

Current Methods

FORENSIC GUNSHOT RESIDUE ANALYSIS

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A. J. Schwoeble • David L. Exline

Current Methods In Forensic Gunshot Residue Analysis

Forensicnetbase

D. DeGaetano, J.A. Siegel



Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase:

Current Methods in Forensic Gunshot Residue Analysis A. J. Schwoeble, David L. Exline, 2000-06-27 With the ever spreading problem of violent crime in today's society techniques to assist forensic scientists and other law enforcement personnel have come to the forefront With improvement in collection methods and analytical tools to conduct more thorough analyses gunshot residue examination has made a dramatic impact as an area of trace evidence that is essential in the investigation and prosecution of violent crime Current Methods in Forensic Gunshot Residue Analysis deals with major areas of gunshot residue analysis such as current and future methods of analysis collection techniques interpretation of evidence as well as expert testimony and report writing This text is a necessity for any forensic scientist conducting this type of analysis and all other law enforcement personnel academia and lawyers involved in the investigation and prosecution of violent crimes involving firearms

Review of WF. Rowe, 2001 This book reviews the methods currently used for the analysis of gunshot residue with particular emphasis on variable pressure SEM EDS analysis of primer residues The chapters consider in turn 1 gunshot residue as forensic evidence including the loss or transfer of gunshot residue and its collection at the scene of the crime 2 the formation and composition of primer residue particles 3 methods of gunshot residue analysis concentrating on the aforementioned variable pressure SEM EDS but also outlining graphite furnace atomic absorption spectrophotometry neutron activation analysis inductively coupled plasma mass spectrometry and capillary electrophoresis 4 gunshot residue plumes produced by a variety of firearms presenting video captures from the highspeed video studies conducted by RJ Group Inc in 1994 5 the results of SEM EDS analyses of a number of samples of gunshot residue produced by various handguns firing a variety of brands of ammunition and finally 6 the proper documentation of test results and the presentation of testimony The book concludes with a glossary of ballistic terms and a comprehensive bibliography of articles relating to the analysis of gunshot residue

Forensic Analysis of Gunshot Residue, 3D-printed Firearms, and Gunshot Injuries Oscar Black, James Cizdziel, 2019 As technology continues to advance forward it is crucial that the forensic disciplines maintain their lead over the criminal element The field of firearm analysis is one such area that has experienced rapid developments spurred on by recent technological advancements With the invention of high resolution 3D printing new improvements in instrumental techniques such as Raman Spectroscopy and Mass Spectrometry and improvements in simulation capabilities for ballistic wounding potential entirely new fields of study have evolved This book takes an in depth look at the current state of gunshot residue analysis and wound ballistics and showcases groundbreaking research in these crucial areas The ramifications of the availability of 3D printed firearms are also discussed with authors submitting evaluations of new and existing forensic methods on trace analysis of GSR and fingerprinting as well as potential protocol adaptations to better address the unique challenges of 3D printed firearms Whereas this book is primarily oriented toward forensic researchers and practitioners others with an interest in keeping up with developments in forensic science may find it informative and useful

New

Approaches In Forensic Science Jagdish Kumar Agrawal, 2006-01-01 This Book Is A Comprehensive Volume On Gunshot Residues It Covers The Phenomenon Of Gun Shot Residue Formation Their Placing Collection Detection And Identification Gun Shot Residues Lead To The Identification Of Shooter Range Determination And Identification Of Gun Shot Holes Hence Play An Important Role In Firearm Cases Various Methods Reported For The Detection Of Gun Shot Residues So Far Have Been Discussed In Detail And Their Merits And Demerits Are Listed Authors Have Successfully Applied The Differential Pulse Anoding Stripping Voltametric Analysis For The Detection Of Gun Shot Residues On The Hands Of The Shooter This Method Is Quick Quantitative Non Destructive Effective And Cheap As Compared To The Methods Suggested So Far This Work Is Based On The Actual Experiments Conducted At The State Forensic Science Laboratory Govt Of Madhya Pradesh Sagar And Dr Hari Singh Gour University Formerly Sagar University Sagar It Will Be Of Great Interest To All Those Who Are Working In The Field Of Gunshot Residue Analysis Students Of Forensic Science Investigating Officers Advocates And Judicial Officers This May Also Interest The General Public To Help Them In Preserving The Firearm Evidence In The Form Of Gunshot Residues To Avoid Complication In The Investigation Of The Firearm Cases Particularly Where Mode Of Firing Suicide Accident Homicide Is Disputed

Survey of Gunshot Residue Analysis in Forensic Science Laboratories D.

