
LC/MS: Theory, Instruments and Applications

Two-Day Course

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COURSE DESCRIPTION

This course is designed to be an introduction to the theory and practical implementation of LC/MS and LC/MS/MS technology in the laboratory. It emphasizes problem-solving skills with examples encountered in industrial and academic research including characterization of trace level drug substance impurities and degradation products, identification of drug metabolites, and the analysis of natural products and bio-molecules. The interpretation of mass spectra will be illustrated with practical examples. In addition, structure determination of proteins and peptides will be presented. This course will focus on atmospheric pressure ionization interfaces including electrospray and atmospheric pressure chemical ionization, and will survey the various mass analyzer options. This course will address issues regarding the coupling of capillary HPLC, microbore HPLC, UHPLC and standard 4.6 mm chromatography. A thorough coverage of approaches toward method development for both qualitative and quantitative analysis of pharmaceutical products and biomolecules will provide a good starting point for understanding the practical issues facing implementation of LC/MS in the laboratory. Furthermore, an overview of the current state-of-the-art of automating the LC/MS laboratory including the interfacing of automated sample preparation devices will be provided. Finally, this course will cover analytical method development in protein mass spectrometry combined with separation techniques for analyzing proteins and peptides.

WHO SHOULD ATTEND

This course is designed for practicing LC/MS chemists (new users, chromatographers, analytical chemists, protein chemists, and laboratory managers)

TOPICS

- Introductions to Liquid Chromatography (LC) / Mass Spectrometry (MS)
 - History
 - Ionization
 - Atmospheric pressure ionization API (ESI, APCI)
- Mass Analyzers
 - Quadrupoles
 - Tandem mass spectrometry (MS/MS)
 - Ion trap
 - Ion cyclotron resonance (ICR)
 - Time-of-flight
 - Orbitrap
- LC/MS Method Development
 - Issues: sample preparation
 - LC/MS Interface
- Automation and High Throughput Sample Analysis
- Application in Drug Metabolism
- Applications—Small Molecules, Pharmaceuticals, Natural Products (Structure Elucidation, Identification and Quantitation)
- Applications—Proteins and Peptides
 - Protein characterization and structural problems

ABOUT THE INSTRUCTORS

Dr. Guodong Chen (Course Director) has extensive pharmaceutical research experience in major pharmaceutical companies, including Eli Lilly and Company, Schering-Plough (now Merck) and Bristol-Myers Squibb. Currently, he is heading analytical/mass spectrometry group at Bristol-Myers Squibb's Princeton site, providing analytical/mass spectrometric support to drug discovery programs and development projects in small molecule pharmaceuticals and biologics. His research interests include development and application of advanced analytical/mass spectrometry techniques in pharmaceutical research and development. He has over 65 research publications in peer-reviewed journals and book chapters in pharmaceutical analysis, and three edited/co-edited books, "Characterization of Impurities and Degradants Using Mass Spectrometry" (Wiley), "Protein and Peptide Mass Spectrometry in Drug Discovery" (Wiley) and "Characterization of Protein Therapeutics Using Mass Spectrometry" (Springer). His scientific contributions include short course instructor at EAS, Pittcon and ASMS conferences, invited speaker at national/international conferences and academic institutes with over 75 presentations, and reviewer for *International Journal of Mass Spectrometry*, *Journal of Mass Spectrometry*, *Journal of the American Society for Mass Spectrometry*, *Rapid Communication in Mass Spectrometry*, *Journal of Proteomics & Bioinformatics*, *Expert Review of Proteomics*, *Organic Process Research & Development*, *Journal of Pharmaceutical Sciences*, *Analytical Biochemistry*, *Journal of Pharmaceutical and Biomedical Analysis*, *Drug Discovery Today*, *mAbs*, *Chemistry Today* and Wiley/Springer book proposals. He also organized/chaired scientific sessions at various forums, including EAS, CPSA, Pittcon, ACS, ASMS and HOS conferences. Dr. Chen was the Chairperson of the North Jersey Section of ACS Mass Spectrometry Discussion Group (2004) and in 2006, he received Early Career Award in Mass Spectrometry. He was an invited Analytical Chemistry Program Chair for ACS MARM Conference (2005) and President of Chinese American Chemical Society-Tri State (2007). He served as the founding Chairperson of the ASMS Protein Therapeutics Interest Group (2009-2011). Dr. Chen was a recipient of Schering-Plough President's

Award for Discovery and BMS Research Leveraging Technology Innovation Award. He received his Ph.D. in Analytical Chemistry from Purdue University under the direction of Professor R. Graham Cooks.

Dr. Ragu Ramanathan received his B.S. degree in Chemistry from the University of Southern Mississippi in 1988 and a Ph.D. degree in Analytical/Physical Chemistry from the University of Florida in 1994. After completing three years as postdoctoral researcher at the Washington University (St. Louis, MO), where he applied mass spectrometry to cancer research, he joined Analytical Biochemistry Laboratories in Columbia, MO. Over the next 15 years, Dr. Ramanathan applied his expertise in mass spectrometry, analytical chemistry, drug metabolism and pharmacokinetics to discover and develop drugs at several major pharmaceutical research and development organizations (Schering-Plough Research Institute, Warner-Lambert, Pfizer and Bristol-Myers Squibb). Currently, Dr. Ramanathan is serving as a Director at QPS, LLC, providing leadership to the biotransformation and non-regulated bioanalytical group. He has published over 50 research papers and over 10 book chapters in pharmaceutical analysis. He is an editor of a book on Mass Spectrometry in Drug Metabolism and Pharmacokinetics (Wiley, Hoboken, NJ, 2008). In 2012, Dr. Ramanathan co-edited a peer-reviewed special Bioanalysis Journal issue focusing on "HRMS in DMPK". Dr. Ramanathan served as the Chairperson of the North Jersey Section of ACS Mass Spectrometry Discussion Group (2005) and as the Chairperson of the ASMS Drug Metabolism and Pharmacokinetics Interest Group (2008-2010). Dr. Ramanathan was one of the inaugural organizing committee members of the APA-India Conference and contributed to APA-USA Conference by serving in the Discovery and New Technology committee over the last four years. Dr. Ramanathan's other contributions to the scientific community include podium presentation session chairperson at EAS, ACS, ASMS, APA-India, APA-USA and CPSA-USA, short course instructor at EAS, ACS, ASMS, and APA-India, reviewer for *Xenobiotica*, *Journal of Mass Spectrometry*, *Bioanalysis*, *Drug Metabolism and Disposition*, *Drug Metabolism Letters*, *Journal of the American Society for Mass Spectrometry*, *Rapid Communications in Mass Spectrometry*, *Journal of Pharmaceutical and Biomedical Applications*, *Chemical Research in Toxicology* and Wiley Book Proposals.