Attorneys and judges involved in criminal and civil judicial proceedings may also find the book a useful reference in preparation for these types of cases.

Practicing forensic chemists and students of forensic chemistry will find Chapter 1 and Chapter 2 useful in better understanding the process that occurs before the laboratory analysis of fire scene evidence can begin. The first two chapters are written from the investigator's point of view to aid chemists and others to better understand basic fire dynamics, ignition, heat transfer, and fire scene investigation techniques. This introduction is important because forensic chemists must be aware of the actions taken in the field. Scientists and investigators interface at some point in the process of analyte detection, collection, packaging, and transport to the laboratory. Therefore, it is essential that investigators and forensic chemists maintain excellent communication and collaboration during the process.

The third chapter, entitled "Detection of Ignitable Liquid Residues in Fire Scenes: Accelerant Detection Canine (ADC) Teams and Other Field Tests," describes the field methods used to identify potential evidence at the scene of a fire suspected as arson. The use of biological detectors (canines) is compared to the use of emerging instrumental field tests. Chapter 4, entitled "Essential Tools for the Analytical Laboratory: Facilities, Equipment, and Standard Operating Procedures," is useful to those who are interested in the initial organization of a new laboratory and setting up standard operating procedures, as well as for revising existing laboratories and procedures. The next chapter contains a detailed description of the analytical methods used in the detection and characterization of ILRs from fire debris, and the sixth chapter, entitled "ASTM Approach to Fire Debris Analysis," details the consensus standards widely used in the discipline. Chapter 7 deals with the interpretation of the data generated from the analyses and includes helpful suggestions for report writing and testimony in these types of cases. The final chapter summarizes new developments in extraction and analysis that can be used to improve the detection of ILRs in fire debris and describes current quality assurance methods in fire debris analysis.

We wish to thank the chapter authors for their expertise and contributions to this volume. We also thank the staff of CRC Press, particularly Becky McEldowney and Julie Spadaro, for their persistence, patience, and encouragement.

We wish to thank the many people who have contributed to our education and success, including our parents, academic mentors, colleagues, and students.

Last but by no means least, we wish to thank our families for their support and encouragement even after countless weekends and late nights spent in front of our computers.

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The Editors

José R. Almirall, Ph.D., is an Assistant Professor in the Department of Chemistry and Biochemistry, the Associate Director of the International Forensic Research Institute, and the Director of the Graduate Program in Forensic Science at Florida International University in Miami, Florida. He earned a B.S. in chemistry from Florida International University, an M.S. in chemistry from the University of Miami, and a Ph.D. in pure and applied chemistry from the University of Strathclyde in Glasgow, Scotland. He was a practicing forensic scientist at the Miami-Dade Police Department Crime Laboratory in Miami, Florida, for 12 years prior to his academic appointment in 1998. Dr. Almirall has testified in more than 100 criminal trials as an expert witness in the areas of drugs, trace evidence, and arson evidence analyses. Dr. Almirall has authored or co-authored over 40 publications in the field of analytical chemistry and forensic chemistry and has presented over 140 papers and workshops in the U.S., Europe, Central America, Australia, and Japan. The interests of his research group include the development of analytical methods for the detection and analysis of arson evidence, materials characterizations by a variety of methods, and new applications of mass spectrometry in forensic science.

Kenneth G. Furton, Ph.D., is a Professor in the Department of Chemistry and Biochemistry, Associate Dean of Arts and Sciences, and Director of the International Forensic Research Institute at Florida International University (FIU). He earned a B.S. in forensic science at the University of Central Florida in 1983, a Ph.D. in analytical chemistry at Wayne State University in 1986, and completed postdoctoral studies in nuclear chemistry at the University of Wales, Swansea, in 1988 before becoming a faculty member at FIU. Since then, he has directed the research of scores of undergraduate and graduate students and is the author or co-author of more than 300 publications and presentations. Professor Furton's research program has focused on forensic science and separation science, including the development of novel sample preparation methods prior to chromatographic analysis. Recent work includes studying the chemical basis of detector dog alerts to forensic specimens. He has testified in county and federal court in areas including drug analysis and the use of canines as chemical detectors.

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