DeGaetano, J.A. Siegel, 1990 The purpose of this survey was to determine the methods of analysis being used on gunshot residue GSR samples in forensic science laboratories across the United States In addition the two general techniques of GSR analysis are compared and contrasted Problems encountered by analysts using scanning electron microscopy energy dispersive X ray analysis SEM EDX are discussed

Chemical Analysis of Firearms, Ammunition, and Gunshot Residue

James Smyth Wallace, 2008-06-04 Firearms and their associated ammunition spent bullets and spent cartridge cases provide useful information for identifying suspects terrorist groups and the criminal history of a weapon Unfortunately despite the numerous detailed books on the physical aspects of firearms very little has been published on the chemical aspects and what has b

A Survey of Gunshot Residue Analysis Methods R.L. Singer, D. Davis, M.M. Houck, 1996 A survey was sent to 80

forensic laboratories in 44 States and two Canadian Provinces concerning methodology in analyzing gunshot residue GSR and interpreting the results Of the 80 surveys 50 63% were returned completed Questions included standard procedures collection methods thresholding problems and specificity of data These results are compared to a previous survey reported in 1990 Implications for the interpretation and future study of these methods are discussed

On the Integrated Analysis and Forensic Interpretation of Gunshot Residues Callum Bonnar, 2023 Gunshot residue GSR is a type of trace material that can be very important to the investigative coronial or criminal justice outcomes of incidents involving firearms If scientists can identify and interpret these traces they can contribute valuable information to the forensic process The intent of this body of work was to improve the capabilities available to forensic practitioners regarding this particular category of trace evidence Specifically it was identified that contemporary GSR analyses largely target the inorganic portion of gunshot residues IGSR

Forensic scientists already recognize that firearms also produce organic residues OGS Research into the exploitation of OGS traces as evidence has been well documented in academic literature but as yet no single technique has been adopted into routine laboratory use It is even rarer for an integrated IGS OGS methodology using data on both components of the trace to be used forensically for either detection or evaluation of traces The original contribution to knowledge made by this PhD project was the exploration of options for this unified approach New data on the subject were generated using combinations of laboratory experimentation firing range fieldwork and collection of survey samples Authentic GSR samples were collected both from shooting experiments performed under controlled conditions and also following natural shooting activities undertaken by recreational shooters It was found that liquid chromatography mass spectrometry instrumentation already available to forensic chemistry laboratories could detect known OGS compounds from recovered traces A process for preparing subsamples for this organic analysis while still retaining the possibility of inorganic analysis by scanning electron microscopy SEM EDS was developed Further samples were collected alongside written surveys asking about recent firearm use Analysis of the pool of non shooter background samples gave confidence that the combination of analytical methods was specific for the detection of GSR with few to no false positives This tandem approach offers potential improvement over current methodologies as it increases the mass of material that can be targeted for detection It also allows greater confidence when discriminating between GSR and inorganic environmental GSR like interferences by providing more chemical data to the analyst from each trace These data are applicable to sub source and activity level evaluations used by experts in some jurisdictions when presenting their findings Next different strategies for combining the outputs of each test into a single reportable result were investigated Initially the inorganic and organic laboratory tests were judged to indicate whether samples were either positive or negative for GSR using separate predetermined categorical requirements A Bayesian updating approach was then used to show that a statistical improvement in diagnostic accuracy was achieved when using two categorical tests in tandem More advanced statistical methods including both univariate and multivariate models were also used to generate likelihood ratios representing the potential strength of evidence that could be provided to an investigator or courtroom Of several techniques evaluated artificial neural networks were chosen as the preferred method for synthesising multivariate data into a cohesive output without needing to discard any underlying information Some perceived advantages and disadvantages of choosing categorical or likelihood ratio based reporting are discussed Data were also used as examples to perform certain sub source and activity level evaluations Finally two separate spectrometers featuring ambient ionisation capability were assessed for possible use as rapid and selective detectors for analysing GSR Both Direct Sample Analysis DSATM and Direct Analysis in Real Time DART ion sources were found to be capable of desorbing and ionising relevant OGS compounds Either instrument was suitable for analysing and potentially discriminating between smokeless powders collected in their unburned state However the outcomes for GSR samples collected using adhesive stubs

