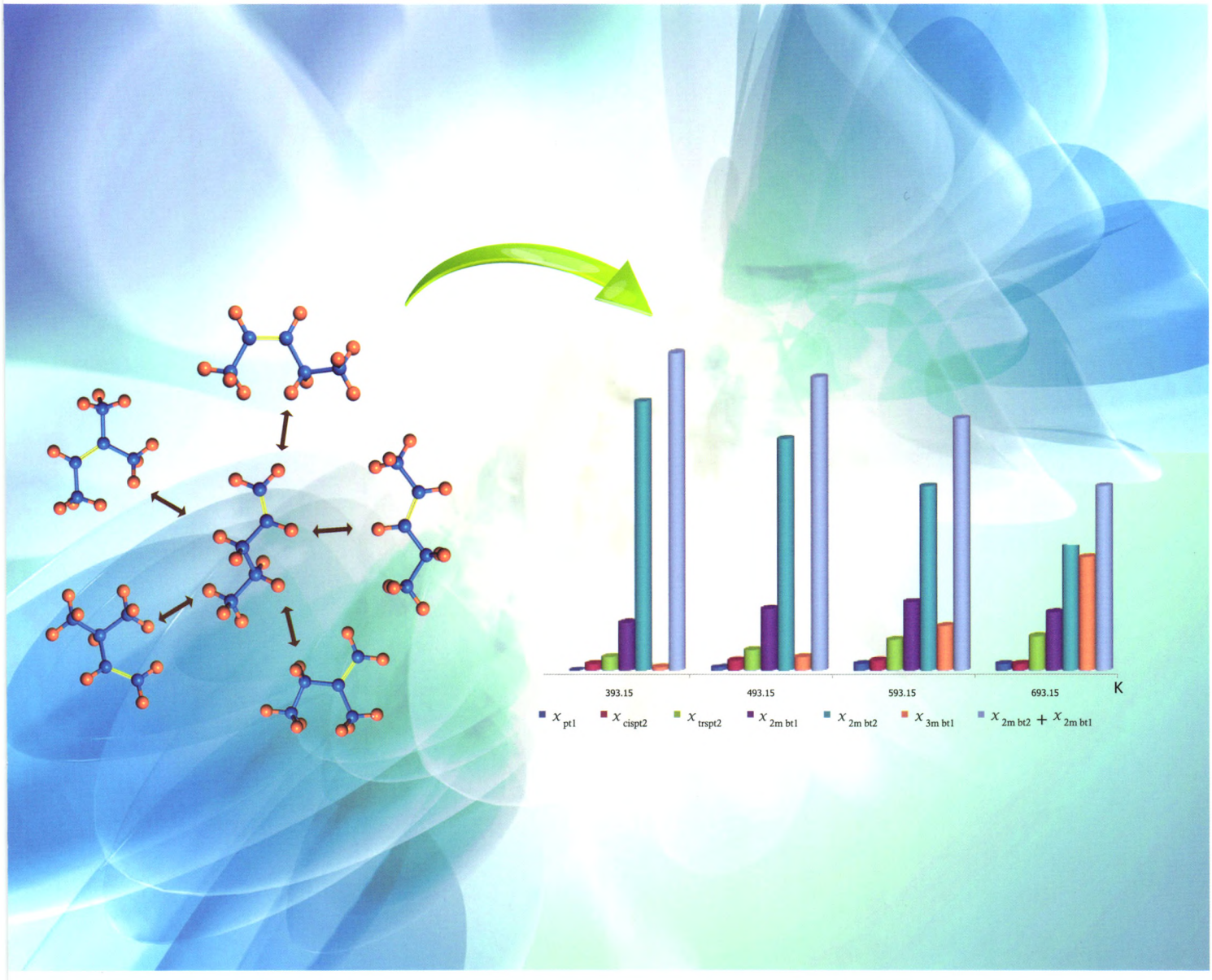
中文核心期刊 Ei核心期刊
本刊被Ei Compendex,CA,AJ,CBST,Scopus等
国际重要检索数据库收录

