

WORKSHOP

Catalysts and Catalytic Processes Used in Saudi Arabia

4-6 November 1991

RI Building 15 Auditorium



The Research Institute
King Fahd University of Petroleum & Minerals
Dhahran 31261, Saudi Arabia

MONDAY, 4 November 1991

Morning Session: Chairman: Dr. A. G. Maadhah

- 07:30-07:50 Registration
07:50-08:00 Inauguration and Opening Remarks
08:00-08:30 An Overview of the KFUPM Research Institute
Dr. Abdallah E. Dabbagh, Director
08:30-09:00 An Overview of SAMAREC Operations and
Future Plans
Dr. M. Ajjan, SAMAREC, Jeddah
09:00-09:45 FCC Gasoline Octanes and Chem. Composition
Dr. A. C. Pouwels, Akzo, The Netherlands
09:45-10:00 Coffee Break
10:00-10:45 Catalyst Uses in Pemref Refinery
Mr. S. Nageeb, Petromin-Mobil Refinery, Yanbu
10:45-11:30 Commercial Experience with Ketjenfine 752
Mr. A. H. Pichel, Akzo, The Netherlands
11:30-11:45 Prayer
11:45-13:00 Lunch (Bldg. 15, 4th Floor)
Sponsor: Al-Azzaz Est., Al-Khobar (Agent for Akzo)

Afternoon Session: Chairman: Dr. A. M. Al-Jarallah

- 13:15-14:00 Improvements in Gasoline MON
M. Van Vliet, UOP, The Netherlands
14:00-14:30 Refinery Hydroprocessing for the 1990's -
Criterion Philosophy - Part I
Mr. A. J. Suchanek, Criterion, U.S.A.
14:30-15:00 Prayer and Coffee Break
15:00-16:00 Refinery Hydroprocessing for the 1990's -
Criterion Philosophy - Part II
Mr. A. J. Suchanek, Criterion, U.S.A.

Note: Last ten minutes of each lecture will be devoted for questions and answers.

Program

TUESDAY, 5 November 1991

Morning Session: Chairman: Dr. M. B. Amin

- 07:45-08:15 An Overview of SABIC Operations and Future Plans
M. Al-Qurtas, SABIC, Riyadh
- 08:15-09:00 Scientific Basis of Dehydrocyclization of C6 to C10 Paraffins and its Implication in Industrial Catalytic Reforming Catalysts
Jean-Pierre Frank, Procatalse, France
- 09:00-09:45 Carbon Formation and Removal in the Primary Reforming Process
Dr. B. Cromarty, ICI, England
- 09:45-10:00 Coffee Break
- 10:00-10:45 Characterization of the Microstructure of Catalysts
Dr. M. Essig, BASF, Germany
- 10:45-11:30 Modern Developments in LTS Catalysts
Dr. H. Roos, BASF, Germany
- 11:30-11:45 Prayer
- Lunch (Bldg. 15, 4th Floor)
- 11:45-13:00 Sponsor: Y.B.A. Kanoo, Dammam (Agent for BASF)

Afternoon Session: Chairman: Dr. N. M. Abbas

- 13:00-13:45 Reduction of Steam Reforming and Methanation Catalysts
Dr. Y. D. Yeboah, KFUPM/RI, Dhahran
- 13:45-14:30 Influence of Natural Gas Quality on Reformer Operation
R. Stockwell, United Catalysts, USA
- 14:30-15:00 Prayer and Coffee Break
- 15:00-15:20 Catalyst Research Facilities at the Research Institute, KFUPM
Dr. A. M. Al-Jarallah, KFUPM/RI, Dhahran
- 15:20-16:30 Tour - RI Laboratories/Facilities (Groups)
- 20:00 Dinner (Gulf Meridien, Al-khobar)
Sponsor: ICI-Katalco, U.K.

WEDNESDAY, 6 November 1991

Morning Session: Chairman: Dr. M. Shalabi

- 08:15-09:00 Methanol Synthesis
I. Dybkjaer, Haldor Topsoe, Denmark
- 09:00-09:45 Catalyst Applications in CCR Platforming
R. L. Peer, UOP, USA
- 09:45-10:00 Coffee Break
- 10:00-10:45 Syngas Manufacture: Opportunities and Limits of the Reforming Technology
I. Dybkjaer, Haldor Topsoe, Denmark
- 10:45-11:30 Utilization of LCO as a Diesel Blend
Dr. J. A. Anabtawi, KFUPM/RI Dhahran
- 11:30-11:45 Prayer
- 11:45-13:00 Lunch (Bldg. 15, Level 4)
Sponsor: Bader Chem. Est., Dammam
(Agent for Haldor Topsoe)

Afternoon Session: Chairman: Dr. Y. D. Yeboah

- 13:15-13:45 Commercial Performance of the Houdry Catofin Process
Lee Tucci, Süd-Chemie/UCI, USA
- 13:45-14:30 Questions and Answers
- 14:30-15:00 Prayer and Coffee Break
- 15:00-15:30 Questions and Answers
- 15:30-15:40 Closing Remarks
- WORKSHOP ENDS.
- 19:30 Valedictory Dinner (Al-Hamra Hotel, Dammam)
Sponsor: Marmar Chemicals
(Agent for UCI/Süd Chemie)

Joint Saudi-Japanese Workshop on
**Petroleum Refining and Gas Conversion:
Application of New Catalysts**

(26-27 May 1992)

TECHNICAL PAPERS

Organized by

*The KFUPM Research Institute
Dhahran, Saudi Arabia*

*The Japan Petroleum Institute
Tokyo, Japan*



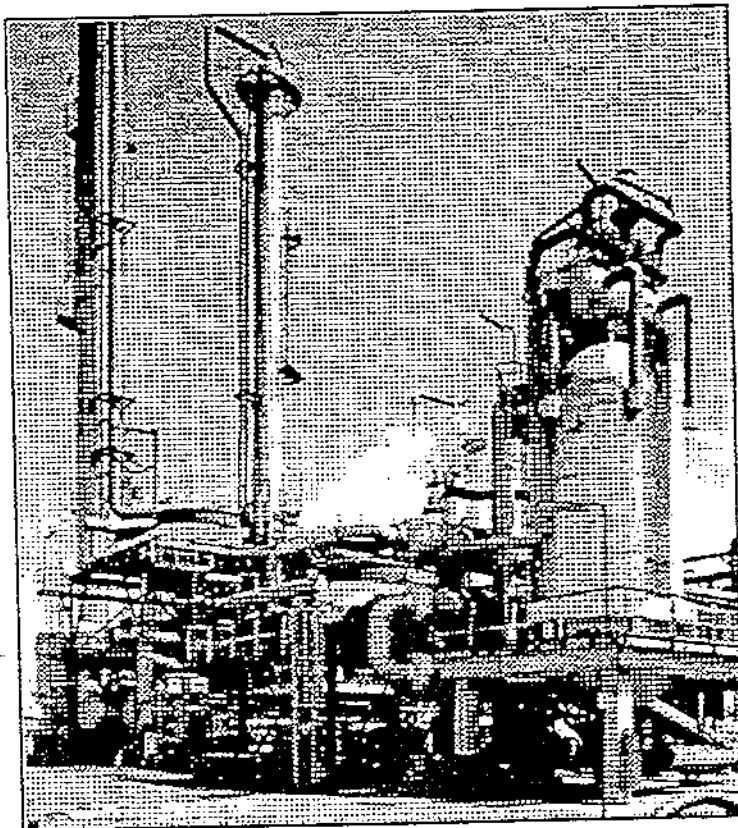
**The Research Institute
King Fahd University of Petroleum & Minerals
Dhahran 31261, Saudi Arabia**

PETROLEUM REFINING AND GAS CONVERSION:
APPLICATION OF NEW CATALYSTS

TECHNICAL PAPERS

1. Idemitsu R-HYC Catalyst for Residual Oil Upgrading
A. Iino, Idemitsu Kosan Co. Ltd.
2. Characterization and C5/C6 Isomerization Activity of Solid Superacid
(Pt/SO₄²⁻/ZrO₂)
T. Shimizu, Cosmo Oil Co. Ltd.
3. Petroleum Refining Technologies Developed by Nippon Oil Company
A. Inoue, Nippon Oil Co. Ltd.
4. Synthesis of C₂₊ Hydrocarbons by Vapor Phase Oxidative Coupling of Methane Under Pressure
K. Fujimoto, University of Tokyo
5. Reaction Mechanism and Active Oxygen Species in Oxidative Coupling of Methane
K. Ohtsuka, Tokyo Institute of Technology
6. Formation of Ethane and Ethylene by the Reaction of Methane and Carbon Dioxide Over Metal Oxide Catalysts
Y. Ohtsuka, Tohoku University
7. Conversion of Associated Gas to Liquid Fuels on Novel Catalyst Systems
T. Inui, Kyoto University
8. Studies on Fischer-Tropsch Synthesis Over Activated Metal in Gas Phase
M. Nomura, Osaka University
9. Hydrogenation of Carbon Monoxide Over Dispersed Cobalt Catalysts Prepared from Co₂(CO)₈
Y. Sugi, National Chemical Laboratory for Industry, Japan
10. Oxidative Dehydrogenation of cis-2-butene on Iron Oxide Film Catalyst
A. Ueno, Toyohashi University of Technology
11. Synthesis, Characterization, and Catalytic Properties of High Silica Zeolites
M. M. Abdillahi, KFUPM Research Institute
12. Synthesis of Mixed Alcohol from Synthesis Gas on Mo-Based Catalyst
T. Tatsumi, University of Tokyo
13. Aromatization of Butane on Zn-Modified ZSM-5 Type Zeolites
T. Yashima, Tokyo Institute of Technology
14. Natural Gas to Fuel Cells: Effect of Carbon Monoxide
S. Gultekin, KFUPM
15. Reduction of Supported Nickel Catalysts
Y. Yeboah, KFUPM Research Institute

