

1. Record Nr.	UNINA9910767577503321
Titolo	Mineralogical analysis applied to forensics : a guidance on mineralogical techniques and their application to the forensic field // edited by Mariano Mercurio, [and three others]
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2023] ©2023
ISBN	3-031-08834-4
Descrizione fisica	1 online resource (320 pages)
Collana	Soil Forensics
Disciplina	737
Soggetti	Chemistry, Forensic
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Intro -- Preface -- Contents -- Contributors -- Chapter 1: Optical Microscopy Applied to Forensics -- 1.1 Stereoscopic Microscope: Instrumentation and Analysis Procedures -- 1.1.1 Magnification -- 1.1.2 Lighting System -- 1.1.3 Diagnostic Characteristics for the Study of Various Materials -- 1.2 Polarized Light Microscope: Instrumentation and Analysis Procedures -- 1.2.1 Sample Preparation -- 1.2.2 Different Light Arrangements and Optical Diagnostic Characteristics of Anisotropic Materials -- 1.2.3 Semi-quantitative Analysis -- 1.3 Applications of Optical Microscopy to Forensic Sciences -- 1.3.1 Minerals and Rocks -- 1.3.2 Pedological Materials -- 1.3.2.1 Diagnostic Physical Characteristics for the Study of Soil Particles -- 1.3.2.2 Organic and Anthropogenic Fragments in Forensic Soil -- 1.3.3 Precious Stones and Gems -- 1.3.4 Precious Metals -- 1.3.5 Building Materials -- References -- Chapter 2: X-ray Diffractometry in Forensic Science -- 2.1 X-Rays: Characteristics, Production, Analytical Procedures -- 2.2 X-Ray Diffraction -- 2.3 Collecting and Analyzing Data -- 2.4 Phase Identification -- 2.5 Sample Preparation: Good and Bad Practices -- 2.6 Preferred Orientation in Clay Minerals -- 2.7 Quantitative Analysis -- 2.7.1 Full-Pattern Fitting/Rietveld Method -- 2.8 Environmental Crimes: Evaluation of the Presence of Asbestos Minerals in Massive Samples -- 2.9 Cultural Heritage Crimes: Identification of the Geological Provenance of Geoarchaeological Materials -- 2.10

Concluding Remarks -- References -- Chapter 3: Scanning Electron Microscopy (SEM) in Forensic Geoscience -- 3.1 Scanning Electron Microscopy -- 3.2 The Signals of an SEM -- 3.3 The Structure of an SEM -- 3.4 Electron Microanalysis -- 3.5 Specimen Preparation -- 3.6 Automated Mineralogy -- 3.7 Applications of SEM in Forensic Geoscience.

3.7.1 Applications of Manual Scanning Electron Microscopy and Microanalysis -- 3.7.2 Applications of Automated Mineralogy -- References -- Chapter 4: Infrared Spectroscopy and Application to Forensics -- 4.1 Theoretical Background -- 4.1.1 The Infrared (IR) Radiation -- 4.1.2 The Absorption of IR Radiation -- 4.1.3 The Harmonic Oscillator Model -- 4.1.4 Transition Moment and General Selection Rule in IR Spectroscopy -- 4.1.5 The Normal Vibration Modes of Molecules -- 4.1.6 Transmittance, Absorbance and Beer-Lambert's Law -- 4.1.7 The IR Spectrum: Position, Intensity and Shape of Absorption Bands -- 4.1.8 Features of the IR Spectrum and Their Interpretation -- 4.2 Instruments and Methodologies -- 4.2.1 Analysis in Reflectance -- 4.2.2 Quantitative Analysis -- 4.2.3 FTIR Microscopy and Imaging -- 4.3 Sample Preparation -- 4.3.1 Powders -- 4.3.2 Single Crystals, Doubly Polished Slabs -- 4.4 Applications in Forensics -- 4.4.1 Fingerprinting -- 4.4.2 Qualitative Analysis of Discrete Features in the Spectral Signal -- 4.4.3 Quantitative Analysis -- 4.4.4 Spatial Analysis (Imaging) -- References -- Chapter 5: Raman Spectroscopy and Forensic Mineralogy -- 5.1 Raman Spectroscopy: Basic Notions -- 5.1.1 The Raman Effect -- 5.1.2 Raman Spectrum -- 5.1.3 Raman Spectroscopy: From Past to Present -- 5.1.4 Unconventional Techniques Based on Raman Spectroscopy -- 5.2 Applications of Raman Spectroscopy: Gemmological Materials -- 5.2.1 Raman Spectroscopy in Gemmology: Advantages and Disadvantages -- 5.2.2 Identification of Gems Through Raman Spectroscopy -- 5.2.3 Analytical Issues -- 5.2.4 Portable or Bench Top Spectrometer? -- 5.3 Other Applications of Raman Spectroscopy: Inks and Pigments, Explosives, Dangerous Minerals -- 5.3.1 Inks and Pigments -- 5.3.2 Explosives -- 5.3.3 Dangerous Minerals for Human Health: Asbestos and Crystalline Silica.

