Two–Dimensional Correlation Spectroscopy. Applications in Vibrational and Optical Spectroscopy

Description:
In the last decade or so, perturbation–based generalized two–dimensional (2D) correlation spectroscopy has become a powerful and versatile tool for the detailed analysis of various spectroscopic data. This seemingly straightforward idea of spreading the spectral information onto the second dimension, by applying the well–established classical correlation analysis methodology, has turned out to be very fertile ground for the development a new generation of modern spectral analysis techniques.

In Chapter 1, some historical perspectives and an overview of the field of perturbation–based 2D correlation spectroscopy is provided. Chapter 2 covers the central theoretical background of the two–dimensional correlation method. Chapter 3 provides a rapid and simple computational method for obtaining 2D correlation spectra from experimentally obtained spectral data set, followed by the practical considerations to be taken into account for the 2D correlation analysis of real–world spectral data in Chapter 4. The next three chapters deal with more advanced topics. Chapter 5 introduces the concept of sample–sample correlation and hybrid correlation, and Chapter 6 explores the relationship between 2D correlation spectroscopy and classical statistical and chemometrical treatments of data. Chapter 7 examines other types of 2D spectroscopy, such as nonlinear optical 2D spectroscopy based on ultra fast laser pulses, 2D mapping of correlation coefficient, and newly emerging variant forms of 2D correlation analyses, such as moving–window correlation and model based correlation method.

The remaining chapters of the book are devoted to specific application examples of 2D correlation spectroscopy illustrating how the technique can be utilized in various aspects of spectroscopic studies. These examples include:

- Generalized Two–Dimensional Correlation Studies of Polymers and Liquid Crystals
- Two–Dimensional Correlation Spectroscopy and Chemical Reactions
- Protein Research by Two–Dimensional Correlation Spectroscopy
- Applications of 2D Correlation Spectroscopy to Biological and Biomedical Sciences
- Application of Hetero–spectral Correlation Analysis
- Extension of Two–Dimensional Correlation Analysis to Other Field

This book serves as an introductory text for newcomers to the field, as well as presents a survey of specific interest areas for the experienced practitioners.

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