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Preface

Recent advances in fuel processing catalysts for fuel cell applications

From the status of a scientific curiosity some 150 years ago, fuel cells have graduated to become a well-established technological component of NASA space exploration and hold promise to revolutionize the way energy is generated and used. Progress toward commercialization in the area of stationary power generation is rapid with several companies having built and operated demonstration units with typical capacities of 1 kW to 2.0 MW. Fuel cell's modularity facilitates scale-up to even larger systems of 10–50 MW. Operation of self-contained power plants has been demonstrated for the following types of fuel cells: phosphoric-acid fuel cells (PAFC), solid-oxide fuel cells (SOFC), molten-carbonate fuel cells (MCFC), alkaline fuel cells (AFC), and proton exchange membrane (PEM) fuel cells.

Advances in mobile applications are also impressive where PEM fuel cells are usually chosen for such systems due to their rapid start-up capability. While significant challenges exist that are associated with the size, weight, cost, and fuel supply, nearly every major car manufacturer in the world is actively engaged in the research and development of fuel cell powered vehicles. In addition to company-funded development, many industrialized countries support research and development through government-sponsored programs. While, multiple demonstration vehicles have been built to date, the commercialization of mobile applications is likely to proceed more slowly than in the case of fuel cell based stationary systems. This is mainly due to the more aggressive performance and cost targets required for automotive applications.

Additional applications include universal power supplies (UPSs), auxiliary power units (APUs), portable generators and micro fuel cells for portable electronic devices (cellular telephones, personal digital assistants, etc.). Direct methanol fuel cells (DMFC) are typically used in the latter systems.

Recently, DOE has announced its decision to discontinue the funding of *on-board* fuel processing R&D, while continuing to support technology development in stationary fuel processing. R&D work for the development of an ultra-pure hydrogen infrastructure will continue. Off-board hydrogen production, storage and separation technologies continue to attract significant research and investments to enable the introduction of PEM fuel cell vehicles into the automotive market.

The first fuel processing for fuel cells symposium was organized by the ACS Divisions of Fuel Chemistry and Petroleum Chemistry in 2001. The 2003 symposium on Fuel Processing Catalysts for Fuel Cell Applications was organized by the Division of Fuel Chemistry, Petroleum Chemistry and Industrial Engineering Chemistry Division of the American Chemical Society (ACS) and was held during the 226th ACS National Meeting in New York City, New York, September 7–11, 2003. The symposium was focused on recent advances in fuel processing catalysts, electro catalysts and overview of recent advances in various types of fuel cells for variety of applications such as residential, automobile, stationary and portable applications for clean power generation.

The unprecedented volume of fuel cell related topics in the program of the ACS conference is not surprising. Fuel cells have captured the imagination of technologists, entrepreneurs, and consumers with its promise of clean energy and new business paradigms. Their attributes are manifested by the breadth of fuel-cell related research and development activities that are being undertaken around the globe. The R&D has resulted in new discoveries and inventions. The successes and lessons learned make for the enthusiastic dialogues and contributions exhibited at the 2003 ACS symposium on Fuel Cells and Catalysis held in New York City.

We are delighted to have the opportunity to present selected papers from the 2003 fuel-processing symposium in the present issue. The included contributions are expanded versions of the papers presented before the ACS Division of Fuel Chemistry and all articles have passed through the same review process as all submissions to *Catalysis Today*. This special issue is a collection of manuscripts that were written to elaborate on the results that were presented at the symposium. It displays the mosaic of recent developments in

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fuel processing technologies for the production of hydrogen for fuel cell systems, ranging from unit processes such as reforming, shift reactors, etc., to the comprehensive system-level approaches for contaminant and by-product management, efficiency enhancement.

These are indeed exciting times for fuel cells and technology enthusiasts. This has been made possible by the dedication and patience of the researchers such as the contributors to this special issue, as well as the audience and sponsors that inspire them. We thank all the authors and all the peer reviewers for their contribution to this special issue. We wish to acknowledge ACS Divisions of Fuel Chemistry, Petroleum Chemistry and Industrial Engineering Chemistry Divisions for co-sponsoring the symposium on Recent Advances in Fuel Processing Catalysts for Fuel Cell Applications. As guest editors, we are also grateful to the journal editors (Prof. J.R.H. Ross and Prof. J.J. Spivey) and to the editorial team at Elsevier for their support in publishing this special issue.

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