ISSN 1001-8719
CN 11-2129/TE
CODEN SXSHEY

石油学报(石油加工)

ACTA PETROLEI SINICA
(PETROLEUM PROCESSING SECTION)



ISSN 1001-8719
9 771001 871135 12>
万方数据

中国石油学会主办
石油化工科学研究院 承办

2013
6
Vol.29

石 油 学 报

（石油加工）

第 29 卷 第 6 期 2013 年 12 月（卷终）

目 次

* 封面文章

期刊基本参数：CN11－2129/TE * 1985 * b * A4 * 188 * zh＋en * P * ￥20.00 * 1500 * 27 * 2013－12 **本期责任编辑**：杨华英

ACTA PETROLEI SINICA

(PETROLEUM PROCESSING SECTION)

Vol. 29 No. 6 Dec. 2013

CONTENTS

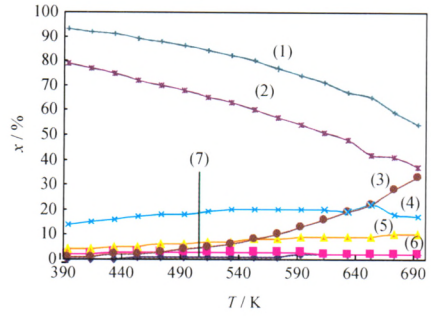
Research Articles

Acta Petrolei Sinica (Petroleum Processing Section), 2013, 29(6): 929-935 **doi**: 10.3969/j.issn.1001-8719.2013.06.001

Thermodynamic Analysis of 1-Pentene Skeletal Isomerization Reaction

LI Jinzhi LONG Jun ZHAO Yi YU Zhongwei

1-Pentene skeletal isomerization to 2-methyl-1-butene and 2-methyl-2-butene are exothermic reactions, and the equilibrium compositions of 2-methyl-1-butene and 2-methyl-2-butene decreased with the increase of temperature. Therefore, the reaction temperature of skeletal isomerization should be kept lower.



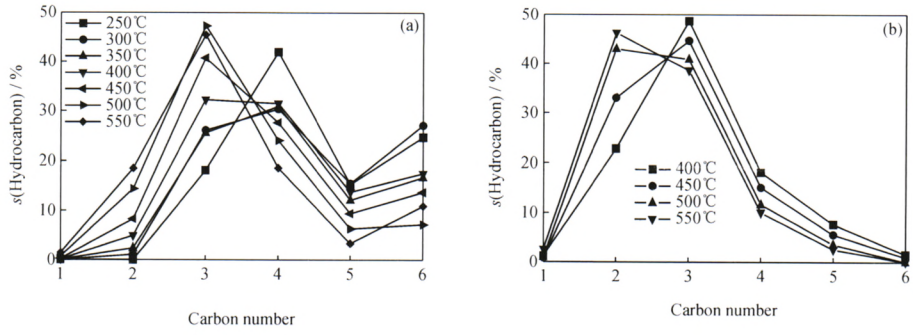
(1) 2 mbt1+2 mbt2; (2) 2 mbt2; (3) 3 mbt1; (4) 2 mbt1; (5) trspt2; (6) cispt2; (7) pt1

Acta Petrolei Sinica (Petroleum Processing Section), 2013, 29(6): 936-944 **doi**: 10.3969/j.issn.1001-8719.2013.06.002

Effect of Molecular Sieves on Hydrocarbon Selectivity in Methanol to Olefin Reaction

SONG Shouqiang LI Minggang LI Lisheng WANG Dianzhong ZHANG Fengmei SHU Xingtian

ZSM-5 and SAPO-34 molecular sieves were the suitable shape-selective catalysts for MTP and MTO processes, respectively. Pore structure and pore size of molecular sieves determined hydrocarbon selectivity in methanol conversion product due to shape-selective effects, for example, majority of hydrocarbon product was C_3 with ZSM-5 of 10-ring opening as catalyst above 400℃ and those were C_3, C_2 with SAPO-34 of 8-ring opening as catalyst. Meanwhile, carbon number of majority of hydrocarbon product decreased with the reaction temperature rising.



