Book Review

Advances in Photochemistry, Vol. 13

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After a temporary break of some six years, the well-known series *Advances in Photochemistry* has been restarted. The series was founded in 1963 by W. Albert Noyes, Jr., along with George Hammond and James N. Pitts, Jr. Noyes, one of the giants and founding fathers of photochemistry, died in November 1980, and Volume 13 of *Advances in Photochemistry* has accordingly been dedicated to his memory, a fitting tribute from Julian Heicklen introducing the book. Jim Pitts, who was an editor of all the earlier Volumes retired from the editorial team with the publication of Volume 12, so that of the original trio only George Hammond remains. He is now ably assisted by Dave Volman of the University of California, Davis, and by Klaus Gollnick of the University of Munich. They have chosen to present to us six review articles that encompass a wide area of photochemistry, ranging from the physical and theoretical chemistry of relatively small molecules to processes of major industrial importance.

The first two articles are concerned with photodissociation dynamics. William Jackson and Hideo Okabe introduce the topic with a review entitled "Photodissociation Dynamics of Small Molecules". This review is concerned largely with experimental work and the rapid development of the subject has constrained the authors to restrict themselves to papers that have appeared over the preceding three years. The impetus behind the dramatic growth in research has been the availability of highly sensitive new tools, of which the laser is the foremost. Theory has developed alongside the newly won experimental information, and is described by Vladimir Kresin and William Lester, Jr., in "Quantum Theory of Polyatomic Photodissociation". The theory of photodissociation must try to describe branching ratios, translational and internal energy distributions of fragments, angular distributions and the behaviour of the total cross-section as a function of incident photon energy.

The stilbenes have played a crucial role in the development of modern photochemistry. In addition to their well-known unimolecular reactions, the stilbenes undergo a variety of bimolecular photochemical reactions, such as dimerization, cycloaddition with unsaturated compounds and reactions with amines, imines and singlet arenes. These topics form the subject of Frederick Lewis's presentation of "Bimolecular Photochemical Reactions of the Stilbenes".

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Marye Anne Fox continues the book with a discussion of "Photoinduced Electron Transfer in Organic Systems: Control of Back Electron Transfer". Great interest has been aroused recently by the possibility of using visible or UV light to initiate electron transfer from a donor to an acceptor molecule. Reverse electron transfer acts as a deactivating back reaction, but if its rate can be controlled, observable selective chemistry can follow the transfer. For example, compounds in altered oxidation states can be formed, or, alternatively, rearranged or substituted products can be produced at the same oxidation level as the reactant. Dr. Fox's article illustrates several methods by which back electron transfer can be obviated and thus by which organic transformations can be accomplished.

"Chemical Sensitization, Spectral Sensitization and Latent Image Formation in Silver Halide Photography", by T. H. James, and "Dye-Sensitized Photopolymerization", by David Eaton, are the two contributions in the volume directly concerned with applied photochemistry. The first of these articles reviews recent experimental and theoretical work bearing on the mechanism of latent image formation in silver halide photography. Some of the questions addressed are how nuclei of silver are formed photochemically, what role the released halogen (or hole) plays, how crystal defects and impurities influence sensitivity and latent image formation and how radiation absorbed by dyes at the crystal surface induces the formation of silver. The second article follows logically from the first. Although the physical and chemical properties of the silver halides make them unique in high sensitivity and an extensive range of applications, an increasing number of "unconventional" photoimaging processes make use of organic photochemical methods based on photopolymerization. The end products include printed circuit boards, integrated circuits, plastic printing plates, holograms and relief maps, and there are many others. Most of the processes rely on UV radiation as the actinic source. However, in certain cases, such as photoimaging using laser sources, photopolymer systems are needed which are sensitive to visible photons. The review describes the methods known to induce vinyl polymerization using visible light, amongst which are sensitization by photoreducible and photo-oxidizable dyes and sensitized cationic polymerization.

The scope of the reviews is considerable. Each article is authoritative, timely and reasonably up-to-date (the references generally go some way into 1984). Even if not every photochemist can aspire to possessing a personal copy of this book, there will be few who will not wish at least to browse through it in a library.

R. P. WAYNE