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TRUSTED EXPERTISE IN CHEMISTRY AND FORENSICS

COURSE OUTLINE: RAMAN SPECTROSCOPY

I. Raman Spectroscopy Theory

A. The Properties of Light
B. Quantum Mechanics Review
C. Photon/Molecule Scattering Interactions
D. The Raw Raman Spectrum
E. Calculating the Raman Shift

II. The Meaning of Raman Spectral Features

A. Peak Positions: The Harmonic Oscillator Approximation
B. Peak Heights – Variables Affecting Intensity
C. Peak Widths

III. III. Lasers as Raman Light Sources

A. How Lasers Work
B. The Fluorescence Problem
C. Lasers for Modern Raman Spectroscopy

IV. Spectrometers and Detectors

A. Introduction to Gratings
B. Working Principles of Grating Monochromators
C. Spectrometer Designs
D. Single Point Detectors
E. Array Detectors and Charge Coupled Devices
F. FT-Raman Instruments

Contact Brian Smith: Tel: +1 (508) 579-6514 Email: bcsmith@spectros1.com Website: https://spectros1.com/

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V. Sampling

A. Sample Preparation
B. Sampling Geometries

VI: Introduction to Raman Spectral Interpretation

A. Molecular Vibrations
B. Performing Identities
C. C Mixture Analysis
D. 12-step program for successful Raman Interpretation

VII. Infrared Spectral Interpretation of Hydrocarbons

A. Straight Chain Alkanes: Methyl and Methylene Groups
B. Alkenes: Distinguishing Isomers
C. Substituted Benzene Rings

VIII. Molecules With C-O Bonds

A. Alcohols
B. Ethers
C. Carbohydrates

VIII. C=O Functional Groups

A. Ketones
B. Carboxylic Acids
C. Esters

IX. Organic Nitrogen Compounds

A. Amides
B. Amines
C. Amine Salts

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X. Overcoming the Problem of Mixture Analysis

III. Dealing with Mixtures

A. Spectral Subtraction

1. Theory
2. Optimizing Subtraction Results
3. Spotting Artifacts

B. Library Searching

1. Background & Theory
2. The Search Process
3. Properly Interpreting Search Results
4. Subtract & Search Again

XI. Applications

A. Forensic Science
B. Polymers

The Petrochemical Industry