

Preface

Recently, a variety of state-of-the-art vibrational spectroscopy techniques have been developed rapidly, for example, Raman imaging, Raman optical activity (ROA), surface-enhanced Raman scattering (SERS), nonlinear Raman spectroscopy, cascade laser IR spectroscopy, infrared (IR) imaging, near-infrared (NIR) imaging, and time-resolved vibrational spectroscopy. Moreover, several spectral analysis methods, such as quantum chemical calculations, chemometrics, and two-dimensional correlation spectroscopy, have also been advanced. These experimental and spectral analysis methods have all been extensively used for a variety of investigations of proteins.

The purpose of this book is to demonstrate the usefulness of these modern vibrational spectroscopic methods in protein research. This book places some emphasis on *in vivo*, *in situ*, and noninvasive studies of proteins. It also points to the imaging of biological systems including proteins; Raman, IR, and NIR imaging are introduced. Most of the chapters are concerned not only with simple purified proteins, but also with rather complicated protein systems, such as protein aggregates, fibrous proteins, membrane proteins, and protein assemblies. Moreover, the book can be connected with medical science to some extent.

The book outlines cutting-edge vibrational spectroscopy methods by the front-runners of this field. All the contributors are experts in both modern vibrational spectroscopy and protein research. A few new techniques, such as quantum cascade laser-based IR transmission spectroscopy and SERS with nanotag design, are introduced in this book.

This book aims at making a strong bridge between molecular spectroscopists and researchers in life sciences. Thus it is suitable for molecular spectroscopists who are interested in protein research and for protein scientists who are interested in molecular spectroscopy. This book is useful for scientists, engineers, and graduate students in various fields of protein research including chemistry, biological sciences, pharmaceutical science, agricultural science, and medicine. One can use this book as a text for a course, for example, at a graduate school.

We do hope this book can inspire readers to employ vibrational spectroscopy techniques for various investigations of proteins and/or to open new directions of protein research based on vibrational spectroscopy.

In closing, we would like to thank Dr. Aliaksandra Sikirzhyskaya for preparing the wonderful cover of this book and also to Mr. Peter Linsley and Ms. Sara Pianavilla of Elsevier for their continuous efforts in publishing this book.

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