Preface

As early as 1969, a groundbreaking study informed to launch rigorous research activity on the reactivity of photoactivated semiconductor catalysts coined photocatalysis. Staring the decades of development, research activities have come a long way in accomplishments. Currently, articles in different aspects of photocatalysis abound most scientific journals and libraries. Such advances brought forth will inform the decision to as well publish more books. The present book underscores many of the essential grounds of photocatalysis and provides updates on the scientific cornerstones, research advances, current opinions and interpretations. Basically, the book is devoted only to photocatalysis by semiconductor materials. Therefore, in major discussions other photocatalysts such as phthalocyanines will not at all be considered. Our emphasis is on treating topics essential for understanding the current drive in photocatalytic research.

We began our discussion of photocatalysis in Chapter 1 by introduction of the concepts that form the backbone of photocatalysis. The chapter covers the principles of solid state chemistry and physics underlying photocatalysis including the concept of semiconductivity, band gap calculations, defects and reactive oxidising species. Photocatalysis has an organic link with chemical kinetics and leads unifying investigations where all the branches of science cross-pollinate. Chapter 2 of the book therefore describes kinetic concepts as they apply to photocatalysis. In this chapter, the dependence of rate on reaction conditions and parameters has been detailed. Chapter 3 deals with mechanism of photocatalysis. Aspects of physical chemistry such as adsorption models, photocatalytic rates and kinetic disguises have been discussed. Chapter 4 focuses on the structure, property and activity of prototypical semiconductor photocatalysts. One poser that is invariably raised is how to extend the spectral absorption of TiO_2 to visible region to enable the effective use of visible solar spectrum. This chapter discusses the strategies to drive substantially improved photoactivity from semiconductor materials. The factors affecting performance of photocatalyst have been highlighted.

The goal of environmental photocatalytic oxidation is to eradicate air and waterborne pollutants. Chapter 5 presents a recent survey of persistent pollutants, which is aimed at helping to provide perspective or update to researchers. As most workers

have used various photocatalysts, model pollutants, physical state of reactant, reactor configurations and conditions, this chapter brings to notice the useful findings. Besides environmental purification, photocatalysis finds viable applications in chemical analysis and alternative energy. The chapter also devotes discussions on recent topics in the applications of photocatalysis such as remote photocatalytic oxidation, intelligent ink indicator and dual function photocatalysis. Chapter 6 focuses on the advances that relate to organic chemistry especially as regards synthesis, product selectivity and characteristic reactions. Finally, this text utilises current terminologies and acceptable illustrations in the aspects of physical chemistry of heterogeneous photocatalysis in order to guard against misconceptions.

Readership: This book would appeal to students, and researchers in the industry and academia, who may be interested in applied physical chemistry and related fields in the mainstream chemistry tandem. I hope the book will be extended to the bookshelves of myriad libraries for extensive dissemination of knowledge.

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