Second Joint Saudi-Japanese Workshop on
**RECENT DEVELOPMENTS IN SELECTED
PETROLEUM REFINING AND
PETROCHEMICAL PROCESSES**



December 12-13, 1992
RI Building 15 Auditorium



The Research Institute
King Fahd University of Petroleum & Minerals
Dhahran 31261, Saudi Arabia
Tel: (03) 860 3888 / 860 3883
Fax: (03) 860 3989 / 860 2266

Day 1 Saturday, December 12, 1992

- 07:30 Registration
 07:50 Opening Remarks:
 H.E. The Rector of KFUPM, Dr. Bakr A. Bakr
 H.E. The Ambassador of Japan to Saudi Arabia
- 08:00 An overview of the KFUPM Research Institute
 Dr. Abdallah E. Dabbagh, Director RI

Morning Session**Chairman:****Theme: Petroleum Refining Processes****Dr. Ali G. Maadhah**

- 08:30 Characterization and coking behavior of heavy oil and polyaromatic hydrocarbons
 Dr. Yuzo Sanada, Hokkaido University
- 09:20 Coffee Break
- 09:40 Research and development of residual oil hydroconversion technology
 Dr. Yoshihiro Mizutani, Cosmo Research Institute
- 10:20 Study on hydrocracking of heavy oils
 Dr. Yasuhiro Kubota, Nippon Oil Co. Ltd.
- 11:00 Gasoline fraction synthesis from cracking gas over solid acid catalysts
 Dr. Shigeki Mori, Showa Shell Sekiyu K.K.
- 11:40 Prayer
- 12:00 Lunch (Bldg. 15, 4th Floor)

Afternoon Session**Chairman:****Theme: Petroleum Refining Processes****Professor Tomoyuki Inui**

- 13:00 Performance evaluation of naphtha hydrotreating catalysts
 Dr. Jamal Anabtawi, KFUPM Research Institute
- 13:40 Hydrotreating technology for bottom upgrading refineries
 Dr. Shin-ichi Hara, Nippon Mining Co. Ltd.
- 14:20 Prayer and Coffee Break
- 14:40 Structure of sulfided hydrotreating catalysts and their activities
 Dr. Yoshio Akai, Idemitsu Kosan Co. Ltd.
- 15:20 Tour - RI Laboratories and Facilities
- 16:00 Day 1 Ends.

CONTENTS

1. Introductory Remarks <i>Yuzo Sanada</i>	ii
2. Characterization and coking behavior of heavy oil and polyaromatic hydrocarbons <i>Yuzo Sanada, Hokkaido University</i>	1
3. Research and development of residual oil hydroconversion technology <i>Yoshihiro Mizutani, Cosmo Research Institute</i>	7
4. Study on hydrocracking of heavy oils <i>Yasuhiro Kubota, Nippon Oil Co. Ltd.</i>	12
5. Gasoline fraction synthesis from cracking gas over solid acid catalysts <i>Shigeki Mori, Showa Shell Sekiyu K.K.</i>	21
6. Performance evaluation of naphtha hydrotreating catalysts <i>Jamal Anabtawi, KFUPM Research Institute</i>	22
7. Hydrotreating technology for bottom upgrading refineries <i>Shin-ichi Hara, Nippon Mining Co. Ltd.</i>	23
8. Structure of sulfided hydrotreating catalysts and their activities <i>Yoshio Akai, Idemitsu Kosan Co. Ltd.</i>	29
9. Preparation of potassium promoted chromia-alumina catalysts <i>Hiroshi Miura, Saitama University.</i>	35
10. Performance of Rh/ZrO ₂ and Ru/ZrO ₂ catalysts for low-temperature steam reforming of n-butane <i>Akira Igarashi, Kogakuin University</i>	40
11. Synthesis of C ₂ -oxygenated compounds from syngas over non-rhodium catalysts <i>Katsuhiko Wakabayashi, Kyushu University</i>	45
12. Catalytic oxidative dehydrogenation of iso-butane to iso-butene <i>Yusaku Takita, Oita University</i>	52
13. Aromatization of propane in CO ₂ atmosphere <i>Tadashi Hattori, Nagoya University</i>	58

Third Joint Saudi-Japanese Workshop On
**PETROLEUM REFINING, PETROCHEMICALS,
AND RELATED ISSUES**

(October 31 - November 1, 1993)

TECHNICAL PAPERS

Organized by

The KFUPM Research Institute
Dhahran, Saudi Arabia

The Japan Petroleum Institute
Tokyo, Japan



THE RESEARCH INSTITUTE
KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DHAHRAN, SAUDI ARABIA

- 3 -

CONTENTS

Title	Page
Preface Dr. Ali G. Maadhah, Research Institute, KFUPM, Dhahran	ii
1. Petroleum Products Upgrading at Saudi Aramco A. M. Al-Zahrani, Saudi Aramco, Dhahran, Saudi Arabia	1
2. Hydrocracking of Heavy Oils with Highly Dispersed Catalysts A. Matsumura, T. Kondo, Y. Sasaki, and K. Ukegawa National Institute for Resources and Environment, Ibaraki, Japan	5
3. Catalyst Selection for Naphtha Desulfurization J. A. Anabtawi, S. A. Ali, M. A. B. Siddiqui, and S. M. J. Zaidi, Research Institute, KFUPM, Dhahran, Saudi Arabia	11
4. Research and Development of LCO Deep Desulfurization Technology Over the Co-Mo Catalysts T. Miura, N. Itoh, F. Hayashi, and T. Ueda, Tonen Corporation, Saitama, Japan	17
5. Deactivation and Regeneration of Industrial Reforming Catalysts J. N. Beltramini, Chemical Engineering Department, KFUPM, Dhahran, Saudi Arabia	23
6. Study on Hydrocracking of Vacuum Gas Oil T. Enomoto, M. Adachi, Y. Nakatuka, Y. Kubota, and M. Ushio, Nippon Oil Company, Yokohama, Japan	33
7. Structure and Catalysis of Highly Dispersed Hydrodesulfurization (HDS) Catalysts Y. Okamoto, M. Odawara, and T. Imanaka, Osaka University, Osaka, Japan	38
8. Ternary Molybdenum Chalcogenides for HDS Reactions S. Kareem, Research Institute, KFUPM, Dhahran, Saudi Arabia	44
9. Development of Highly Active Zeolite-based Hydrodesulfurization Catalysts M. Sugioka, Muroran Institute of Technology, Muroran, Japan	55
10. Z-Forming Process: Conversion of LPG and Light Naphtha to Aromatics K. Shimizu, S. Saito, K. Hirabayashi, Mitsubishi Oil Company; and T. Kondo, K. Adachi, and S. Inoue, Chiyoda Corporation, Yokohama, Japan	61
11. The Importance of Catalysis to SABIC Operations A. Al-Ubaid, Saudi Basic Industries Corporation, Riyadh, Saudi Arabia	66

12.	Development of an Active Nickel Catalyst for Steam Methane Reforming T. Numaguchi, K. Shoji and K. Kikuchi, Toyo Engineering Corporation, Chiba, Japan	67
13.	Activity of Commercial Steam Reforming Catalysts Y. D. Yeboah, S. A. Ali, J. Zaidi, A. Siddiqui, and S. Gultekin, Research Institute, KFUPM, Dhahran, Saudi Arabia	73
14.	Production of Hydrogen and Syngas in Hydrogen-Permsselective Membrane Reactor T. Kondo, K. Adachi, and S. Inoue, E. Kikuchi, Waseda University, Tokyo, Japan	83
15.	Thermal Stability of Zeolite Structures M. M. Abdillahi, Research Institute, KFUPM, Dhahran, Saudi Arabia	89
16.	Characterization and Catalytic Properties of Metallosilicates T. Yashima, Tokyo Institute of Technology, Tokyo, Japan	97
17.	Preparation of Novel Hydrogenation Catalyst from Amorphous Alloy T. Takahashi and T. Kai, Kagoshima University, Japan	105
18.	Bacterial Corrosion Monitoring and Control in Petroleum Production O. A. Ashiru, Research Institute, KFUPM, Dhahran, Saudi Arabia	111
19.	Impact of Gulf War on the Environment M. B. Amin, Research Institute, KFUPM, Dhahran, Saudi Arabia	121
20.	Corrosion in Petroleum Production and Refining I. Al-Adel, Saudi Aramco, Dhahran, Saudi Arabia	126

