

Photochemistry and Photophysics

Photochemical and photophysical phenomena are involved in all life and related processes; everyday examples include photosynthesis, the degradation of plastics, the formation of vitamin D by sunlight, the use of darkened glass in medicine bottles to protect the drug from photodegradation, and so forth. Photochemistry and photophysics form a modern science, which studies the interaction between light and matter when radiation is absorbed by atoms or molecules. It overlaps with several disciplines, including chemistry, physics, materials science, etc. Scientists in the field aim to gain more knowledge and a deeper understanding of the photochemistry and photophysics of all kinds of processes, ranging from the study of living systems to academic research topics and to artificial devices and products. There is particular interest in and research efforts towards efficiently converting sunlight into clean and sustainable energy, and in developing workable devices for applying photochemical and photophysical processes in information technology.

Scientists are continually developing new concepts, new molecules, and new functional materials based on photochemical and photophysical processes. Research reports and several new books on photochemistry and photophysics have been published recently, enriching and expanding the scientific and technological development of the area. However, research reports are usually focused on a specific academic topic, and most of the recent books are mainly concerned with the photoreactions of organic molecules, but only rarely with the photochemical and photophysical properties of metal complexes, a class of molecules that is of increasing theoretical and practical interest. Moreover, the latest achievements and trends in photochemistry and photophysics, such as research on molecules giving light signals for information processing, on the conversion of sunlight into electrical energy using solar cells, on applications of light-emitting devices, and so forth, have had relatively little attention in recent books.

Therefore, one welcomes a book that aims to describe the photochemistry and photophysics of the most important types of molecules, to introduce recent new applications, and to offer perspectives on future developments in the area. In their new book, Vincenzo Balzani, Paola Ceroni, and Alberto Juris describe the concepts, research achievements, and application developments of photochemistry and photophysics, based on their teaching and research in photochemistry and photophysics, their long experience, and their accumulated knowledge.

The first four chapters of the book present fundamental concepts about the nature of light, the principles of the interaction between light and matter, and the formation, electronic structure, properties, chemical reactivity, and radiative and non-radiative decay of excited states. The discussions are supported by many literature references and examples of typical classes of molecules.

Then the fifth chapter combines the above concepts in a discussion of supramolecular systems. The next chapter deals with the fundamental concepts and theoretical approaches for two very important photochemical and photophysical processes: energy transfer and photoinduced electron transfer. The following chapters are concerned with molecular organic photochemistry, the typical reactions of various organic compounds, the photochemistry and photophysics of metal complexes with luminescence properties, and the relationships between photochemical, photophysical, and electrochemical properties of molecules.

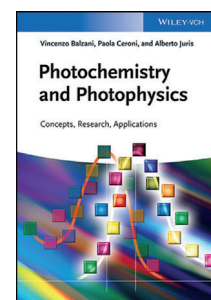
The book introduces the currently very active topic of light-powered molecular devices and machines, and describes how the interactions between molecules and light can be exploited to handle information: for reading, writing, erasing, and logical operations. Many important light-driven molecular machines, including linear shuttles and rotary motors, are described and illustrated. Other topics covered include artificial photosynthesis and the relationship between light and human life, as in light-based therapeutic treatments, photocatalysis for environmental protection, fluorescence for the labeling of biomolecules, etc. The chapters also cover various applications of photochromic compounds, solar cells (PV, OSC, DSSC), electrochemiluminescent materials (LEDs, OLEDs, LECs), photochemical synthesis of industrial products, and so on.

This book provides an interesting and broad perspective on the field of photochemistry and photophysics. It explains the fundamental concepts of photochemistry and photophysics, describes research achievements and trends, and highlights various important application topics. The abundant illustrations are helpful for understanding the concepts and the recent literature that is cited, making it not only a very readable textbook for beginners in the field of photochemistry and photophysics, but also a valuable reference source for researchers working in this field. We strongly recommend this book as a source of motivation for all potential users.

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