ONE-DAY COURSE, Sunday only
Ion Mobility Mass Spectrometry:
An Introduction to Instrumentation, Applications, and Data Analysis

Instructors

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Realization of the value-added by combining ion mobility spectrometry (IMS) and mass spectrometry (MS) has generated significant interest in its use in range of fields including omics pursuits, threat detection, and fundamental studies of gas-phase ion chemistry. This course provides students with a basic understanding of the most common instrumental configurations, experimental sequence, best practices, and the theory underlying the different types of ion mobility systems employed both in academic and commercial settings. An overview of hyphenated IMS-MS instrumentation with multiple practical applications and experimental designs will be presented including comparative discussions on advantages and disadvantages between different stand-alone and hyphenated techniques. This course will provide a comprehensive look at ion mobility spectrometry and its use in modern analytical chemistry. While ion mobility systems are largely compatible with all mass spectrometry systems each IM-MS combination possesses a range of unique advantages and applications. These instrumental considerations and specific experimental sequences will be covered in this course. Graduates of the course will have gained a detailed understanding of IMS and an overview of its practical applications for both stand-alone and MS-coupled operation.

Learning Objectives:

- Gain and understanding of the instrumental configurations most commonly found between ion mobility and mass spectrometry
- Build a foundation to interpret experimental results from the range of hybrid instrumentation available
- Develop a conceptual theoretical framework of the processes underlying the ion mobility experiment
- Understand the capabilities, limitations, and application areas for the most common configurations of ion mobility and mass spectrometers.

Course Outline:

Introduction to Ion Mobility Mass Spectrometry
- Historical Perspective and Origins

Theory and Fundamentals of Ion Mobility Spectrometry
- Introduction to Kinetic Theory and Momentum Transfer
- Origins of Ion-Neutral Cross Sections

Drift Tube Ion Mobility Spectrometry
- Modern Instrumentation
- Experimental Sequence and Variable Control
- Applications

Traveling Wave Ion Mobility Spectrometry
- Instrumental Configuration
- Experimental Sequence and Variables
- Data Interpretation
- Applications

Field Asymmetric Waveform Ion Mobility
- Instrumental Configurations
- Experimental Variables and Data Collection
- Data Interpretation

Applications
Outlook and Future Directions
Omics Technologies
IMS Informatics
Role in Probing Gas-Phase Ion Chemistry and Structure
Hybrid Instrumentation

Prerequisite: Working knowledge of mass spectrometry.