5.4 Concluding Remarks -- References -- Chapter 6: ICP-MS - Fundamentals and Application to Forensic Science -- 6.1 ICP-MS - Principles -- 6.1.1 Analytical Steps -- 6.1.2 Interference Issue -- 6.2 Laser Ablation Coupled with ICP-MS (LA-ICP-MS) -- 6.3 Sample Preparation and Analytical Phase -- 6.3.1 Analytical Phase -- 6.3.2 LA-ICP-MS -- 6.4 Forensic Applications -- 6.4.1 Glass -- 6.4.2 Soils -- 6.4.3 Biological Tissues -- References -- Chapter 7: Simultaneous Thermal Analysis (STA): A Powerful Tool for Forensic Investigation of Geomaterials -- 7.1 Thermoanalytic Techniques and Instrumentation -- 7.1.1 Thermogravimetric Analysis (TGA) -- 7.1.2 Differential Thermal Analysis (DTA) -- 7.1.3 Differential Scanning Calorimetry (DSC) -- 7.1.4 Hyphenated Techniques -- 7.2 Sample Preparation -- 7.3 Thermal Behavior of Minerals and Their Mixtures -- 7.3.1 Clay Minerals -- 7.3.2 Zeolites -- 7.3.3 Sulphates -- 7.3.4 Carbonates -- 7.3.5 Halides -- 7.3.6 Other Minerals -- 7.3.7 Soils -- 7.3.8 Rocks -- 7.4 Applications of Thermal Analyses to Forensic Sciences -- References -- Chapter 8: X-Ray Fluorescence: Chemical Characterization of Materials by X-Ray Spectrometry -- 8.1 Processes That Can Generate X-Rays -- 8.2 The Spectrum of X-Rays -- 8.3 Absorption of X-Rays -- 8.4 Detection and Measurement of X-Rays -- 8.4.1 X-Ray Detection by Energy Dispersion (ED = Energy Dispersive) -- 8.4.2 X-Ray Detection by Wavelength Dispersion (WD = Wavelength Dispersive) -- 8.5 XRF Qualitative Analysis -- 8.6 XRF Quantitative Analysis -- 8.7 Use

of Portable Equipment -- 8.8 Preparation of the Samples -- 8.9 Examples of Use of the XRF in Forensic Investigations -- 8.9.1 Materials for Industry -- 8.9.2 Precious Materials (Metals and Stones) and Cultural Heritage Materials -- 8.9.3 Characterization of Paint, Pigments and Inks.

8.9.4 Analysis of Evidence in Criminal Scenes in Forensic Anthropology and Archaeology -- 8.9.5 Analysis of Soils, Earth Materials and Environmental Samples -- References -- Chapter 9: Isotopic Analysis Techniques Applied to Forensics: New Frontiers of Isotope Geochemistry -- 9.1 Sample Preparation -- 9.1.1 Preparation Techniques for Inorganic Samples -- 9.1.1.1 Extraction with a Solvent -- 9.1.1.2 Dissolution with Mineral Acids -- 9.1.1.3 Fusion with a Flux -- 9.1.2 Preparation Techniques for Organic Samples -- 9.1.2.1 Teeth and Bones -- 9.1.2.2 Hair -- 9.1.2.3 Soil -- 9.1.2.4 Plants -- 9.1.2.5 Food -- 9.1.2.6 Beverages -- 9.1.2.7 Extraction of a Gas from a Solid -- 9.1.3 Chromatographic Separation Techniques -- 9.1.3.1 Liquid Phase Chromatographic Separation -- 9.1.3.2 Gas Phase Chromatographic Separation -- 9.2 Instrumentation -- 9.2.1 Inductively Coupled Plasma-Mass Spectrometry -- 9.2.1.1 Principles and Instrumentation -- 9.2.1.2 Measurement Procedures -- 9.2.2 Thermal Ionization Mass Spectrometry - Solid Source Mass Spectrometers -- 9.2.2.1 Principles and Instrumentation -- 9.2.2.2 Measurement Procedures -- 9.2.3 Thermal Ionization Mass Spectrometry - Gas Source Mass Spectrometry -- 9.2.3.1 Principles and Instrumentation -- 9.2.3.2 Measurement Procedures -- 9.2.4 Alpha and Gamma Spectrometry -- 9.3 Application of Isotope Forensics -- 9.3.1 Placement of a Suspect at the Crime Scene -- 9.3.2 Human Provenancing -- 9.3.3 Drugs -- 9.3.4 Explosives -- 9.3.5 Radioactive Materials -- 9.3.6 Environmental Forensics -- 9.3.7 Food Adulteration -- References -- Chapter 10: Image Analysis in Forensic Mineralogy -- 10.1 Digital Images and Acquisition Systems -- 10.2 Image Processing -- 10.3 Measurements -- 10.4 Fields of Application of Image Analysis in Forensic Geology -- 10.4.1 Applications on Macroscopic Images -- 10.4.2 Applications on Images Acquired in Stereomicroscopy -- 10.4.3 Applications on Images Acquired in Optical Microscopy -- 10.4.4 Applications on Images Acquired in Scanning Electron Microscopy -- References.