APPENDIX

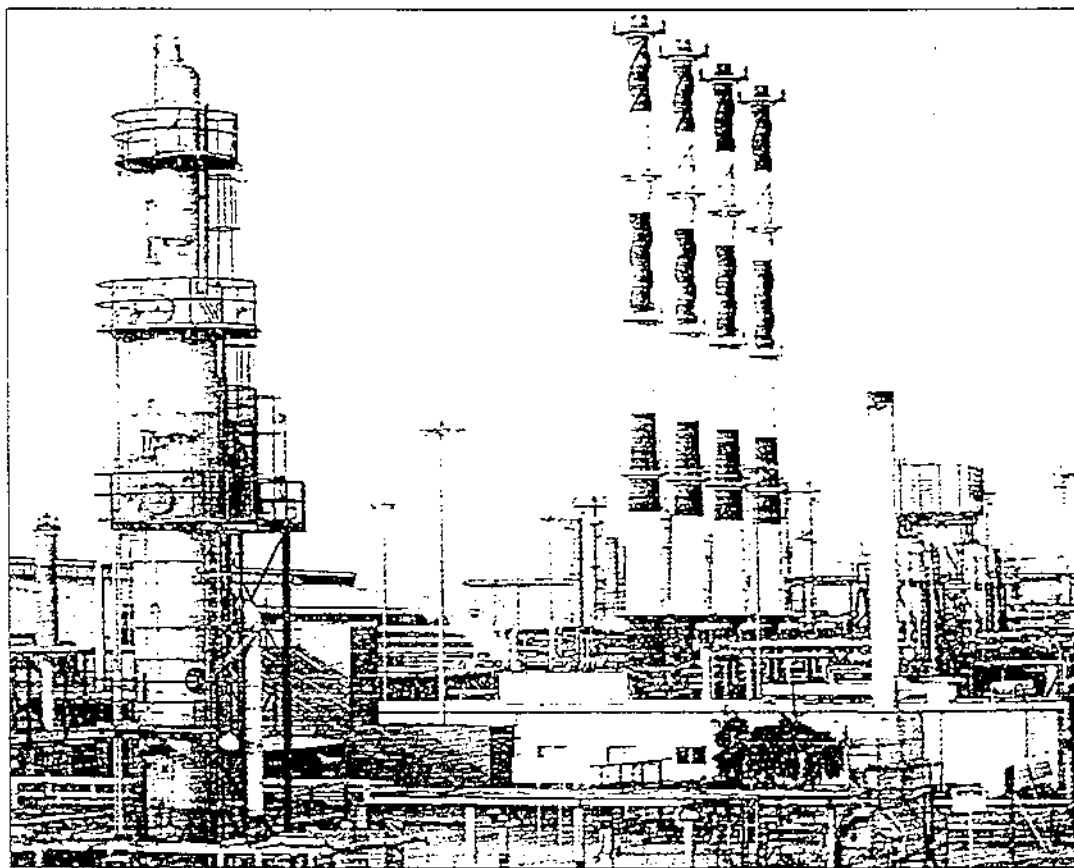
Following Page 135

List of Participants and Addresses

A-1

WORKSHOP

RESID & HEAVY OIL PROCESSING



December 4-6, 1994
RI Building 15 Auditorium



The Research Institute
King Fahd University of Petroleum & Minerals
Dhahran, Saudi Arabia



The Japan Petroleum Institute
Cosmo Hirakawa Building
Tokyo 102, Japan

- 4 -

**Resid & Heavy Oil Processing
Program**

Sunday, December 4, 1994

- 07:30 Registration
- 07:50 Opening Remarks
H.E. Dr. Bakr A. Bakr, Rector of KFUPM
- 08:00 An Overview of the KFUPM Research Institute
Dr. Abdallah E. Dabbagh, Director, RI

Morning Session	Chairman: Dr. Ali G. Ma'adhah
------------------------	--------------------------------------

- 08:15 Hydroprocessing Technology for Upgrading and Converting Atmospheric and Vacuum Residuum
M. A. Peterson, Unocal, USA
- 09:00 Integration of the HYVAHL and SOLVAHL Processes for Resids Conversion
J.P. Peries, IFP, France
- 09:45 *Coffee Break*
- 10:00 Residue Hydrotreating Options and Catalyst Developments
G. Phillips, UOP Ltd., UK
- 10:45 Heavy Oil Upgrading by Onstream Catalyst Replacement in Combination with RDS
N. Shibahara, Idemitsu Kosan Co. Ltd., Japan
- 11:30 *Prayer*
- 12:00 *Lunch (Bldg. 15, Fourth Floor - Sponsored by Japan Petroleum Institute, JPI)*

Afternoon Session	Chairman: Dr. H. Hattori
--------------------------	---------------------------------

- 13:00 Upgrading of Heavy Cuts into Distillates
J. C. Plumail, Procatalyse, France
- 13:45 Resid Hydrotreating
A. H. Pichel, Akzo Nobel, The Netherlands
- 14:30 *Prayer and Coffee Break*
- 14:45 Optimized Catalyst Loadings for Treating Middle East Resid
J. Bartholdy, Haldor Topsoe, Denmark
- 15:30 Cosmo Resid Hydroconversion Catalyst – Catalyst Combination Technology
Y. Yamamoto, Cosmo Research Institute, Japan
- 16:15 *Day 1 ends.*

Note: There will be a brief question and answer session at the end of each lecture.

**Resid & Heavy Oil Processing
Program**

Monday, December 5, 1994

Morning Session **Chairman: Dr. S. H. Hamid**

- 08:15 Advanced Resid FCC Process Technology
 W. S. Letzsch, Stone & Webster Engineering, USA
- 09:00 Fluid Catalytic Cracking of Heavy Materials
 E. Von Schmidt, UOP Ltd., UK
- 09:45 *Coffee Break*
- 10:00 FCC Catalyst Technologies for Heavy Oil Processing
 S. Paloumbis, Grace Davison, FCC Europe, Germany
- 10:45 Catalyst Development in Resid FCC Process
 A. J. Romero, Akzo Nobel, The Netherlands
- 11:30 *Prayer*
- 12:00 *Lunch (Bldg. 15, Fourth Floor - Sponsored by JPI)*

Afternoon Session **Chairman: Dr. T. Takatsuka**

- 13:00 Recent Advances in Resid Processing in FCCs
 P. Ladwig, Exxon Research & Engineering, USA
- 13:45 VEBA-COMBI Cracking Process
 A. Schleiffer, VEBA OEL, Germany
- 14:30 *Prayer and Coffee Break*
- 14:45 Non-Catalytic Upgrading of Heavy Oils and Resids
 M. J. McGrath, Foster Wheeler USA Corp., USA
- 15:30 Hydrogen Effects on the Cracking Catalysts
 H. Hattori, Hokkaido University, Japan
- 16:15 *Day 2 ends.*

Tuesday December 6, 1994

Morning Session **Chairman: Dr. D. K. Al-Harbi**

- 08:15 Incorporation of Hydrocracking in a Complex Conversion Refinery
 A. R. Gentry, The M.W. Kellogg Co., USA
- 09:00 FEROSEP Process for Removing Iron Contaminants from Resid Hydrotreater Feedstocks
 K. Kamiya, Nippon Oil Co., Japan
- 09:45 *Coffee Break*
- 10:00 Effect of Co, Ni, and Fe on HDS Activity and Fine Structure of Mo/Al₂O₃
 M. Yamada, Tohoku University, Japan
- 10:45 Carbon Catalyzed Transfer-Hydrocracking of Heavy Oil
 K. Fujimoto, The University of Tokyo, Japan
- 11:30 *Prayer*
- 12:00 *Lunch (Bldg. 15, Fourth Floor - Sponsored by JPI)*

Resid & Heavy Oil Processing Program

Tuesday, December 6, 1994 (...Contd.)

Afternoon Session	Chairman: Dr. Y. Yeboah
--------------------------	--------------------------------

- 13:00 Problems of Plant Materials in Refineries
Y. Namikawa, JGC Corporation, Japan
- 13:45 Topsoe Technology for Hydrogen Production
O. Hansen, Haldor Topsoe, Denmark
- 14:30 *Prayer and Coffee Break*
- 14:45 EUREKA Process – Thermal Cracking Process for Residual Oil Upgrading
T. Takatsuka, Chiyoda Corporation, Japan
- 15:30 Flexibility Considerations in the Design of the Ras Tanura Refinery Hydrocracker
J. M. Storm, Saudi Aramco, Ras Tanura
- 16:00 Concluding Remarks – Dr. Ali G. Ma'adhah
- 16:30 *Workshop ends.*
-

Information

Registration

There is no registration fee to attend the workshop, but all intending attendees are required to forward their names and affiliations to:

Dr. Ali G. Ma'adhah, Manager
Petroleum & Gas Technology Division
KFUPM Research Institute, Dhahran 31261, Saudi Arabia
Tel. (+966-3) 860 3888 or 860 3007 Fax: (+966-3) 860 3989 or 860 2266

Workshop files including the abstracts of presentations will be distributed at the on-site registration desk at 7:30 a.m. on Sunday, 4 December 1994.

KFUPM RESEARCH INSTITUTE

The Research Institute is an integral part of the King Fahd University of Petroleum & Minerals. It provides consulting, research, and development services to the government and to the private sector, primarily directing its services toward the application of modern technology to the needs of the Kingdom. The Research Institute's technical activities are conducted by seven technical divisions. These are: Petroleum and Gas Technology; Energy Resources; Geology and Minerals; Water Resources and Environment; Metrology, Standards, and Materials; Economics and Industrial Research; and Development and Manufacturing Center.