were poor due to a significant background signal arising from the adhesive in the stubs themselves Therefore it is suggested that any future efforts to incorporate AIMS into a GSR detection procedure should focus on sample collection or isolation procedures In summary the integrated analysis of GSR traces was found by the author to both be technically feasible and to offer greater value to forensic scientists than the sum of its parts **Forensic Analysis of Gunshot Residue** ,2002

Investigating Techniques of Gunshot Residue Analysis Charles Allen Hulet,2002 Improving Forensic Casework Analysis and Interpretation of Gunshot Residue (GSR) Evidence Stephanie Hales,2011 New Method for the Collection and Analysis of Gunshot Residues as Forensic Evidence KKS. Pillay,WA. Jester,HA. Fox,1974 The detection of firearm discharge residues is of great importance in various criminal investigations involving the use of a firearm One of the procedures introduced in the early 1930s was the diphenylamine sulfuric acid dermal nitrate test on paraffin casts for the presence of nitrites and nitrates from gunpowder discharge residues However the limitations of these procedures were pointed out in 1935 and later in 1940 by the Federal Bureau of Investigation 1 2 In spite of the known limitations of this procedure the use of diphenylamine tests to detect gunpowder residues continued because of the lack of other suitable test procedures to satisfy this need in criminal investigations In 1959 Harrison and Gilroy 3 demonstrated the presence of barium Ba antimony Sb and lead Pb in the firearm discharge residues and devised qualitative chemical tests to identify the presence of these elements thus offering a unique new method to detect gunshot residues Because of the limitations in the sensitivity of the colorimetric reactions used to detect Ba Sb and Pb there was no widespread adoption of this method to replace the classical diphenylamine test The continued use of this test to identify gunshot residues is of great concern and this concern was eloquently expressed by practicing forensic chemists Cowan and Purdon 4 Because of the rapid increase in new products for consumers numerous materials around a person s environment can develop a positive reaction to the diphenylamine tests This fact is now generally recognized although the use of the diphenylamine test has not been altogether abandoned

Forensic Analytical Methods Thiago R L C Paixão,Wendell K T Coltro,Maiara Oliveira Salles,2019-08-13 Forensic analysis relates to the development of analytical methods from laboratory applications to in field and in situ applications to resolve criminal cases There has been a rapid expansion in the past few years in this area which has led to an increase in the output of literature This is the first book that brings together the understanding of the analytical techniques and how these influence the outcome of a forensic investigation Starting with a brief introduction of the chemical analysis for forensic application some forensic sampling and sample preparation the book then describes techniques used in forensic chemical sensing in order to solve crimes The techniques describe current forensic science practices in analytical chemistry and specifically the development of portable detectors to guide the authorities in the field The book provides an excellent combination of current issues in forensic analytical methods for the graduates and professionals It will cover the essential principles for students and directly relate the techniques to applications in real situations **Particle Analysis for the**

Detection of Gunshot Residue. III GM. Wolten,RS. Nesbitt,AR. Calloway,1979 The final step in the development of the particle analysis method for gunshot residue detection was a program of case assistance for law enforcement agencies carried out during the first nine months of 1977 Feasibility of Gunshot Residue Detection Via Its Organic Constituents. Part I MH. Mach,A. Pallos,PF. Jones,1978 A quick convenient and reliable test for detecting gunshot residue is needed to cope with the increasing number of crimes involving handguns Chemical color tests for nitrates 1 and for antimony barium and lead 2 have been used but these methods lack the required sensitivity and specificity for forensic purposes Two instrumental techniques neutron activation analysis and atomic absorption have found some acceptance by crime laboratories Neutron activation analysis has been used to detect antimony and barium in hand samples 3 but it suffers from the drawbacks that samples must be sent out for analysis and that it is insensitive to lead Atomic absorption has been used to detect lead by flame atomization 4 and antimony and barium have been detected with a flameless atomizer 5 This approach has extended the availability of gunshot residue analysis However the costs still limit the number of laboratories with the required equipment Perhaps a more serious limitation of any technique that is based on the bulk amounts of antimony barium or lead on a person s hands is the possibility of environmental or occupational sources of these elements on the hands This limitation requires setting a threshold often higher than the amount deposited by firing Furthermore the amount of residue on the hand declines very rapidly with time

