

Preface

The importance of catalysis is due to the large number of applications in catalytic processes, particularly in the chemical and petrochemical industry, in power generation, in environmental preservation by reducing gas and water pollution, and in the development of new materials.

Although many important catalytic processes were mostly resolved, there is great scope for development of new processes and new efficient catalysts in various areas of industry. Known processes for several decades can be optimized by improving their performance and stability. There are good prospects for the development of new catalysts, alternative catalysts, and processes for environmental catalysis, fine chemicals, hydrotreating heavy oils, generation of hydrogen, C1 chemistry, new materials, and biomass.

The study of nanostructured materials is of great interest from the standpoint of both basic science and technological applications.

The increased process efficiency, substitution of raw materials, the development of cleaner processes, and technologies for environmental control and for alternative energy production are focal areas that illustrate the need for adjustments to existing formulations and/or development of new materials.

Specifically in the area of catalysis and materials, progress in the summary field requires a descriptive and theoretical understanding of interface phenomena and an interdisciplinary approach where the physical chemistry, modeling of processes, and surface phenomena appear with an appropriate methodological way to construction of scientific knowledge to minimize the gap between theory and application.

The following methods have had an impressive progress in recent years and consequently the basic knowledge in catalysis, facilitating the understanding of surface and interfacial phenomena. In addition to the chemical and physicochemical methods, physical methods of surface and interfaces were those which allowed the greatest advance in the knowledge of phenomena involving the chemical reaction.

This book aims to present the fundamentals of catalysis and applications illustrated with experiments performed in our laboratory, trying to understand why select the catalysts and processes. We seek to split the text into two parts. The first part presents the fundamentals addressing the activity patterns, adsorption–desorption phenomena, and advanced theories (Chaps. 1–5). The second part presents the most important conventional methods of characterizing properties (Chap. 6); the important methods of preparation with pre/posttreatment (Chap. 7); the most important traits (Chap. 8), with examples and practices; spectroscopic characterizations, even in situ (Chaps. 8–12); Nanostructured catalysts (Chap. 13) the microkinetic chemistry and surface mechanisms (Chap. 14), and finally the evaluation of an industrial catalyst process (Chap. 15).

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