Petroleum and Gas Technology Division

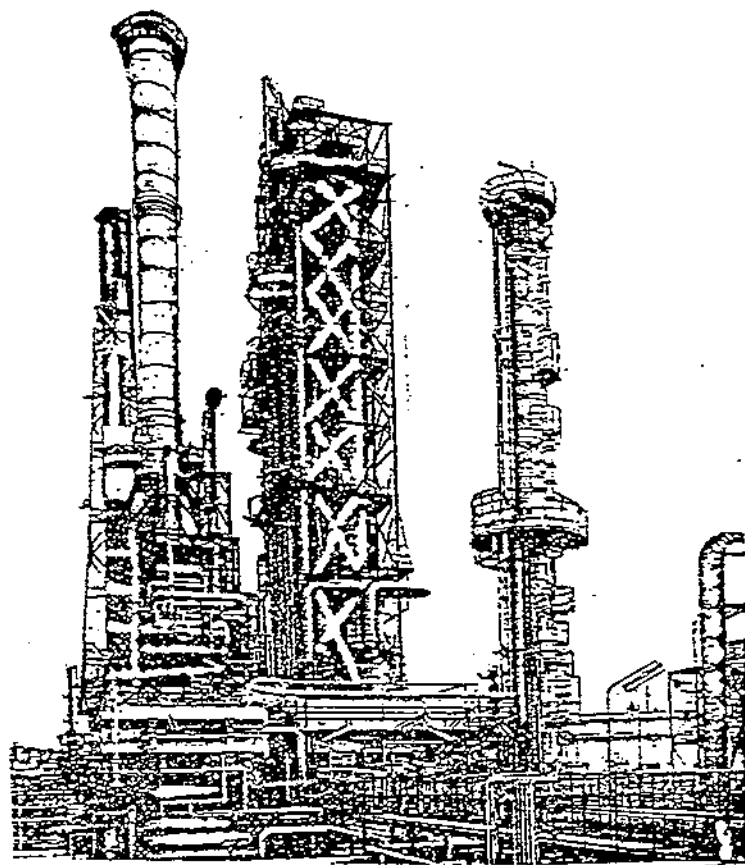
The major activities of the Petroleum and Gas Technology Division involve research and development relating to petroleum, natural gas, petrochemical, and desalination industries. The division is actively involved in investigations encompassing the production, transportation, processing, and utilization of gaseous and liquid hydrocarbons and their petrochemical products. The division is also engaged in water desalination and process engineering studies. The division's activities are carried out within its three sections: Petroleum Refining and Petrochemicals; Petroleum Engineering; and Desalination and Process Engineering.

Petroleum Refining and Petrochemicals Section

With more than 30 full-time staff and several part-time KFUPM faculty members, the section is divided into four groups: catalysts and catalytic processes; petroleum refining; polymers and plastics R&D, and polymer degradation and stabilization. With its experienced professionals and modern equipped labs, the section combines outstanding capabilities in the service of refining, petrochemical and chemical industries in Saudi Arabia and the GCC region.

The Fifth Workshop on

CATALYSIS IN PETROLEUM REFINING AND PETROCHEMICALS



December 2-3, 1995
RI Building 15 Auditorium
King Fahd University of Petroleum & Minerals



KFUPM Research Institute
Dhahran, Saudi Arabia

PEC

Petroleum Energy Center
Tokyo, Japan



Japan Petroleum Institute
Tokyo, Japan

Catalysis in Petroleum Refining & Petrochemicals
Program

Day One: Saturday, December 2, 1995

- 07:30 Registration
07:40 Opening Remarks
H.E. Dr. Abdulaziz A. Al-Dukhayyil, Rector of KFUPM
07:50 Introductory Remarks by the Head of the Japanese Delegation
Professor T. Yashima, Chairman, Cooperation Committee, Japan Petroleum Institute
08:00 An Overview of the KFUPM Research Institute
Dr. Abdallah E. Dabbagh, Director, RI

Morning Session

Theme: *Hydroprocessing*

Chairman: *Dr. Ali G. Ma'adhah*

- 08:15 Basic Concept of Paraffin Hydrocracking on Metal-Zeolite Catalyst
Dr. K. Fujimoto, The University of Tokyo, Japan
08:45 Noble Metal Hydrocracking Catalysts for Naphtha and Middle Distillates
Mr. K. Kleemeier, UOP
09:15 Evaluation of Conversion and Catalyst Fouling on Hydrocracking of Heavy Oils Over Ni/Zeolite and Ni-Co/Zeolite Catalysts
Dr. T. Takahashi, Kagoshima University, Japan
09:45 *Coffee Break*
10:00 Development of Aromatics Hydrogenation Catalyst for Diesel Fuel
Dr. T. Ino, Nippon Oil Company, Japan
10:30 Hydrocracking: A Flexible Solution for Producing High Quality Middle Distillates
Mr. R. Dutriau, IFP, France
11:00 Catalyst Design and Development for Two-Stage Upgrading of Polyaromatic Hydrocarbons
Dr. A. Nishijima, National Institute of Materials & Chemical Research, Japan
11:30 *Prayer*
12:00 *Lunch (Bldg. 15, Fourth Floor - Sponsored by Petroleum Energy Center)*

Afternoon Session

Theme: *Gas Conversion*

Chairman: *Dr. T. Yashima*

- 13:00 Liquid Phase Alkylation of Benzene with Propylene Catalysed by β -Zeolites
Mr. C. Perego, Eniricerche, Italy
13:30 Recent Technology Development in Conversion of LPG to Aromatics
Dr. M. M. Abu-Shbak, KFUPM-RI
14:00 New Process for Producing Oxogas from Natural Gas
Dr. T. Yoshizawa, Cosmo Research Institute, Japan
14:30 *Prayer and Coffee Break*
14:50 Production of Light Olefins & Alkanes by Plasma Conversion of Methane or Heavy Feed Stocks
Dr. W. M. Sackinger, OBELISK Hydrocarbons Ltd., USA
15:20 Hydrogen/Syngas Production Using a Circulating Fluidized Bed
Dr. K. Ueyama, Osaka University, Japan
15:50 Emerging Japanese Catalytic Technologies
Dr. M. Otake, DIA Research Institute, Japan

Day 1 ends.

Catalysis in Petroleum Refining & Petrochemicals
Program

Day Two: Sunday, December 3, 1995

Morning Session

Theme: *FCC/Deep Desulfurization*

Chairman: *Dr. K. Fujimoto*

- 07:45 Catalyst Deactivation in FCC-A Review of Mechanisms and Testing Methods
Mr. E. Breevord, Akzo Nobel, The Netherlands
- 08:15 1995-Fluid Catalytic Cracking Update
Mr. W. S. Letzsch, Stone & Webster Inc., USA
- 08:45 Development in FCC Technology
Mr. S. Beeston, UOP
- 09:15 The Commercial Operating Result of New RFCC
Mr. K. Okumoto, Idemitsu Kosan Co., Japan
- 09:45 *Coffee Break*
- 10:00 Studies on Diesel Deep Desulfurization: Process Parameters Effect on the Conversion of Various Types of Sulfur Compounds Present in Kuwait Atmospheric Gas Oil
Dr. M. K. Andari, KISR, Kuwait
- 10:30 Review of Research Activity on Diesel Fuel Deep Desulfurization in Japan
Mr. H. Tanda, Idemitsu Kosan Co., Japan
- 11:00 Deep Desulfurization of Middle Distillates
Dr. A. Ishihara, Tokyo University of Agriculture & Technology, Japan
- 11:30 *Prayer*
- 12:00 *Lunch (Bldg. 15, Fourth Floor - Sponsored by Petroleum Energy Center)*

Afternoon Session

Theme: *Petrochemicals*

Chairman: *Dr. S. Halim Hamid*

- 13:00 Application of an Initiator Mix to Optimize VCM Polymerization
Dr. H. Westmijze, Akzo Nobel, The Netherlands
- 13:30 Oligomerization of Light Olefins with a New Amorphous Mesoporous Silica-Alumina
Mr. C. Perego, Eniricerche, Italy
- 14:00 Isomerization of C₅-C₇ n-Paraffins over β -zeolite
Dr. A. Kamo, PEC, Japan
- 14:30 *Prayer and Coffee Break*
- 14:50 Coke Deactivation of MFI Type Zeolites Used for Aromatization of Light Paraffins
Dr. S. Fukase, Japan Energy Corp., Japan
- 15:20 Characterization of Chromia/Alumina Catalysts
Dr. A. Rahman, KFUPM-RI
- 15:50 Concluding Remarks
Dr. A. G. Ma'adhah, KFUPM Research Institute
- Workshop ends.*

Note: There will be a brief question and answer session at the end of each lecture.

