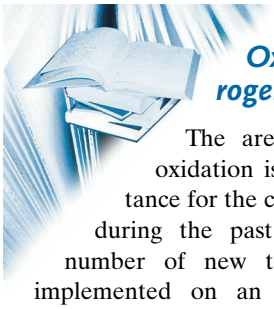

Liquid Phase Oxidation via Heterogeneous Catalysis

The area of catalytic selective oxidation is of considerable importance for the chemical industry: in fact, during the past decade an impressive number of new technologies have been implemented on an industrial scale. Some major achievements have involved the use of heterogeneous catalysts capable of activating hydrogen peroxide, as an alternative to the homogeneous catalysts formerly or currently employed. The most outstanding example is titanium silicalite, a system which, although discovered as long ago as the 1980s, has been employed for large-scale industrial applications only in recent years. On the other hand, a great variety of new heterogeneous systems, including metal-substituted molecular sieves, supported transition metal complexes, and noble metal nanoparticles for liquid-phase oxidations, have been widely studied in recent years. Although the feasibility of these systems might be doubtful in many cases, this high level of scientific interest is an indication of the importance of this area. In this regard, liquid-phase oxidation plays a primary role in the valorization of bio-platform molecules, which is the strongest driving force for innovation in the chemical industry today.

All of this demonstrates that this area of research is far from mature, and that its continuing growth deserves a book in which all aspects of the design, characterization, and application of catalysts for liquid-phase oxidation are examined comprehensively, together with an analysis of prospects for further development. The book edited by Mario Clerici and Oxana Kholdeeva takes a step in this direction, and has the additional merit of providing a picture of the various classes of heterogeneous catalysts. Even though each class of catalysts is treated in a separate chapter by an expert or a team renowned in the field, it is evident that the editors have steered the authors' contributions towards highlighting common features and minimizing differences of style between the chapters, especially with regard to relationships between catalyst characteristics and reactivity behavior. The many literature references cited in each chapter also provide opportunities for further reading.

After an introductory chapter on the role of environmentally benign oxidants, the book offers seven monograph-style chapters, each dealing with a specific class of heterogeneous catalysts: transition-metal-substituted zeolites, ordered nanoporous metallo-aluminophosphates, mesoporous metal silicates, supported metal-based catalysts, supported polyoxometalates, supported metal complexes, and metal-organic frameworks. The chapters on mesoporous metal silicates and supported polyoxometalates (POMs) are especially well structured and complete; in particular, the latter chapter deals with the heterogenization of POMs, which is of great importance in view of the special reactivity properties of these materials. One chapter covers various types of catalysts for photocatalytic oxidations with molecular oxygen, and another one reports on recently developed industrial applications. Even though there are journal reviews dealing with all the above-mentioned systems, I find it very useful to be able to compare reactivity behaviors and mechanisms within a single volume. Also very useful is the final chapter dealing with industrial processes for phenol hydroxylation, propene epoxidation, and caprolactam production, which also includes a section on the general engineering aspects of liquid-phase oxidations. As these sections have been written by researchers directly involved in the industrial development of these technologies, they deal with interesting aspects that are not easy to find in readily available open scientific literature, such as detailed flowcharts of the processes for propylene epoxidation, or other information that is scattered about amid the vast and often confusing patent literature or elsewhere. The transformation of renewable materials by means of catalytic liquid-phase oxidation is a subject that might perhaps have deserved an in-depth analysis in a chapter devoted to it, considering the importance it holds nowadays. However, information on these reactions can be found in various chapters in the book.

This monograph provides a motivating perspective for researchers working in the field of catalytic selective oxidation. I strongly recommend it, as it covers recent advances and concepts all within one volume. PhD students will draw inspiration from this book, both for the preparation of new or modified catalytic materials and for applications in the selective oxy-functionalization of organic substrates, while more experienced researchers will benefit from the opportunity to read a comprehensive and comparative analysis of the relevant literature.

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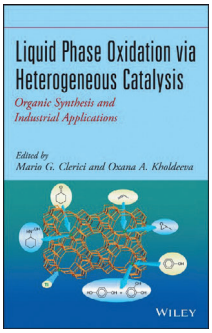

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