Forensic Analysis National Research Council,Division on Earth and Life Studies,Board on Chemical Sciences and Technology,Committee on Scientific Assessment of Bullet Lead Elemental Composition Comparison,2004-04-26 Since the 1960s testimony by representatives of the Federal Bureau of Investigation in thousands of criminal cases has relied on evidence from Compositional Analysis of Bullet Lead CABL a forensic technique that compares the elemental composition of bullets found at a crime scene to the elemental composition of bullets found in a suspect s possession Different from ballistics techniques that compare striations on the barrel of a gun to those on a recovered bullet CABL is used when no gun is recovered or when bullets are too small or mangled to observe striations Forensic Analysis Weighing Bullet Lead Evidence assesses the scientific validity of CABL finding that the FBI should use a different statistical analysis for the technique and that given variations in bullet manufacturing processes expert witnesses should make clear the very limited conclusions that CABL results can support The report also recommends that the FBI take additional measures to ensure the validity of CABL results which include improving documentation publishing details and improving on training and oversight

Standard Guide for Reporting of Forensic Primer Gunshot Residue pGSR Analysis by Scanning Electron Microscopy/Energy Dispersive X-Ray Spectrometry SEM/EDS , Elemental Analysis of Gunshot Residue to Differentiate Bullet Type and Firing Distance Christine Ella Hay,2013 **An Investigation of the Forensic Applicability of Distance Determination of Gunshot Residue Using Chemical Analysis by X-ray Fluorescence Spectroscopy** Raelene Keesling (F.),2016 *Analytical Techniques in Forensic Science* Rosalind

Wolstenholme, Sue Jickells, Shari Forbes, 2020-10-27 An in depth text that explores the interface between analytical chemistry and trace evidence Analytical Techniques in Forensic Science is a comprehensive guide written in accessible terms that examines the interface between analytical chemistry and trace evidence in forensic science With contributions from noted experts on the topic the text features a detailed introduction analysis in forensic science and then subsequent chapters explore the laboratory techniques grouped by shared operating principles For each technique the authors incorporate specific theory application to forensic analytics interpretation forensic specific developments and illustrative case studies Forensic techniques covered include UV Vis and vibrational spectroscopy mass spectrometry and gas and liquid chromatography The applications reviewed include evidence types such as fibers paint drugs and explosives The authors highlight data collection subsequent analysis what information has been obtained and what this means in the context of a case The text shows how analytical chemistry and trace evidence can problem solve the nature of much of forensic analysis This important text Puts the focus on trace evidence and analytical science Contains case studies that illustrate theory in practice Includes contributions from experts on the topics of instrumentation theory and case examples Explores novel and future applications for analytical techniques Written for undergraduate and graduate students in forensic chemistry and forensic practitioners and researchers Analytical Techniques in Forensic Science offers a text that bridges the gap between introductory textbooks and professional level literature

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Table of Contents Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase

1. Understanding the eBook Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - The Rise of Digital Reading Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Advantages of eBooks Over Traditional Books
2. Identifying Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - User-Friendly Interface
4. Exploring eBook Recommendations from Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Personalized Recommendations
 - Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase User Reviews and Ratings
 - Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase and Bestseller Lists
5. Accessing Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase Free and Paid eBooks
 - Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase Public Domain eBooks
 - Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase eBook Subscription Services
 - Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase Budget-Friendly Options
6. Navigating Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase eBook Formats

- ePub, PDF, MOBI, and More
 - Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase Compatibility with Devices
 - Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Highlighting and Note-Taking Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Interactive Elements Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 8. Staying Engaged with Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 9. Balancing eBooks and Physical Books Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Setting Reading Goals Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Fact-Checking eBook Content of Current Methods In Forensic Gunshot Residue Analysis Forensicnetbase
 - Distinguishing Credible Sources
 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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