

Preface

Applying the principles of catalysis to new challenges is one of the most rewarding parts of our profession. As I look at the changes in content of the Specialist Periodical Reports over the last ten years, it is clear that although the problems that must be solved change, many of the principles used to solve those problems do not. It is my hope to bring to you in this series some of both – the principles, and the problems to which they are applied.

I am especially pleased with the response of the authors that have been invited to contribute to this volume. Their attention to schedules, responsiveness to reviewers' comments, and enthusiasm has been very encouraging. I have had the opportunity to meet each of the authors over the last few years, and that has been one of the most rewarding elements of my job as Senior Reporter.

Michel Boudart (Stanford University) illustrates a principle – how kinetic coupling in and between catalytic cycles can help in the discovery process. He provides examples from both heterogeneous and homogeneous catalysis to demonstrate this principle.

Wolfgang Hölderich and D. Heinz (Technische Hochschule Aachen) illustrate a problem – the application of heterogeneous catalysts to the environmentally benign synthesis of fine chemicals, such as fragrances. This is one example of how catalysts can be developed to synthesize products efficiently and cleanly. This type of 'green catalysis' is one of the challenges we face, especially with large volume commodity chemicals.

Antony Dixon (Worcester Polytechnic Institute) describes one of the most innovative areas of research in catalysis – catalytic membranes. His review focuses on the emerging area of inorganic membranes which extends the use of these materials to the higher temperatures needed for many synthesis processes.

Linda Broadbelt (Northwestern University) addresses a very specific and important problem – the use of catalysts to recover polymeric wastes into value-added products. This review concentrates on several high-volume polymers (such as polyethylene), and also discusses the use of catalysts in 'coprocessing' strategies in which wastes are processed with conventional feedstocks such as coal or petroleum.

Magnus Johansson, Dennis Papadias, Philippe Thevenin, Anders Ersson, Rolf Gabrielsson, Govind Menon, Pehr Björnbom, and Sven Järås (Kungl Tekniska Hogskolan) present a summary of the use of catalysts for combustion in gas turbines. The use of catalysts has tremendous promise in lowering NO_x emissions from this increasingly used power source. However, there are difficult challenges in developing thermally stable catalysts that can withstand the demanding conditions of a modern gas turbine.

Their colleagues at KTH, Mehri Sanati, Christina Hörnell, together with Sven Järås, also present a review of alkene oligomerization using heterogeneous catalysts. This is an important reaction in the production of gasoline and diesel blending stocks, and other widely used commodity chemicals such as detergents.

Finally, Ya-Huei Chin and Daniel Resasco (University of Oklahoma) review the catalytic oxidation of methane under lean-burn conditions. They focus on palladium-based catalysts, which are the most active for methane oxidation. They examine both the low temperature region (<800 °C), which is most relevant to exhaust control, and the high temperature region (>800 °C), which is applicable to gas turbines.

Volume 15 is underway and I look forward to bringing it to you. As always, comments are welcome.

James J. Spivey
Research Triangle Institute
Research Triangle Park, NC
USA
Email 'jjs@rti.org'