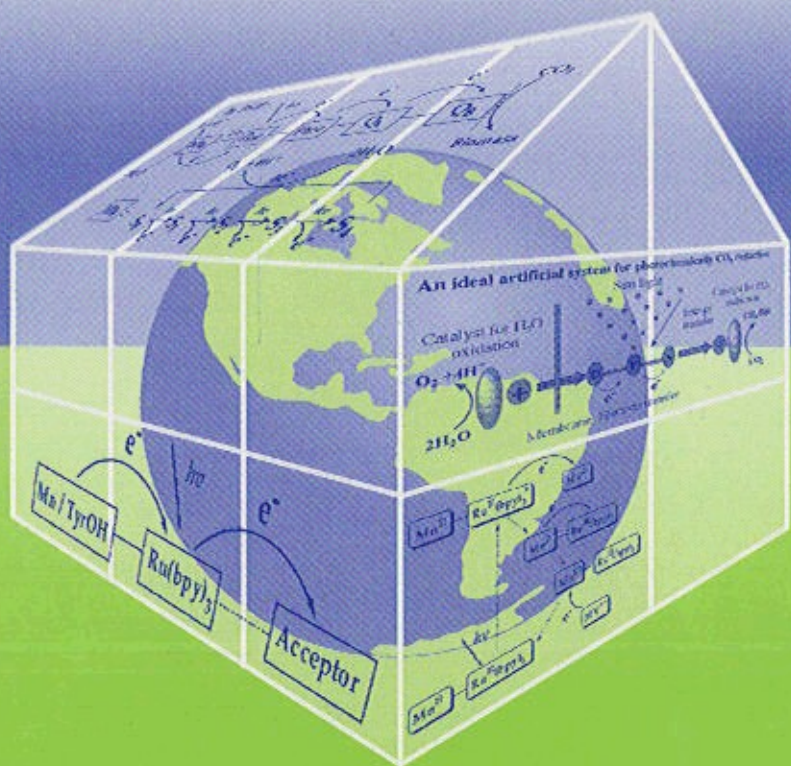


ACS SYMPOSIUM SERIES 852

Utilization of Greenhouse Gases



EDITED BY
Chang-jun Liu, Richard G. Mallinson,
and Michele Aresta

Contents

Preface.....	ix
--------------	----

General Overview

1. Carbon Dioxide Utilization: Greening Both the Energy and Chemical Industry.....	2
Michele Aresta	

Simultaneous Utilization

2. Catalysis in the Simultaneous Utilization of Greenhouse Gases.....	42
Zhen Yan, Hongshan Shang, Chaoxian Xiao, and Yuan Kou	
3. Novel Highly Active Reforming Catalyst System and Production of Pure H ₂ from CH ₄ and CO ₂ with Pd–Ag Membrane Reactor.....	57
Linsheng Wang, Kazuhisa Murata, and Megumu Inaba	
4. Dry Reforming of Ethane on Trimetallic Perovskites LaCo _x Fe _{1-x} O ₃ : Characterizations and Reactivity.....	69
G. Rodriguez, L. Bedel, A. C. Roger, L. Udrón, L. Carballo, and A. Kiennemann	
5. Combined Carbon Dioxide and Steam Reforming with Methane in Low-Temperature Plasmas.....	83
K. Supat, S. Chavadej, L. L. Lobban, and R. G. Mallinson	
6. Influence of Electrode Configuration on Direct Methane Conversion with CO ₂ as a Coreactant Using Dielectric–Barrier Discharges.....	100
Yue-ping Zhang, Yang Li, Chang-jun Liu, and Baldur Eliasson	
7. Effect of H ₂ S on the Reaction of CH ₄ with CO ₂ over Titania-Supported Noble Metal Catalysts.....	116
András Erdőhelyi, Tamás Szailer, and Éva Novák	

