# Preface

Catalysis research continues to address both the traditional areas of chemical synthesis and fuel production, but with increased emphasis on environmentally benign processes and products. This volume reflects the interest in both. The reviews provided here include hydrogen production, upgrading of fuels to minimize emissions, as well as new catalysts and processes for chemical synthesis – each with attention to the environmental impact of catalyst activity and selectivity.

Mehri Sanati and Mostafa Faghihi (Växjö University, Sweden), Bjorn Harrysson (Nynäs Naphthenics AB, Stockholm, Sweden), Bjorje Gevert (Chalmers Gothenburg, Sweden), and Sven Järås (KTH, Stockholm, Sweden) provide a review of hydrodearomatization, which is important in fuel processing. This reaction is typically carried out with other hydrotreating reactions (*e.g.*, hydrodesulfurization). Hydrodearomatization is essential in order to improve the fuel quality and minimize undesirable emissions. One key area for research is sulfur tolerance, particularly for the noble metal-based catalysts. The authors explore the reactivity of a wide range of catalysts, and address the hydrodearomatization of mono- and multi-ring aromatic compounds.

Wolfgang Hoelderich and Felix Kollmer (University of Technology, RWTH, Germany) examine catalytic oxidations for fine chemical synthesis, which typically use oxidizing agents other than dioxygen, such as $N_2O$ and $H_2O_2$. The authors point out the important differences between oxidation reactions (and catalysts) needed to produce bulk chemicals, compared to those needed to produce fine chemicals: operating temperature, reactor design.

In another review from KTH, Johan Agrell, Bård Lindström, Lars Pettersson, and Sven Järås review the catalytic generation of hydrogen from methanol. This is one of the options for generation of hydrogen from liquid fuels for stationary and mobile applications, fuel processing, and fuel cells. Methanol can be used to generate hydrogen by several reactions: decomposition to CO and hydrogen, steam reforming, and partial oxidation (as well as combinations of these reactions). The authors explore the different catalysts needed for each of these reactions, as well as recent industrial research activity.

Tomoyuki Inui (Air Water Inc., Osaka, Japan) also addresses reforming of hydrocarbons for syngas and hydrogen production. His review focuses on the reaction of methane with $CO_2$, oxygen and/or steam. There are significant research needs in this well-studied area, including coke formation and reactor design/kinetics. Both noble metal and conventional Ni-based catalysts are reviewed, as well as new synthesis techniques.

Olga Buyevskaya and Manfred Baerns (Institute for Applied Chemistry

Berlin-Adlershof, Germany) provide a thorough review of the oxidative functionalization of ethane and propane. This review concentrates on the oxidative dehydrogenation of these two compounds to produce the corresponding olefins. In addition, the selective oxidation of ethane and propane to produce directly higher value oxygenates such as acetic acid, acrolein and acrylic acid is addressed.

Wataru Ueda (formerly at Science University of Tokyo in Yamaguchi; now at Hokkaido University, Sapporo, Japan) and Sui Wen Lin (Tokyo Institute of Technology, Japan) also address selective oxidation of lower alkanes – epoxidation, coupling and dehydrogenation reactions, for example. Their review focuses on the use of metal halide catalysts for these reactions. These catalysts can increase the activity and selectivity of selective oxidation reactions. Particular emphasis is given to the layered metal chloride catalysts for selective oxidations.

Sung-Won Ham (Kyungil University, Korea) and In-Sik Nam (Pohang University of Science and Technology, Korea) discuss the selective catalytic reduction of $NO_x$ using ammonia over conventional vanadium-based catalysts, zeolite catalysts, and exploratory catalysts based on novel titania formulations and pillared clays. A comprehensive review of poisoning and deactivation is also provided, along with a study of the mechanism/kinetics and reactor modeling.

Finally, Chunshan Song (Penn State University, USA) reviews the conversion of polycyclic hydrocarbons into specialty chemicals over zeolites. Until recently, the conversion of these compounds into useful products was not widely studied. These compounds are used in advanced polymers, but the large-scale production of the corresponding monomers requires selective catalysts for the conversion of polycyclic aromatic hydrocarbons. This review focuses on the various zeolites that can be modified to produce these compounds.

I am working with the authors of Volume 17 to prepare reviews of topics that are at the leading edge of catalysis research. I look forward to bringing this next volume to you. As always, comments are welcome.

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