

Special Issue in Honor of Professor S. Ted Oyama: 2014 ACS Distinguished Researcher Award in Petroleum Chemistry and Storch Award in Fuel Science

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This special issue of Topics in Catalysis honors Professor S. Ted Oyama for his Awards in Petroleum Chemistry and Fuel Science Research. These awards were celebrated at two American Chemical Society (ACS) symposia in 2014. The first one, the ACS's Distinguished Research Award in Petroleum Chemistry Symposium, took place at the 247th ACS National Meeting in Dallas, TX, during March 17–19, 2014 and the second one, the ACS's Storch Award in Fuel Science Symposium, took place at the 248th ACS National Meeting in San Francisco, CA, during August 10–12, 2014. Professor Oyama received the 2014 ACS Distinguished Research Award in Petroleum Chemistry “for his

substantial contributions to the field of heterogeneous catalysis” including the discovery of highly active transition metal phosphide catalysts for hydrotreatment of petroleum and coal-derived feedstocks and biomass refining, the development of new compositions, and the understanding of their reaction mechanisms by in situ spectroscopic techniques at high temperatures and pressures of reaction. Following this recognition, Professor Oyama was also awarded the 2014 ACS Storch Award in Fuel Science “for his broad contributions to the field of fuel science” including the production of hydrogen by catalytic reforming, selective oxidation of hydrocarbons, biomass conversion, their reaction kinetics and mechanisms, and spectrokinetic methods to study catalysts in situ at reaction conditions and theory and application of inorganic membranes for separation of hydrogen and fuel-relevant gases. This special issue consists of contributions by catalysis researchers who participated in the two ACS symposia honoring Professor Oyama's Awards.

Currently, Professor S. Ted Oyama holds dual appointments in the Chemical Systems Engineering Department at the University of Tokyo and the Chemical Engineering Department at Virginia Polytechnic Institute & State University (Virginia Tech). He earned his PhD degree in Chemical Engineering at Stanford University in 1981, after which he has held positions in industry and academia: Research Engineer/Project Leader at Catalytica Associates, Inc. (1981–1986), Visiting Scholar at the University of California, Berkeley (1986–1988), Associate Professor at Clarkson University (1988–1993), Associate Professor (1993–1996), Professor (1996–Present), and Fred W. Bull Professor (1999–2009) at Virginia Polytechnic Institute & State University, Professor at the University of Tokyo (2010–Present), and Visiting Professor at University of Rio de Janeiro (1992), University Pierre and Marie Curie, Paris

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Professor Oyama's research interests span over the areas of petroleum refining, selective oxidation, pollution control, biomass conversion, steam reforming, gas separation membranes, and membrane reactors. His research has led to the discovery of novel highly active catalysts based on transition metal phosphides which have found applications in hydrodesulfurization (HDS), hydrodenitrogenation (HDN), and hydrodeoxygenation (HDO) reactions; and to the development of highly permselective silica-based inorganic membranes. One of the main aspects that characterizes his research is the understanding of catalytic active sites and membrane properties from a molecular point of view, via both experimental and theoretical approaches. A few examples of this work include details of the active site of the most active hydrotreating catalyst, nickel phosphide, the spectroscopic (e.g., EXAFS, XANES, Raman, FTIR, UV–Vis) study of catalyst active sites at high temperatures, high pressures, in both gas and liquid phases, the development of a spectrokinetic method (analysis of coverage transients, ACT) to determine true reaction intermediates, and the derivation of a fundamental equation to describe the permeance of small gases in inorganic membranes. These examples highlight Professor Oyama's elegant scientific approaches of fundamental understanding of catalysts and materials to solve problems of practical application.

The 2014 ACS Distinguished Researcher Award in Petroleum Chemistry and the Storch Award in Fuel Science are not the only recognitions Professor Oyama has received so far. Other honors and awards also include the Dean's Award for Excellence in Research (1997, 2003, 2007), Japan Society for the Promotion of Science Fellowship (2007), Alumni Award for Excellence in Research (2008), Humboldt Senior Researcher Award (2008), Catalysis Club of Philadelphia Prize (2009), and Fellow of the American Chemical Society (2012). In addition to his contributions to catalysis research, as attested by more than 220 refereed publications, six edited books, one authored book, and more than 380 invited lectures at universities and industries, Professor Oyama has also contributed extensively to the catalysis community and several professional organizations including the American Chemical Society. At the ACS, he was Chair of the Northern New York

Section (1990–1993) and Chair of the Division of Petroleum Chemistry (2009–2010), and has been member of the Program Committee of the ACS Petroleum Division since 1991. He has also organized numerous symposia at National Meetings and actively recruited many junior researchers to serve as symposium organizers and committee members. Among other service activities to the catalysis community, Professor Oyama was Coordinator of NSF's USA/Brazil University Exchange Program (1992–2000) and Chairman of the Gordon Conference on Hydrocarbon Resources (1994). He is currently an editor of the highly ranked *Journal of Catalysis* and member of the editorial board of the *Journal of Natural Gas Chemistry* and the *Emirates Journal of Engineering*.

This Special Issue of Topics in Catalysis includes 20 representative contributions from the two symposia organized in honor of Professor Oyama's awards that took place at the ACS National Meeting in Dallas and San Francisco. These two symposia spanned over a total of five full day sessions which consisted of more than 60 contributions from leading experts in catalysis in the broad areas of novel metal phosphides, carbides, and sulphides catalytic materials; C1 and hydrogen chemistry, fuel cell, and membranes; oxidation catalysis; spectroscopy, mechanism and kinetics; and biomass and fuels processing. The contributions in this Special Issue are also organized in three related sections: (1) Novel Metal Phosphides, Carbides, and Sulphides Catalytic Materials; (2) Spectroscopy and Oxidation Reactions; and (3) Catalytic Materials and Catalysis for Fuels Applications, areas that are closely related to Professor Oyama's research work.

To conclude, we wish to acknowledge the authors' contributions and attentive responses to reviewers, the anonymous reviewers who provided unselfish comments and suggestions, Dr. Kenneth Howell, Springer Senior Editor, for his technical support, and Professor Hans-Joachim Freund, Editor-in-Chief of Topics in Catalysis, for his invitation to organize this special issue in honor of Professor S. Ted Oyama. For us it was an honor to organize the symposia and this special issue recognizing Ted's achievements. As a researcher, a professor, a mentor, a colleague, and a friend, Professor Oyama continues to inspire us and a large number of catalysis researchers in industry and academia who have had the opportunity to meet, work, and collaborate with him. Our best wishes and congratulations for his well deserved awards!



Professor Ted Oyama, his wife Hideko Tamaru Oyama, friends, and former students during the Distinguished Research Award in Petroleum Chemistry Ceremony at the ACS 2014 Spring Meeting in Dallas, TX