Catalysts in Petroleum Refining and Petrochemicals

Proceedings

of the Sixth Annual Workshop
held at the KFUPM Research Institute
December 1-3, 1996



The Research Institute
King Fahd University of Petroleum & Minerals
Dhahran, Saudi Arabia

- 6 -

Contents

Foreword	ii
1. FCC Catalyst and Additive Technologies for Heavy Feed/Resid Processing <i>Paul Diddams, Balbir Lakhanpal, and Steve Paloumbis</i> <i>GRACE Davison, Worms, Germany</i>	1
2. Progress and Future Aspect of Resid FCC Catalysts – Roles of Zeolites..... <i>Yoichi Nisimura</i> <i>Former Director, Catalysis & Chemicals Industries Company, Japan</i>	19
3. Deep Catalytic Cracking	29
<i>Warren S. Letzsch and Lark E. Chapin</i> <i>Stone & Webster Engineering Corporation, Houston, Texas, USA</i>	
4. Recent Advances of FCC Technology and Catalyst in RIPP	43
<i>Wang Yamin, Li Caiying, Chen Zubi, Zhong Xiaoxiang</i> <i>Research Institute of Petroleum Processing, SINOPEC, Beijing, China</i>	
5. New FCC Catalyst Design for Bottoms Cracking	55
<i>H. Yamada, M. Tanno, M. Yamashita, M. Ohi, M. Tsujii</i> <i>Energy Research Lab, Cosmo Research Institute, Saitama, Japan</i>	
6. Evaluation of Coke Selectivity of FCC Catalysts	63
<i>E. Brevoord, A. C. Pouwels, F. P. P. Olthof, H. N. J. Wijngaards, and</i> <i>P. O'Connor, Akzo Nobel, The Netherlands</i>	
7. New Fluid Cracking Catalyst Demetallization Process	75
<i>Stephen K. Pavel and Frank J. Elvin</i> <i>Coastal Catalyst Technology, Inc., Houston, Texas, USA</i>	
8. Options for Reduction of FCC Gasoline Sulfur	93
<i>Rick Dickinson, Glenn Dodwell, Ronald McClung, and Alan Sweezey</i> <i>Engelhard Corporation, USA</i>	
9. Fuel Oil Conversion and Utilization Options – Inside the Refinery	109
<i>R. L. Dickenson, B. L. Schulman, and F. E. Biasca</i> <i>SFA Pacific, Inc., California, USA</i>	
10. Improvements in Reformulated Gasoline Technology	111
<i>Kerry L. Rock and Thomas F. Kellett</i> <i>CDTECH, USA</i>	

11.	Stabilization Against Oxidation of Petroleum Products: Development of New Phenolic Antioxidants	121
	<i>Yasukazu Ohkatsu and Takeshi Nishiyama</i> <i>Kogakuin University, Tokyo, Japan</i>	
12.	Efficient Utilization of Heavy Oils by Thermal-Thermal or Thermal-Catalytic Two-State Processes	127
	<i>Toshimitsu Suzuki</i> <i>Kansai University, Osaka, Japan</i>	
13.	Well-designed Catalyst with Controlling Pore Structures for Hydroprocessing of Petroleum Heavy Oils	135
	<i>Yoshihiro Ohguchi and Takeo Ono</i> <i>R&D Center, Chiyoda Corporation, Yokohama, Japan</i>	
14.	actiCAT® Presulfurized Catalysts	141
	<i>J. Gary Welch</i> <i>CRI International, Inc., Houston, Texas, USA</i>	
15.	Off-site Treatments of Refining Catalysts: Regeneration and Presulfiding	163
	<i>P. Dufresne, J. Darcissac, F. Girardier, and F. Valeri</i> <i>EURECAT, France, and</i> <i>S. Abotteen, Al-Bilad Catalyst Co., Jubail, Saudi Arabia</i>	
16.	Thiochemicals as Presulfiding Agents for Hydrotreatment Catalysts	177
	<i>C. Brun, T. Saint-Pierre, and J. Perrot</i> <i>Elf Atochem, France</i>	
17.	Development of Highly Active Catalysts for Hydrogenation of Heavy Oil	185
	<i>M. Yamamoto, Z.-G. Zhang, and T. Yoshida</i> <i>Hokkaido National Industrial Research Institute, Sapporo, Japan</i>	
18.	Effect of Catalyst Acidity on Hydrodenitrogenation of Model Compounds and Gas Oils	193
	<i>H. Tanaka, S. Aizawa</i> <i>Petroleum Refining Research & Technology Center, Japan Energy Corporation, Saitama, Japan</i>	
19.	Pyrolysis Reaction Mechanism of Heavy Oil Model Compounds	201
	<i>H. Kawai and F. Kumata</i> <i>Advanced Technology Research Institute, Petroleum Energy Center, Kanagawa, Japan</i>	
20.	Petroleum Residue Upgrading with Dispersed Catalysts	213
	<i>A. Del Bianco, N. Panariti, and M. Marchionna</i> <i>Eniricerche and Snamprogetti, Italy</i>	
21.	The Unicracking Process – Striving for Operational Excellence	221
	<i>Philip A. Fleming</i> <i>UOP, USA</i>	

22.	Characterization of Hydrocracking Catalysts by Temperature Programmed Methods: TPR/TPS/TPD.....	223
	<i>Shakeel Ahmad, S. A. Ali, K. Alam and S. H. Hamid</i> <i>KFUPM Research Institute, Dhahran, Saudi Arabia</i> <i>E. Iwamatsu, E. Hayashi, Y. Sanada, and T. Yoneda</i> <i>Petroleum Energy Center, Japan</i>	
23.	Development of Heavy Oil Hydrocracking Catalysts: Catalyst Characterization with TPS-TPR-ESR Method	235
	<i>E. Hayashi, E. Iwamatsu, S. Ahmed, A. K. K. Lee, S. H. Hamid, Y. Sanada, and T. Yoneda</i> <i>Petroleum Energy Center, Saudi Arabia & Japan, and KFUPMIRI</i>	
24.	New Generation Hydrocracking Technology Allows Increased Flexibility for Feedstock Quality and Product Yields and Characteristics.....	243
	<i>P. Marion and A. Billon</i> <i>Institut Français Du Pétrole, France</i>	
25.	Development of New Hydrocracking Catalyst and Simulator Aided Management of Hydrocracking Process	271
	<i>Wataru Sahara, Yasuhiro Kubota, Hajime Okazaki, and Masaru Ushio</i> <i>Central Technical Research Laboratory, Nippon Oil Company Ltd.</i> <i>Yokohama, Japan</i>	
26.	Development of Catalyst for Synthesis of Gasoline From Light Paraffins	279
	<i>Hagiwara Takashi, Kubota Hajime, Sakuma Shigenori, Onodera Masaru, and Kawamura Ichiro</i> <i>Central R&D Laboratory, Showa Shell, Kanagawa, Japan</i>	
27.	High Value Utilization Options for LPG	285
	<i>R. A. Pogliano, M. A. Krawczyk, B. V. Vora, J. H. Gregor, and H. E. Fullerton</i> <i>UOP, USA</i>	
28.	The Nature of the High Sensitivity of Pt/KL Catalysts to Sulfur Poisoning ...	307
	<i>T. Fukunaga and V. Ponc</i> <i>Idemitsu Kosan Company, Chiba, Japan and Gorlaeus Laboratories, Leiden University, Leiden, The Netherlands</i>	
29.	Aromatization of Lower Hydrocarbons Over Ga Loaded HZSM-5	315
	<i>Tatsuaki Yashima, Shin Fujita, and Takayuki Komatsu</i> <i>Tokyo Institute of Technology, Tokyo, Japan</i>	
30.	The Effect of Non-framework Aluminium Species in the Aromatization of Light Alkanes Over Pentasil Zeolite	325
	<i>Jorge N. Beltramini, KFUPM, Dhahran Saudi Arabia</i> <i>Ronghui Frang, ETH Technical Chem. Lab., Zurich, Switzerland</i> <i>A. Whittaker, University of Queensland, Australia</i>	

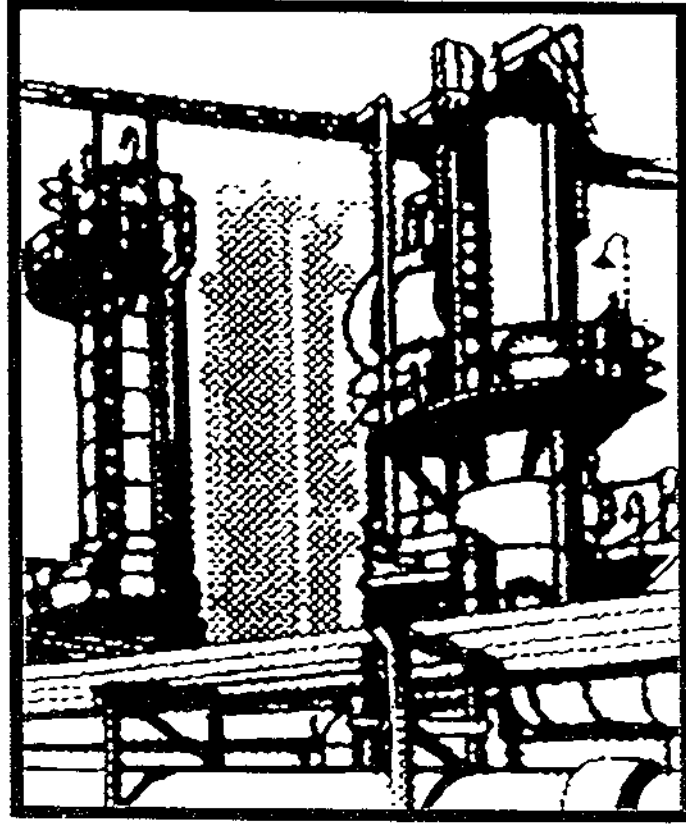
31.	Sustainable Ni/Ca _{1-x} Sr _x TiO ₃ Catalyst Prepare In Situ for the Partial Oxidation of Methane to Synthesis Gas.....	337
	<i>K. Takehira, T. Hayakawa, K. Suzuki, H. Yasuda, S. Hamakawa, and M. Shimizu</i> <i>National Institute of Materials and Chemical Research, Ibaraki, Japan</i>	
32.	Ethanol Synthesis from Carbon Dioxide on TiO ₂ -supported [Rh ₁₀ Se] Catalyst.....	347
	<i>Ken-ichi Aika, Hiroshi Kurakata, and Yasuo Izumi</i> <i>Tokyo Institute of Technology, Yokohama, Japan</i>	
33.	PYROCAT Steamcracking in Coated Radiant Coils.....	353
	<i>M. Wyrostek and M. Rupp, Veba Oel AG, Gelsenkirchen, Germany, and D. Kaufmann and H. Zimmermann, Linde AG, Munich, Germany</i>	
34.	Oxidative Dehydrogenation of Ethane Over Layered Metal Halide Oxide Catalysts.....	371
	<i>Wataru Ueda and Sui-Wen Lin</i> <i>Tokyo Institute of Technology, Yokohama, Japan</i>	
35.	Alkylbenzenes: The Enichem Route to Isopropylbenzene.....	377
	<i>O. Cappellazzo</i> <i>EniChem, Italy</i>	
36.	Measurement and Control of Rhodium Hydrido Carbonyl Phosphine Catalyst Loss in Homogeneous Hydroformylation of Olefin Alcohols with Syngas.....	395
	<i>Gary D. Martinie and Tamal K. Dutta</i> <i>Saudi Aramco, Dhahran, Saudi Arabia</i>	
	List of Participants and Workshop Program.....	410