Organic Synthesis with CO₂ as a Reactant

8. **A Novel Route for Carbon Dioxide Cycloaddition to Propylene Carbonate**.....130
W. Wei, T. Wei, and Y. Sun
9. **Catalytic Behavior of Calcium Oxide for Synthesis of Dimethyl Carbonate from Propylene Carbonate and Methanol Near Room Temperature**.....138
Tong Wei, M. Wang, Wei Wei, Yuhan Sun, and Bin Zhong
10. **Catalytic Esterification of Carbon Dioxide and Methanol for the Preparation of Dimethyl Carbonate**.....159
Fa-hai Cao, Ding-ye Fang, Dian-hua Liu, and Wei-yong Ying
11. **Electrochemical Reduction of CO₂ on Cu Electrode in Methanol at Low Temperature**.....169
Satoshi Kaneco, Hideyuki Katsumata, Tohru Suzuki, and Kiyohisa Ohta
12. **CO₂ Hydrogenation over Copper-Based Hybrid Catalysts for the Synthesis of Oxygenates**.....183
Son-Ki Ihm, Se-Won Baek, Young-Kwon Park, and Jong-Ki Jeon
13. **Methanol Synthesis from H₂/CO/CO₂ over CNT-Promoted Cu–ZnO–Al₂O₃ Catalyst**.....195
Hong-Bin Zhang, Xin Dong, Guo-Dong Lin, You-Zhu Yuan, Peng Zhang, and K. R. Tsai

Biochemical Fixation of CO₂

14. **Enzymatic Conversion of Carbon Dioxide to Methanol by Dehydrogenases Encapsulated in Sol–Gel Matrix**.....212
Zhongyi Jiang, Hong Wu, Songwei Xu, and Shufang Huang
15. **Toward Solar Energy Conversion into Fuels: Design and Synthesis of Ruthenium–Manganese Supramolecular Complexes to Mimic the Function of Photosystem II**.....219
Licheng Sun, Björn Åkermark, Leif Hammarström, and Stenbjörn Styring

Methane Valorization

16. **Catalytic Stability of Ni Catalyst for Partial Oxidation of Methane to Syngas**.....246
Zhenhua Li, Xiangyu Zhang, Fei He, and Genhui Xu
17. **Structure-Reactivity Studies of the Methane Partial Oxidation by Nitrous Oxide-Activated Iron Clusters in Various Zeolite Topologies**.....260
Peter-Paul H. J. M. Knops-Gerrits
18. **Direct Partial Oxidation of Methane to Methanol in a Specially Designed Reactor**.....280
Qijian Zhang, Dehua He, Xin Zhang, Qiming Zhu, and Shuiliang Yao

Conversion of Methane and Other Greenhouse Gases via Plasmas or Microwave Heating

19. **Plasma Catalytic Hybrid Reforming of Methane**.....292
Thomas Hammer, Thomas Kappes, and Wolfgang Schiene
20. **Methane Coupling and Reforming Using Non-Equilibrium Pulsed Discharge at Room Temperature: Catalyst-Pulsed Discharge Combined System**.....302
S. Kado, K. Urasaki, H. Nakagawa, K. Miura, and Y. Sekine
21. **Evaluation of a High-Energy Transform Efficiency Pulse Power Supply for Methane Plasma Conversion**.....314
Mamoru Okumoto, Shuiliang Yao, Akira Nakayama, and Eiji Suzuki
22. **Factors Affecting the Catalytic Activation of Methane via Microwave Heating**.....325
L. Daniel Conde and Steven L. Suib
23. **Decomposition of CF₄ by Microwave Heating: A Potential Way to Decrease Greenhouse Gas Emissions**.....338
Franz-Joef Spiess, Steven L. Suib, Yuji Hayashi, and Hiroshige Matsumoto

Application of Supercritical CO₂

- 24. Application of High-Pressure Phase Equilibria to the Selective Oxidation of Alcohols over Supported Platinum Catalysts in Supercritical Carbon Dioxide.....352**
Roger Gläser, Jörg Williardt, David Bush, Michael J. Lazzaroni, and Charles A. Eckert

Methane Combustion

- 25. Catalytic Combustion of Methane over Co–Mn Mixed Oxides.....366**
W. B. Li, Y. Lin, and Y. Zhang
- 26. Supported Pd Catalyst for High-Temperature Methane Combustion: Examining the Combustion Synthesis Preparation Method.....375**
M. A. Fraga, M. C. Greca, and L. G. Appel

Indexes

- Author Index.....387**
- Subject Index.....389**