

# Preface

Materials science has become an extremely broad and multidisciplinary field of research and the emerging technologies where it is applied in the recent years have been astonishingly increasing. Photocatalysis, as a branch of catalysis, has been one of these technologic fields, where the study of the materials science resulted particularly important. This book attempts to cover the main aspects in the very broad field of materials science addressed to materials applied in heterogeneous photocatalytic process of various nature. A very wide class of photocatalytic materials have been treated here in an attempt of cover both the main basic aspects to approach the study of photocatalytic materials and also examples of solid photocatalysts, their features and applications, without, of course, being exhaustive due to the plethora of materials and aspects which would be treated in such an effort.

This book reports information on several types of materials used in heterogeneous photocatalysis both from a theoretical and an applicative point of view. We hope that the 6 sections comprising 37 chapters will provide a fairly broad overview for readers interested in this fascinating field of research. In addition to very popular bare and mixed metal oxides and sulfides such as TiO<sub>2</sub>, ZnO, WO<sub>3</sub>, MoS<sub>2</sub>, other more complex and innovative materials are proposed such as metal-organic structures, graphene and graphene oxide, magnetic materials, plasmonic nanoparticles, and 2D materials among others. The reader will be able to evaluate the advantages and disadvantages of using the various materials, taking into account not only their cost but also their (photo)stability, toxicity, and ease of preparation. Moreover, readers can find in the book different types of examples of photocatalytic reactions of oxidation and reduction carried out in liquid–solid and in gas–solid systems where the different heterogeneous photocatalysts would be suitable. The various materials presented have been tested, among other reactions, for pollutants degradation, chemical transformations including CO<sub>2</sub> activation, organic synthesis and applications of biomimetic photocatalytic systems, fungal abatement in photocatalytic surfaces. We would like to underline that the authors have tried to deal with the topics so that the reader who wishes to deepen them can find the necessary literature among the numerous references cited in each chapter. We believe that a book that summarizes concepts and topics from a certain field that can then be further explored in the scientific literature is particularly useful for young researchers and PhD students, as well as for experienced researchers who are about to start research in that field. Finally, we want to thank all the colleagues and friends who enthusiastically joined us in writing the book, and a last but not least thanks goes to Elsevier and the staff who accompanied us with great professionalism and patience during this rewarding adventure.

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Every great advance in science has issued from a new audacity of imagination  
John Dewey, 1929