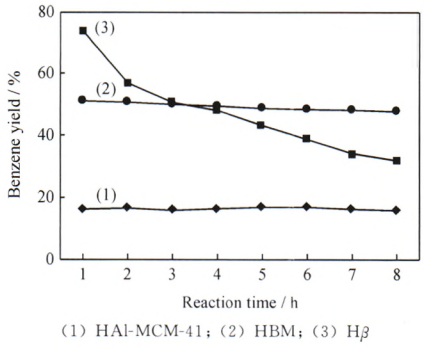
(a) ZSM-5; (b) SAPO-34

Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 945-951 **doi**: 10.3969/j.issn.1001-8719.2013.06.003

Synthesis of Mesoporous Aluminosilicate Molecular Sieves by Assembling β Zeolite Subunits

WANG Linying LI Xiang ZHOU Feng WANG Yao WANG Anjie HU Yongkang

Mesoporous aluminosilicate molecular sieves (BM) were hydrothermally synthesized by assembling zeolite subunits, which were generated by controllable desilication of β zeolite in a Na_2SiO_3 aqueous solution, in the presence of cetyltrimethylammonium bromide. Compared with conventional Al-MCM-41, BM exhibited improved hydrothermal stability. The proton-exchanged HBM possessed much stronger acidity than HAl-MCM-41, and showed superior catalytic performance in cumene cracking.



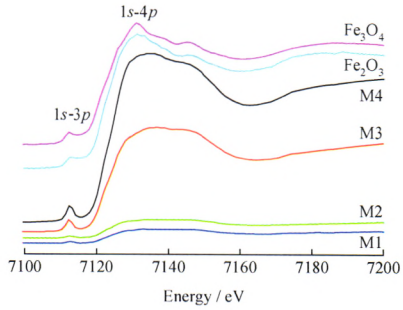
(1) HAl-MCM-41; (2) HBM; (3) Hβ

Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 952-958 **doi**: 10.3969/j.issn.1001-8719.2013.06.004

Synthesis of Fe-MFI Mesoporous Zeolites in Metal Complex and TBABr Co-Templates System

LI Yuping ZHOU Sheng YANG Donghua LI Xiaofeng PAN Ruili DOU Tao

Fe-MFI mesoporous zeolites were synthesized with metal complex and TBABr as co-templates. The products showed improved selectivity for C_2H_4 and C_3H_6 and catalytic stability in MTO reaction, which might be attributed to the adjustment of the acidity and pore structure of Fe-MFI zeolites and the reduction of diffusion resistance in the presence of mesopores.

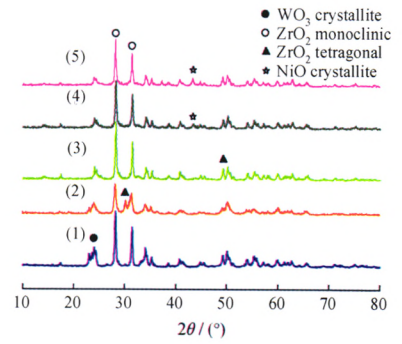


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 959-965 **doi**: 10.3969/j.issn.1001-8719.2013.06.005

Preparation of Ni-WO_3/ZrO_2 Solid Acid Catalyst and Its Catalytic Performance for *n*-Heptane Hydroisomerization

SUO Yanhua LI Yan CHEN Gang WANG Yingjun

A series of Ni-WO_3/ZrO_2 catalysts were prepared by the impregnation method and used as the catalyst for *n*-heptane isomerization. Their crystal structure and acidity were determined by XRD, BET and NH_3-TPD. The results showed that the conversion of *n*-heptane isomerization and selectivity to *i*-heptane could reach 39.96% and 94.79%, respectively.



