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Book Review

Modern Molecular Photochemistry of Organic Molecules

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The book will be of interest to scientists doing organic chemistry, as well as nanotechnology, chemical biology, physical chemistry and polymer and materials science. It contains a wealth of information on photochemical and photophysical processes with a systematic approach and readers will not be disappointed.

Organic photochemistry first emerged in the 1960s as a significant discipline. Now, some 50 years later, the book shows how diverse the field has become. The authors who are well-recognized photochemists connect topics old and new, from the incorporation of quantum and molecular orbital theory to the present state of the discipline. There are 15 chapters; each contains many subsections, where the authors pay close attention to the basic principles of photochemistry and photophysics of organic compounds.

Chapters 1–3 include an introduction and overview to organic photochemistry in the 21st century, and the merits for studying it. Descriptions of atomic and molecular orbitals and electronic configurations are provided, including a vector model of electron spin. I found it particularly interesting to read about the role of orbital orientation in spin–orbit coupling. The topics were written making it easy to follow, and lacked any lengthy mathematical treatments.

Chapters 4 and 5 cover radiative transitions between electronic states in processes, such as light absorption and emission of compounds. Pictorial representations are given that always help the reader in what is being explained. There are many diagrams to help visualize processes, such as spin–orbit coupling-induced radiationless transitions in intersystem crossing and other electronic relaxations.

A theoretical treatment of organic photoreactions is given in Chapter 6. This treatment is based on potential energy surfaces and correlation diagrams, among other things, including funnels that effectively ''mate'' surfaces. One discussion was aimed at an energy surface paradigm for organic photochemical reactions.

Chapters 7 and 8 describe energy transfer and electron transfer reactions, including triplet–triplet annihilation of energy transfer from electron exchange interactions. Mechanistic organic photochemistry is introduced with the focus on a great number of examples that transformed the field. Moreover, described are methods, from pulsed excitation and matrix isolation to the determination of rate constants and Stern–Volmer kinetics.

Next is a set of four chapters that use a functional group and chromophore approach to the organic photochemistry of carbonyl, alkene, enone and aromatic compounds. There are many wonderful examples given. Chapter 9 describes the photochemistry of carbonyl compounds. There is the formation of $^*R(n,\pi^*)$ species in primary photoreactions, and secondary thermal reactions of radical pairs, free radicals and biradicals. Other topics covered include intermolecular H-transfer, α-cleavage, [2 + 2] cycloadditions, and also strategies on designing phototriggers and photoprotecting groups.

Chapter 10 describes the photochemistry of alkenes and the formation of $^*R(\pi,\pi^*)$ species. Topics also covered were *cis–trans* isomerism, pericyclic reactions, di-π-methane reactions and photoinduced electron transfer reactions. This is followed by Chapters 11 and 12 that describe the photochemistry of enones and dienones, and of aromatic compounds.

Chapter 13 contains the topic of supramolecular organic photochemistry, which is a rather ''grand'' approach that has emerged more recently in the discipline (the pun is intended). This chapter describes crystals and porous solids, host/guest complexes, cavity effects, preorganization of the guest within the host, as well as the persistence of reactive intermediates *via* host incarceration. The penultimate chapter (Chapter 14) describes singlet oxygen chemistry, including its triplet-sensitized production. The final chapter (Chapter 15) describes extending paradigms to understand the photochemistry of other functional groups, such as the compounds containing nitro, azo, diazo and thioketone groups.

In conclusion, this book is a full-scale work and was written for students and researchers who conduct (or may wish to conduct) photochemistry. The book is an outgrowth of the earlier book *Modern Molecular Photochemistry*, which first appeared in 1978 and contained seven chapters. I think the readers of *Photochemistry and Photobiology* will enjoy the new book and it will stimulate new ideas. The text is written in such a way that it offers researchers of diverse backgrounds an opportunity to grasp the material to understand how it can be used to complement their own research effort.

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