الندوة السنوية السابعة

العمليات الحفزية في تكرير البترول والبتروكيماويات

7th Annual Symposium

CATALYSTS IN PETROLEUM REFINING & PETROCHEMICALS



٣٠ رجب - ٢ شعبان ١٤١٨ هـ

November 30 - December 2, 1997

RI Building 15 Auditorium (Level 4)
King Fahd University of Petroleum & Minerals, Dhahran



The Research Institute
King Fahd University of Petroleum & Minerals
Dhahran, Saudi Arabia

PEC

Petroleum Energy Center
Tokyo, Japan



Japan Petroleum Institute
Tokyo, Japan

7-

CATALYSTS IN PETROLEUM REFINING AND PETROCHEMICALS

November 30-December 2, 1997, KFUPM-Research Institute, Dhahran, Saudi Arabia

Day One: Sunday November 30, 1997

07:15 Registration

07:30 Welcome and Opening Remarks:

H.E. Dr. Abdulaziz A. Al-Dukhayil, Rector of KFUPM

Mr. Miyoshi Ishikawa, President, Japan Petroleum Institute

Session 1: Fluid Catalytic Cracking

Chairman: Dr. Abdulaziz U. Al-Ka'abi

08:00 1. FCC unit optimization using the MagnaCat process

B. Bussey, The M.W. Kellogg Technology Company, USA

08:30 2. Catalytic Options to optimize/debottleneck FCC units for enhanced profitability

J. Witzler, Grace Davison, Europe

09:00 3. Catalytic cracking for producing light olefins from heavy oils

Y. Fujiyama, Nippon Oil Company, Japan

09:30 *Coffee Break*

10:00 4. Overview and feasibility of HS-FCC process

T. Ino, Research Institute, Petroleum Energy Center

10:30 5. Novel approaches in small scale FCC catalyst testing

B. Skocpol, Akzo Nobel, The Netherlands

11:00 6. Developments in FCC resid processing

W. Letzsch, Stone & Webster Engineering Corporation

Session 2: Catalytic Processing

Chairman: Dr. Kaoru Fujimoto

13:00 7. Improvements in FCC gasoline desulfurization via catalytic distillation

K. Rock, CDTECH, USA

13:30 8. Mobil Isomerization dewaxing-flexibility in distillate processing

D. Pappal, Mobil Technology Company, USA

14:00 9. Catalyst design and performance

G. Antos, UOP, USA

14:30 *Prayer and Coffee Break*

14:50 10. The development of catalyst dense loading system

S. Okubo, Japan Energy Corporation, Japan

15:20 11. Optimum regeneration of coked-naphtha reforming catalysts in the presence of sulfur

J. Beltramini, Chemical Engineering Dept., KFUPM

15:50 12. Influence of operating parameters on the performance of Pt-Re catalysts

S. A. Ali, KFUPM-Research Institute

Day Two: Monday December 1, 1997

Session 3: Hydrotreating

Chairman: Dr. Abdallah A. Shaikh

07:45 13. HDS over HZSM-5 zeolite supported noble metal catalysts

M. Sugioka, Muroran Institute of Technology, Japan

08:15 14. Desulfurization of distillate fuels

G.D. Martinie, Saudi Aramco, Dhahran

08:45 15. Heavy cut hydrotreating catalysts and technologies

J.C. Plumail, Procatalyse, France

09:15 16. Characterization of spent HDS catalysts used in bench plants

T. Saito, Petroleum Energy Center, Japan

09:45 *Coffee Break*

10:00 17. Effect of sulfiding agent on HDS activity

C. Brun, Elf Atochem, France

CATALYSTS IN PETROLEUM REFINING AND PETROCHEMICALS

November 30-December 2, 1997, KFUPM-Research Institute, Dhahran, Saudi Arabia

Day Two Session 3 Continued

- 10:30 18. Development and commercial operation of diesel oil deep HDS process
K. Nakai, Idemitsu Engineering Company, Japan
- 11:00 19. Development of catalyst and process for deep desulfurization and aromaticsaturation of LCO.
O. Nonaka, Showa Shell Sekiyu K. K. Japan

Session 4: Hydrocracking

Chairman: Mr. Abdullah O. Al-Buiz

- 13:00 20. Development of heavy oil hydrocracking catalysts: evaluation of CoMo catalysts
Shakeel Ahmed, KFUPM-RI
- 13:30 21. Heavy oil upgrading by oil-soluble metal compounds as catalyst precursor
Y. Nakatsuka, Petroleum Energy Center, Japan
- 14:00 22. Selective production of middle distillates from heavy oil by new cracking process
K. Fujimoto, The University of Tokyo, Japan
- 14:30 *Prayer and Coffee Break*
- 14:50 23. Development of Shell resid hydroprocessing moving bed technology and catalysts
M. van Koten, Shell International Oil Products B.V., The Netherlands
- 15:20 24. Development of heavy oil hydrocracking catalysts: The use of clay minerals
E. Iwamatsu, KFUPM-RI and Petroleum Energy Center
- 15:50 25. Hydroprocessing catalysts for hydrocracking applications
E. Brevoord, Akzo Nobel Chemicals, The Netherlands

Day Three: Tuesday December 2, 1997

Session 5: Improved Catalytic Processes

Chairman: Dr. Masatoshi Sugioka

- 08:00 26. Part 1: Low temperature hydrocracking of hydrocarbons on Ni-supported catalysts
Part 2: Outlook for low temperature activation of alkanes
V. Akhmedov, KACST, Saudi Arabia
- 08:45 27. A molecular approach to Co-Mo binary sulfide catalysis
Y. Okamoto, Shimane University, Japan
- 09:15 28. Integrated etherification system for better gasolines
R. Trotta, Samprogetti, Italy
- 09:45 *Coffee Break*
- 10:00 29. Minimum energy plant design by pinch technology
T. Koyama, JGC Corporation, Japan
- 10:30 30. New process for the generation of hydrogen from vacuum residual oil
H. Takaoka, Cosmo Research Institute, Japan
- 11:00 31. Hydrogen effect on sintering of Ni catalysts for steam methane reforming
T. Numaguchi, Toyo Engineering Corporation, Japan

Session 6: Paraffins Utilization

Chairman: Dr. Halim Hamid

- 13:00 32. Continuous adsorptive separation technology
Y. Yokota, Chiyoda Corporation, Japan
- 13:30 33. Pore size regulated ZSM-5 zeolite for the synthesis of para-dialkyl benzenes
Y. S. Bhat, SABIC, Riyadh
- 14:00 34. Preparation of the Cu/ZnO methanol synthesis catalysts by coprecipitation method
S. Fujita, Hokkaido University, Japan
- 14:30 *Prayer and Coffee Break*
- 14:50 35. N-Butane skeletal isomerization over a new super acid
S. Kamiyama, General Sekiyu K.K., Japan
- 15:20 36. Modification of highly dispersed Co catalysts from cobalt acetate with transition metals and application to CO hydrogenation
Y. Sugi, Gifu University, Japan
- 15:50 *Concluding Remarks*
A. Al-Ka'abi, KFUPM Research Institute

العمليات الحفزية في تكرير البترول والبتروكيماويات

Catalysts in Petroleum Refining and Petrochemicals

8th Annual Saudi-Japanese Symposium
King Fahd University of Petroleum and Minerals
Research Institute, Dhahran, Saudi Arabia

November 29-30, 1998



The Research Institute
King Fahd University of Petroleum & Minerals
Dhahran, Saudi Arabia

PEC

Petroleum Energy Center
Tokyo, Japan



Japan Petroleum Institute
Tokyo, Japan

- 8 -

PROGRAM

Day One: Sunday November 29, 1998

Opening Remarks

Chairman: Dr. Abdulaziz Al-Ka abi

- 07:40 Welcome and Opening Remarks:
H.E. Dr. Abdulaziz A. Al-Dukhayyil, Rector of KFUPM
Dr. Noboru Sonoda, President, The Japan Petroleum Institute
- 08:00 An Overview of Applied Research Activities at KFUPM
Dr. Saleh A. Bakhrebah, Vice Rector for Applied Research
-