$w(WO_3)=15\%$

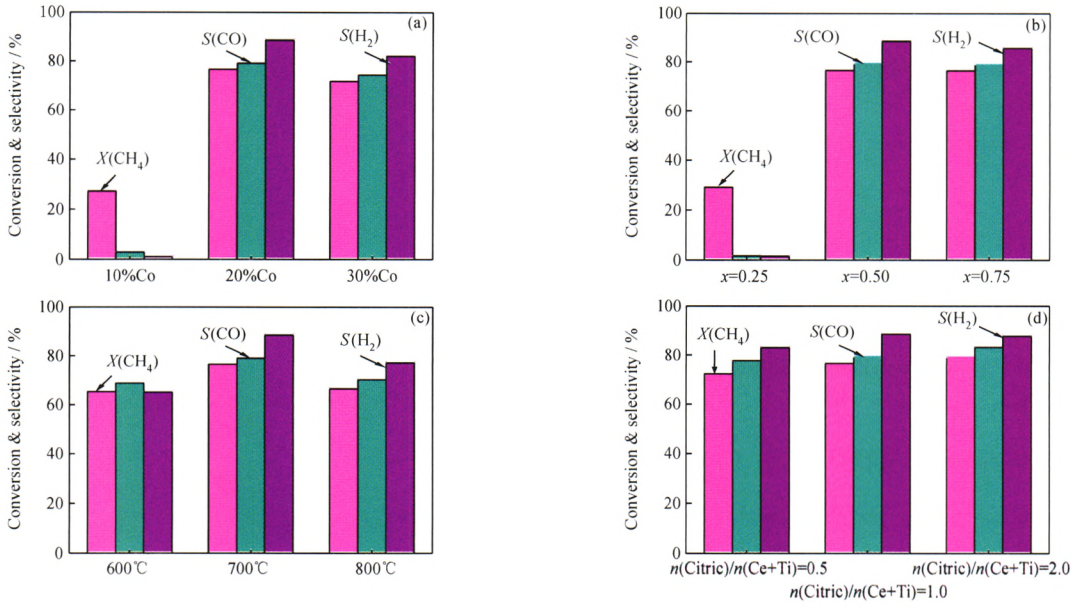
w(Ni)/%: (1) 0; (2) 5; (3) 10; (4) 15; (5) 20

Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 966-974 **doi**: 10.3969/j.issn.1001-8719.2013.06.006

Preparation of $Co/Ce_xTi_{1-x}O_2$ Catalysts and Their Catalytic Performance in Partial Oxidation of Methane

YU Changlin ZHOU Xiaochun HU Jiubiao XIANG Bin CHEN Jianchai WEI Longfu

The formation of ceria-titania solid solution leads to the high performance of supported Co catalyst *m* $Co/Ce_xTi_{1-x}O_2$-*T*-*y* in the catalytic partial oxidation of methane(POM). The results showed that the catalyst $20Co/Ce_{0.5}Ti_{0.5}O_2$-700-1with Co loading of 20%, the citric/(Ce+Ti) molar ratio of 1 and the support calcination temperature of 700℃ exhibited the excellent catalytic performance in POM under the reaction temperature of 750℃ and $n(CH_4)/n(O_2)=2$.

