

Semiconductor Photocatalysis: Principles and Applications

It is rather unusual that Jules Verne finds consideration in a monograph about chemistry, but his prediction is both strange and remarkable: “water will be the coal of the future”. His futuristic vision touched on the “holy grail” of modern electrochemistry and photochemistry, as the author of this book, who is a renowned specialist in the area of photochemistry and photocatalysis, rightly points out.

This book presents for the first time a comprehensive treatment of semiconductor photocatalysis, a special field of photochemistry that has attracted increasing interest in the last few years, not only for academic reasons, but in particular also because of the numerous applications. An important merit of the book is that, as well as providing an excellent summary of the basic principles of semiconductor photocatalysis, it also describes a huge number of examples of real applications.

The book contains five chapters and a bibliography of nearly 650 literature references. The arrangement of the chapters follows the author's aim to give a comprehensive overview of the present state of the art. It is of particular didactic value that the book is based on lectures given by the author at the University of Erlangen–Nuremberg. Consequently, the coverage of the subject, and thus the content of the book, is multidisciplinary.

After a general introduction in Chapter 1, Chapters 2 and 3 present the basic principles of molecular photochemistry and photocatalysis. A separate chapter (Chapter 4) is devoted to photoelectrochemistry, and describes methods for the characterization of photocatalysts. Chapter 5, consisting of over 150 pages, is concerned with semiconductor photocatalysis, the main subject of the book.

The introductory chapter deals briefly, in an original way, with the history of photochemistry, from ancient Egypt up to the present. General aspects of the relationship between catalysis, photochemistry, and photocatalysis are discussed. This discussion is of particular interest since there has, up to now, been no general agreement about the IUPAC definition of photocatalysis.

Chapter 2 contains a well-arranged summary of the basic principles of photochemistry. This chapter and Chapter 3, which is devoted to molecular photocatalysis, together provide the background knowledge that is needed for understanding heterogeneous photocatalysis using semiconductors.

The inclusion of a separate chapter dealing with photoelectrochemistry (Chapter 4) might seem an unusual choice. However, this reflects the particular experience of the author who, in his own research, has shown the advantages in many cases of applying photoelectric methods to the characterization of photocatalysts based on semiconductors.

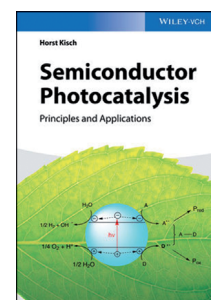
Lastly, Chapter 5 contains a comprehensive survey of all aspects of semiconductor photocatalysis, also taking into account their multidisciplinary importance. Mechanisms of heterogeneous photocatalysis, the characterization of photocatalysts, the preparation and properties of photocatalysts, as well as a remarkable number of examples of reactions belonging to types A or B, are all treated in detail. Finally, the author describes important applications of photocatalysts, and the photoreactors that are necessary for such work.

This book is an indispensable tool for everyone interested in finding answers to problems in photocatalysis. The structure of the book also makes it possible to use it in a problem-orientated way, since there seem to be no important types of heterogeneous photocatalytic reactions that are not described in detail in one or more of the case examples. This monograph is an important resource, not only for experts in the area, but also for physicists and materials scientists who seek an introduction to this rapidly developing special field. The comprehensive review of the literature on photocatalysis is of special value for beginners in this area. This monograph is not only essential for specialist libraries, but is also recommended for everybody who is interested in photocatalysis based on semiconductors.

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