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Short Communication

Molecular Photochemistry and it's Applications

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DESCRIPTION

Psoralen photochemistry and photobiology have been reviewed using selected literature. Aside from the well-known photoaddition of psoralens to DNA, photoreactions involving RNA, tRNA, and proteins merit further investigation. Despite the fact that thymine appears to be one of the most common bases for psoralen photocycloaddition in DNA. To fully assess the specificity of psoralen photoreactions and their application as a probe for biopolymer structure and a tool for photobiological studies of microorganisms, other bases such as adenine and mechanisms other than cycloaddition should be investigated. The relative photobiological importance of monoaddition *vs* crosslinking of psoralens to nucleic acids is also unknown.

Molecular photochemistry provides fundamental and useful information about excited state chemistry. In the case of fine chemicals, photochemistry plays a clear role as a synthesis tool because photoreactions frequently offer the cheapest, shortest routes. On a larger scale, its role is unclear, though the Japanese have built a plant capable of producing 20 million pounds of nylon 6 monomer (caprolactam) per year *via* photonitrosylation of cyclohexane. Many "new" photoreactions will continue to be described in the literature, but the number of new primary processes will most likely remain low. Intelligent photochemistry exploitation will be hampered until useful quantitative reactivity relationships and lifetime data for a wide range of organic molecules are available.

Stilbenes and compounds with stilbene units in their structures serve as the foundation for many photophysics and photochemistry research projects. Furthermore, due to their ease of synthesis and thermal and chemical stability, these compounds are playing an increasingly important role in materials science investigations into optical, electrical, and optoelectronic properties. In keeping with the interdisciplinary nature of such studies, the purpose of this paper is to provide a link between molecular theory and photophysical measurements, preparative applications, and material effects and their potential technical applications.

Typical organometallic complexes have excited states such as ligand field excited states, metal-to-ligand charge-transfer excited states, ligand-to-metal charge-transfer excited states, Rydberg excited states, and excited states associated with metal-metal bonds. Each of these excited states, in general, causes a specific type of photochemical reaction. Ligand field excited states usually result in heterolysis of metal-ligand bonds, charge-transfer states in redox processes, and Rydberg states in homolytic metal-ligand bond dissociation. Metal-metal bond homolysis is caused by excitations involving metal-metal bond states. Each of these photochemical processes has applications in materials chemistry. Metal-ligand bond dissociation is used to deposit thin metal or alloy films. Thin films are created in this process and are used to make semiconductors or microcircuitry. Similarly, metal-ligand bond dissociations are used to produce multiply coordinatively unsaturated compounds.

To initiate radical chain polymerization reactions, metal-ligand bonds are homolytically dissociated. Organometallic compound irradiation on surfaces can be used to derivatize the metal surface. A metal-ligand bond is dissociated and then replaced by a functionalized ligand containing a redox active metal centre in these processes. These derivatized surfaces could be useful in the production of microfabricated circuits.

Laser dyes, optical information storage, photo-conductors, and photo-crosslinked polymers are some of the more recent applications that have already been used or are in the works. Parallel to these advancements, techniques such as laser spectroscopy in the pico- and femtosecond ranges are providing new insights into the fundamentals of the processes.

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