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Multidimensional mass spectrometry methods for synthetic polymer analysis

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Matrix-assisted laser desorption ionization and electrospray ionization have enabled mass spectrometry (MS) analyses for a wide variety of synthetic polymers, but considerable challenges still exist. Polymerizations often create complex mixtures that are impossible to characterize by single-stage MS because of superimposed compositions or discrimination effects in the ionization or detection steps. These problems can partly be resolved by tandem and multistage mass spectrometry (MS²); depending on the polymer, MS² may lead to fragmentation patterns that permit unequivocal identification of the corresponding architecture and comonomer sequence. For the characterization of more complex systems, MS must be combined with separation methods, such as liquid chromatography (LC) or ion mobility (IM) spectrometry. Particularly powerful for such studies are approaches that couple ultrahigh performance LC (UPLC), which significantly reduces elution times, with the ion mobility dimension, which enhances separation and spectral decongestion. Different combinations of LC, IM, and MS² can be used to address questions about polymer composition, structure, and 3D architecture. Analyses involving top-down methods (the entire analysis is performed in the mass spectrometer) as well as methods including prior LC separation or mild, *in situ* thermal desorption/degradation will be demonstrated with a variety of synthetic polymers, including new amphiphilic copolymers, hybrid materials containing bioactive peptides, and supramolecular systems.

Biography

Chrys Wesdemiotis received his PhD degree with Helmut Schwarz at Technische Universität Berlin in 1979. He was a Postdoctoral fellow with Fred W. McLafferty at Cornell University in 1980. After completing his military service in Greece, he returned to Cornell as a Senior Research Associate. In 1989, he joined the faculty of the University of Akron, where he currently is distinguished Professor of Chemistry, Polymers Science, and Integrated Bioscience. His research focuses on the development and applications of multi-dimensional mass spectrometry methods for the characterization of new synthetic polymers and polymer-biomolecule conjugates and interfaces. He served as a Member-at-Large for Education in the Board of Directors of the American Society for Mass Spectrometry (ASMS) and is a Fellow of the American Association for the Advancement of Science (AAAS). He is an Editor of the *European Journal of Mass Spectrometry* and a member of the Editorial Boards of the *Journal of the American Society for Mass Spectrometry*, *International Journal of Mass Spectrometry*, and *Mass Spectrometry Reviews*.

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