Session 1: Cracking Processes

Chairman: Dr. Abdallah Shaikh

- 8:15 1. Influence of reactor type, feed preheat, time on stream and severity effects on the performance of FCC catalysts, *Mr. Dieter Wallenstein, Grace, Germany*
- 8:45 2. The status of the development of new short contact time catalytic cracking technology, *Mr. Juha Jakkula, Neste Oy, Finland*
- 9:15 3. High severity FCC process using a down-flow reactor, *Dr. Satoru Ikeda, Petroleum Energy Center (PEC) and KFUPM-RI*
- 9:45 *Coffee Break*
- 10:00 4. Catalytic activity of mesoporous molecular sieves MCM-41 as solid acid catalysts, *Dr. Seitaro Namba, Teikyo University of Science and Technology*
- 10:30 5. Cracking technologies for petrochemicals, *Mr. Warren Letzsch, Stone and Webster Technology Corporation, USA*
- 11:00 6. Decomposition of hydrocarbons (C₃-C₈) over NaHY zeolites, *Dr. Susumu Tsuchiya, Yamaguchi University, Japan*
-

Session 2: Hydroprocessing

Chairman: Dr. Makoto Misono

- 13:00 7. Results of catalytic hydrocracking of vacuum residue in the autoclave, *Mr. Masaki Abe, Petroleum Energy Center, Japan*
- 13:30 8. Predicting the stability of maximum distillate hydrocracking catalyst from feedstock analysis, *Dr. George Antos, UOP, USA*
- 14:00 9. TiO₂-coated on Al₂O₃ support prepared by CVD method for HDS catalysts, *Dr. Koichi Segawa, Sophia University, Japan*
- 14:30 *Prayer and Coffee Break*
- 14:50 10. Selective preparation of higher active HDS catalysts by controlling chemical states, *Mr. Kei Uchikawa, Idemitsu Kosan Company, Japan*
- 15:20 11. Thiophene hydrodesulfurization over metal oxide loaded smectite clay minerals, *Dr. Muhammad Al-Saleh, KFUPM-RI and PEC*
- 15:50 12. Deactivation and XPS study of nitrated molybdena-alumina catalyst during the hydrodesulfurization (HDS) of dibenzothiophene, *Dr. Masatoshi Nagai, Tokyo University of Agriculture and Technology, Japan*
-

Day Two: Monday November 30, 1998

Session 3: Improved Catalyst & Processes

Chairman: Dr. Koichi Segawa

- 7:45 13. Results of characterization and activity tests of spent catalysts used for a long term in a bench scale unit, *Mr. Fumio Kumata, Petroleum Energy Center*
- 8:15 14. Performance optimization of atmospheric residue desulfurization units, *Mr. Abdul Karim Abbas, KNPC Mina Abdulla Refinery, Kuwait*
- 8:45 15. Development of Cosmo residual hydroconversion catalyst, *Mr. Yoshinori Kato, Cosmo Research Institute, Japan*
- 9:15 16. MAKFining MIDW Technology: Case study for EU diesel upgrading, *Mr. William Tracy, Mobil Technology Company, USA*
- 9:45 Coffee Break
- 10:00 17. Process for the hydrogenation of hydrocarbons in a continuous slurry reactor, *Dr. Rafael Espinoza, Sasol Technology Ltd, South Africa*
- 10:30 18. Alkylation of benzene by light gases (ethane or propane) using zeolite catalysts, *Mr. Shinjin Kobayashi, Mitsubishi Oil Company, Japan*
- 11:00 19. A novel family of solid acid catalysts: Substantially amorphous or partially crystalline zeolitic materials, *Dr. C. P. Nicolaidis, University of the Witwatersrand, South Africa*
-

Session 4: Paraffins Utilization

Chairman: Dr. Halim Hamid

- 13:00 20. Isomerization of light naphtha catalyzed by a solid superacid, *Dr. Teruaki Yamada, Japan Energy Corporation*
- 13:30 21. Technology for C₇ and C₈ aromatics production by transalkylation, *Mr. Toshio Waku, Nippon Oil Company, Japan*
- 14:00 22. Heteropoly catalysts for petroleum industry. Hydroisomerization of alkanes and synthesis of MTBE, *Dr. Makoto Misono, University of Tokyo*
- 14:30 Prayer and Coffee Break
- 14:30 23. Butane aromatization over Pt-Ge intermetallic compound supported on HZSM-5, *Dr. Tatsuaki Yashima, Tokyo Institute of Technology*
- 14:50 24. Direct making of syngas for C₁ chemistry by methane reforming, *Dr. Kaoru Fujimoto, The University of Tokyo*
- 15:50 25. The Chiyoda/UOP Acetica process for the production of acetic acid, *Mr. Takeshi Minami, Chiyoda Corporation, Japan*
- 16:20 Concluding Remarks
-

PROCEEDINGS

9th Annual Saudi-Japanese International Symposium

Catalysts in Petroleum Refining and Petrochemicals

King Fahd University of Petroleum and Minerals
The Research Institute, Dhahran 31261, Saudi Arabia

November 28-29, 1999

-9-

TABLE OF CONTENTS

Preface

Short contact time pilot plant testing for fluid catalytic cracking, Warren Letzsch, Stone and Webster Engineering Corporation, USA

Modeling and simulation of a downer-type FCC unit, Abdallah Shaikh, KFUPM-Chemical Engineering Department

Design of reactor and regenerator section of HS-FCC using cold flow model, Hajime Okazaki, Nisseki Mitsubishi Oil Corporation

FCC Developments to meet increasing propylene demand, Ting Chan, ABB Lummus Global, USA

GFS-2000: New FCC catalyst technology for gasoline sulfur reduction Sergio Sobrinos, Grace Davison, Germany

FCC catalyst additives for enhanced LPG production-recent Technology developments, Andrew Chambers, Intercat Inc.

Effect of catalyst-feedstock interactions on laboratory evaluation procedures of FCC catalysts, Iacovos Vasalos, University of Thessaloniki, Greece

New technology of RFCC catalyst, Takahisa Horie, Catalysts and Chemicals Industries Company

Breakthroughs in RFCC catalyst development, Tian Huiping, Research Institute of Petroleum Processing, Sinopec

New resid catalyst with high HDM activity and large metal uptake capacity further expands a catalyst life, Toru Saitoh, Japan Energy Corporation

R&D of active catalysts for resid upgrading process, Narinobu Kagami, Idemitsu Kosan Company

Stabilization of cracked oil-Development of new phenolic anti oxidants, Yasukazu Ohkatsu, Kogakuin University

Selective production of middle distillates from VGO by hydro-thermal cracking, Kaoru Fujimoto, The University of Tokyo

Acquisition of improved batch reactor data for hydrocracking catalyst development, Syed A. Ali, KFUPM-RI

Successful commercial hydrocracking catalysts-tools and methodologies, George Antos, UOP LLC

Aromatic hydrogenation of diesel fuel over noble metal catalysts, Takashi Fujikawa, Cosmo Research Institute

Hydrotreating catalyst technologies, Saad Akashah, Kuwait Catalyst Company

New reaction model and its simulation results for ultra-deep desulfurization, Shinichi Inoue, Chiyoda Corporation, Japan

Fitting the technology to the chemistry of future fuels, David Mc Namara, Criterion Catalyst Company

Transalkylation of benzene with C₉ aromatics over zeolite catalysts, Akihiko Matsouka, Showa Shell Sekiyu K.K.

Oligomerization of light olefins over solid acid catalysts under mild reaction conditions, Akio Tada, Kitami Institute of Technology

Partial oxidation of CH₄ into synthesis gas on Ni/perovskite catalysts prepared by SPC method, Katsuomi Takehira, Hiroshima University

Infrared study on the mechanism of hydrocarbon activation on zeolites, Kazunari Domen, Tokyo Institute of Technology

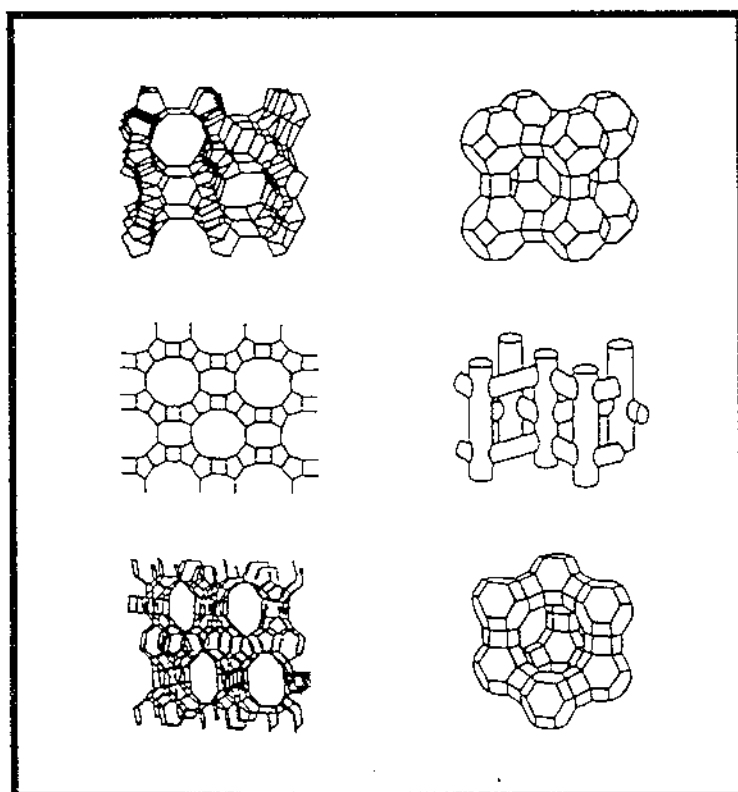
CO hydrogenation over zeolites loaded with MO₃S₄⁴⁺ clusters modified by solid-state reaction between zeolites and KCl, Takashi Tatsumi, Yokohama National University

