

# Preface for the Special Column of Methane Transformation

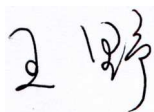
Methane is the main constituent of natural gas, coal-bed gas, landfill gas and methane hydrate resources. These resources may be used more efficiently as clean fuels or as chemical feedstocks if methane can be effectively transformed into liquid fuels or chemicals. However, methane only possesses C–H bonds and is a very stable organic molecule hard to functionalize. The C–H activation, particularly the selective functionalization of C–H bonds in saturated hydrocarbons, remains a difficult challenge in chemistry. The present technology for chemical utilization of methane involves the steam reforming of methane to synthesis gas and the subsequent transformation of synthesis gas to methanol or hydrocarbon fuels via methanol synthesis or Fischer-Tropsch synthesis. However, the steam reforming of methane is a high-cost process. The development of more efficient and economical processes for methane transformation is a dream of all chemists and chemical engineers. I think that this is also one of the most important themes of the *Journal of Natural Gas Chemistry*.

Besides the reforming of methane to synthesis gas, several direct conversion routes such as the oxidative coupling of methane to ethane and ethylene, the selective oxidation of methane to methanol and formaldehyde, and the non-oxidative aromatization of methane to benzene have also been extensively studied over the last several decades. Some strategies that attempt to increase the selectivity of target products at reasonable methane conversions have appeared (*e.g.*, heterogeneous catalysts with highly dispersed active sites, lower-temperature catalytic systems with highly active species, bromination of methane instead of oxidation by oxygen), although practical applications of these strategies seem far away. This special column of methane transformation has collected seven papers on both indirect and direct conversions of methane, and includes the following topics:

- Development of “intelligent” reforming catalysts.
- Study of the oscillation and mechanism for the partial oxidation of methane to synthesis gas.
- Kinetic study of oxidative coupling of methane.
- Development of homogeneous and heterogeneous catalysts for selective oxidation of methane to organic oxygenates (formaldehyde and formic acid).
- Development of novel approaches including coaromatization of methane and propane, and conversion of methane to dimethyl ether mediated by HBr.

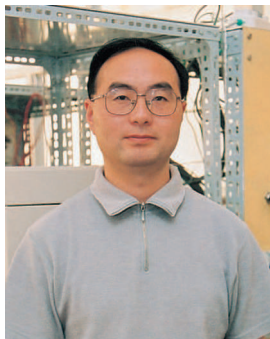
Special thanks go to Prof. Xinhe Bao, the Editor-in-Chief, who invited me to organize this Special Column. I would also like to thank the authors, the referees and the staffs at the Journal office for their nice contributions to this Special Column. It is our hope that this Special Column will encourage and stimulate more creative studies in this challenging research field and lead to exciting breakthroughs in the near future.

Guest Editor



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## Brief Introduction of Professor Ye Wang

Prof. Ye Wang received his B.S. in chemistry from Nanjing University in 1986 and his Ph.D. from Tokyo Institute of Technology in 1996. He worked at Tokyo Institute of Technology and Tohoku University of Japan in 1996–1999. In 2000 he joined the faculty of Hiroshima University and was promoted to Associate Professor in 2001. Since the August of 2001, he has been working as a full Professor at Xiamen University. His main research interests are selective oxidation catalysis and catalysis related to energy. He published more than 100 papers on these research directions. He has been working on the selective oxidation of methane since 1986.