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Volume 83

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The year 2010 marks the relaunch of LNC.

Nicolas C. Polfer · Philippe Dugourd
Editors

Laser Photodissociation and Spectroscopy of Mass-separated Biomolecular Ions

 Springer

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Foreword

The purpose of this book is to introduce students and researchers to exciting developments in laser-based photodissociation of trapped biomolecular ions inside mass spectrometers. The convergence of mass spectrometry (MS) and lasers in fact draws from a rich history in mass spectroscopy in the realm of physical chemistry and chemical physics. Lasers are also routinely employed to ionize biomolecules, for instance in matrix-assisted laser desorption/ionization (MALDI). The combination of MS with lasers allows researchers to obtain spectroscopic, and consequently structural information, on mass-separated ions. For example, based on infrared (IR) absorbances, the presence or absence of various chemical moieties can be verified. In addition, laser-based approaches often offer more control in ion activation. For instance, the absorption of an ultraviolet-visible (UV-vis) photon of a known energy at a known chromophore can trigger more selective photodissociation in the ion.

In this book, we will provide fundamental and operational background on the methods that are employed, and present on-going developments in applications in the context of biomolecules. In [Chap. 1](#), a background on the vibrational and electronic structures of biomolecules is given, showing the influence of these factors on the corresponding IR and UV-vis spectroscopic signatures, as well as the photodissociation dynamics. [Chapter 2](#) discusses benchtop tunable light sources that are useful for collecting IR and UV-vis spectra. In [Chap. 3](#), the basics of different ion trap designs are discussed in terms of their usefulness for photodissociation experiments. [Chapter 4](#) presents applications of vibrational spectroscopy on biomolecules. [Chapter 5](#) delves into applications of UV-vis lasers for structural elucidation of biomolecular species.

Despite the tremendous potential for enhancing the structural information from MS measurements, laser-based biophysical and bioanalytical techniques have so far been limited to a handful of laboratories around the world. Two factors have contributed to holding back a broader implementation of these techniques: (1) researchers in the MS community often have limited familiarity with laser operation, and (2) there are technical challenges in coupling lasers to commercial mass spectrometers and carrying out these measurements. Some of these challenges are now being overcome. The on-going developments of turn-key benchtop light sources are extending these methods to nonspecialist groups. A new generation of mass spectrometers offers vastly higher sensitivity, thus providing the

necessary signal-to-noise ratio to routinely carry out these measurements. It is the hope of the authors that this book will promote a wider understanding of the techniques that are involved, leading to an expansion of laser-based methods for the structural study of biomolecules by MS.

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