The activity and selectivity of C₂-oxygenates in CO hydrogenation over rhodium catalysts, Yoshihiro Sugi, Gifu University

الندوة السنوية العاشرة

العمليات الحفزية في تكرير البترول والبتروكيماويات

10th Annual Symposium
**Catalysts in Petroleum
Refining & Petrochemicals**



٢٣ - ٢٤ شعبان ١٤٢١هـ

November 19-20, 2000

RI Building 15 Auditorium (Level 4)

King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia



The Research Institute
King Fahd University of Petroleum & Minerals
Dhahran, Saudi Arabia

PEC

Petroleum Energy Center
Tokyo, Japan



Japan Petroleum Institute
Tokyo, Japan

- 10 -

Catalysts in Petroleum Refining & Petrochemicals

10th Saudi-Japanese Annual Symposium

King Fahd University of Petroleum and Minerals-KFUPM

The Research Institute, Dhahran, Saudi Arabia; 19-20 November 2000

Day One: Sunday November 19, 2000

Opening Remarks

Chairman: Dr. Muhammad A. Al Saleh

- 7:30 **Registration**
- 8:00 **Welcome and Opening Remarks**
H.E. Dr. Abdulaziz A. Al-Dukhayil, Rector of KFUPM
Dr. Kaoru Fujimoto, Director, The Japan Petroleum Institute, JPI
- 8:15 **An Overview of Applied Research at KFUPM**
Dr. Saleh A. Bakhrebah, Vice Rector for Applied Research

Session I: Hydroprocessing

Chairman: Dr. Mohammed Abul-Hamayel

- 8:30 1. **Commercial Experience with Improved Hydrocracking Catalysts**
Mr. Gert Meijburg, Akzo Nobel (The Netherlands)
- 9:00 2. **Study of Hydrogen Spillover Effects on Bi-Noble Metal Modified Co-Clay Catalysts for Heavy Oil Upgrading**, Dr. Mazen Shalabi, KFUPM Chemical Engineering
- 9:30 3. **Expert Services for Optimal Catalyst Performance**
Mr. Francis Valeri, Eurecat SA, France and Al-Bilad Catalyst Company (Saudi Arabia)
- 10:00 *Coffee Break*
- 10:30 4. **Fuel Conditioning for Fuel Cells**
Dr. Bashir Dabbousi, Saudi Arabian Oil Company (Saudi Aramco)
- 11:00 5. **Development of Technology for Stability Improvement of Fuel Oil by Low Temperature Hydrotreating**, Dr. Hideshi Iki, Nippon Mitsubishi Oil (Japan)

Session II: Residue Processing

Chairman: Dr. Sachio Asaoka

- 13:15 6. **Technology Development of Hydrogen Transfer Cracking of Residue**
Dr. Kaoru Fujimoto, The University of Tokyo (Japan)
- 13:45 7. **Hydrotreating Technology for Residue in Fixed Bed**
Mr. Gang Wang, Fushun RIPP, Sinopec (China)
- 14:15 8. **Development of Preprocessing Technology for Vacuum Residue**
Mr. Hiroshi Mizutani, Cosmo Research Institute (Japan)
- 14:45 *Prayer and Coffee Break*
- 15:00 9. **Development of Zeolite Based Catalyst for Resid Hydrocracking**
Mr. Toshihiko Masuda, Japan Petroleum Energy Center (JPEC)
- 15:30 10. **Synthesis, Characterization and Activity of Zeolite Based Hydrocracking Catalysts**
Dr. Azfar Hassan, KFUPM-RI
- 16:00 11. **Development of RFCC Catalyst**
Dr. Toshio Itoh, Idemitsu Kosan Company (Japan)

Catalysts in Petroleum Refining & Petrochemicals

10th Saudi-Japanese Annual Symposium

King Fahd University of Petroleum and Minerals-KFUPM

The Research Institute Dhahran, Saudi Arabia; 19-20 November 2000

Day Two: Monday November 20, 2000

Session III: FCC and Reforming

Chairman: Dr. Bashir Dabbousi

- 8:00 12. **Development of Dimethyl Ether Synthesis Technology and its Diesel Engine Test**
Dr. Yotaro Ohno, NKK Corporation (Japan)
- 8:30 13. **Gasoline Quality Attainment with Dual Catalyst System and Integrated Reactive Distillation**, Mr. Quentin Debuisschert, Institut Francais du Petrole-IFP (France)
- 9:00 14. **Sulfur Tolerant Noble Metal Catalysts for Reformulating Diesel Oils**
Dr. Yuji Yoshimura, National Institute of Materials & Chemical Research (Japan)
- 9:30 *Coffee Break*
- 10:00 15. **Maximize Use of Existing Assets through Advances in Reforming Catalysts**
Mr. Rajeev Gautam, UOP LLC (USA)
- 10:30 16. **HS-FCC Process for Maximized Propylene Production**
Mr. Abdulgader Maghrabi, KFUPM-RI
- 11:00 17. **High Active Steam Reforming Catalysts for Hydrogen and Syngas Production**
Mr. Fumitake Watanabe, Toyo Engineering Corporation (Japan)

Session IV: Petrochemicals

Chairman: Dr. Kaoru Fujimoto

- 13:15 18. **An Improved Process for Catalytic Dehydrogenation of Propane to Propylene**
Dr. Erling Rytter, Statoil (Norway)
- 13:45 19. **Propane Oxidative Dehydrogenation on Binary Metal Oxides Catalysts**
Mr. B. Y. Jibril, King Saud University
- 14:15 20. **Activation of Light Hydrocarbons through Oxidation Processes**
Dr. Khaled Karim, Saudi Basic Industries Corporation (Sabic)
- 14:45 *Prayer and Coffee Break*
- 15:00 21. **n-Butane Oxidation to Maleic Anhydride over Vanadyl Phosphate Catalyst**
Dr. Y. S. Bhat, Saudi Basic Industries Corporation (Sabic)
- 15:30 22. **Design of Solid Acid Catalysts for Hydrothermal Reaction**
Dr. Sachio Asaoka, Chiyoda Corporation (Japan)
- 16:00 23. **Advances in Catalytic Epoxidation Technology**
Dr. G. D. Martinie, Saudi Arabian Oil Company (Saudi Aramco)
- 16:30 **Closing Remarks-Symposium Ends**, Dr. Halim Hamid, KFUPM-RI

PS: Each presentation includes 5-minute Q&A

Last Revised November 11, 2000

Center for Refining and Petrochemicals

PROCEEDINGS

11th Annual Saudi-Japanese Symposium on
**CATALYSTS IN PETROLEUM REFINING AND
PETROCHEMICALS**

Sha'ban 26-1422 H
November 11-12, 2001 G

- 11 -

11th Saudi-Japanese Annual Symposium
Catalysts in Petroleum Refining & Petrochemicals
King Fahd University of Petroleum & Minerals, Research Institute, Dhahran, Saudi Arabia

Day One: Sunday, November 11, 2001 (Shaaban 26, 1422)

Opening Remarks **Chairman: Dr. Muhammad A. Al Saleh**

- 7:30 Registration
- 8:00 Welcome and Opening Remarks
H.E. Dr. Abdulaziz A. Al-Dukhayyil, Rector of KFUPM
Dr. Takashi Tatsumi, Professor, Yokohama National University, Japan
- 8:25 Overview of Applied Research at KFUPM
Dr. Saleh A. Bakhrebah, Vice Rector for Applied Research

Session 1: Refining Catalysis (HC) **Chairman: Dr. Takashi Tatsumi**

- 8:45 1. Optimizing Study of Atmospheric Residue HDS Process
Hamad Al-Adwani, Kuwait University
- 9:15 2. Designing of Catalytic Reaction and Catalyst for Heavy Oil HT/HDS
Sachio Asaoka, The University of Kitakyushu, Japan.
- 9:45 3. Upgrade Light Cycle Oil to Premium Quality Diesel Fuel
Marius Vaarkamp, Engelhard Corporation, USA
- 10:15 *Coffee Break*
- 10:45 4. Spent Catalysts: KCC Efforts for Long Term Resolution of Potential Hazard
Saad Akashah, Kuwait Catalyst Company-KCC
- 11:15 5. Successful Commercial Hydrocracking Catalysts: Scale-up and Production of Manufacturing Prototypes, *Mark G. Riley, UOP LLC, USA*
- 11:45 *Prayer and Lunch Break*

Session 2: Refining (FCC)/Petrochemicals **Chairman: Dr. Mohammad B. Amin**

- 13:30 6. Decay Model for Catalytic Cracking of Cumene in a Novel Riser Simulator
Sulaiman Al-Khattaf, KFUPM Chemical Engineering Dept.
- 14:00 7. Catalyst Development for Paraffin Isomerization
Paul de Bruin, Akzo Nobel Catalysts, The Netherlands
- 14:30 8. Experimental Determination of FCC Deactivation Constant
Abdulbari Siddiqui, KFUPM-Research Institute
- 15:00 *Prayer and Coffee Break*
End of day one