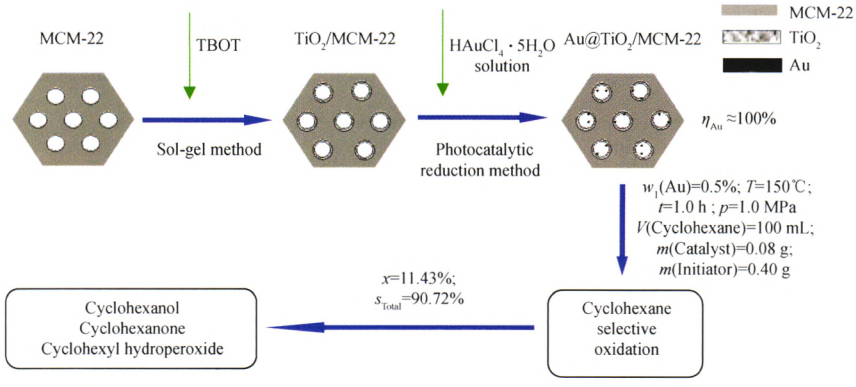


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 975-983 **doi**: 10.3969/j.issn.1001-8719.2013.06.007

Preparation of Au Nanoparticles Catalyst $Au@TiO_2/MCM-22$ and Its Catalytic Performance for Cyclohexane Selective Oxidation

LI Lin ZHOU Jicheng XIE Zhibo OUYANG Wenbing

Au nanoparticles catalyst $Au@TiO_2/MCM-22$ was prepared by photocatalytic direct reduction method. The Au loading efficiency of this catalyst can reach 100%. The conversion of cyclohexane selective oxidation catalyzed by $Au@TiO_2/MCM-22$ was 11.43% with total desired product selectivity of 90.72%.

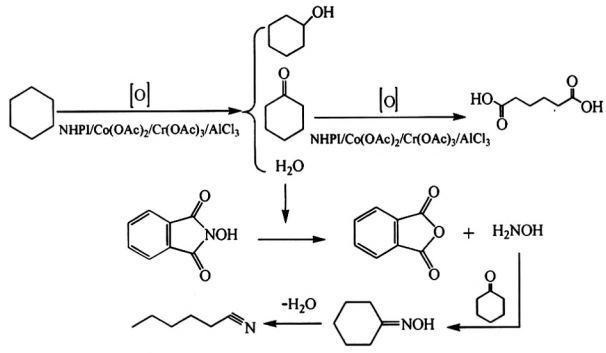


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 984-990 **doi**: 10.3969/j.issn.1001-8719.2013.06.008

Highly Efficient Catalytic System for Cyclohexanone Synthesis by Cyclohexane Oxidation With Oxygen

JIANG Xiaoli SHAN Yuhua WU Lijun LU Mohong LI Mingshi

With *N*-hydroxyphthalimide(NHPI) as catalyst, $Co(OAc)_2$, $Cr(OAc)_3$ and $AlCl_3$ as cocatalysts and acetonitrile as solvent cyclohexane oxidation by O_2 could be efficiently catalyzed. The suitable reaction conditions were $n(NHPI) : n(Co(OAc)_2) : n(Cr(OAc)_3) : n(AlCl_3)=10 : 3 : 1 : 1$, $n(NHPI) : n(CH_3CN) : n(C_6H_{12})=1 : 20 : 10$, 75℃, 1.0 MPa O_2, 6 h, under which 54.4% conversion of cyclohexane with 93.2% selectivity for cyclohexanone and 4.9% selectivity for cyclohexanol was obtained.

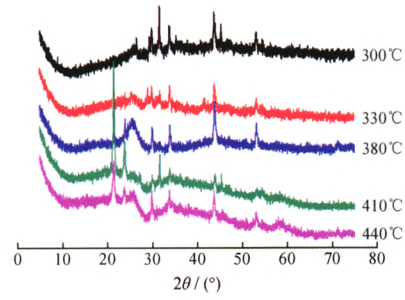


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 991-995 **doi**: 10.3969/j.issn.1001-8719.2013.06.009

Sulfurization of Complex Metal Catalyst for Slurry-Bed Hydrocracking of Residue

ZHANG Lei DENG Wenan LI Chuan

The oil-soluble complex metal catalyst dispersed in Venezuela No. 380 fuel oil was sulfurized under different curing conditions.

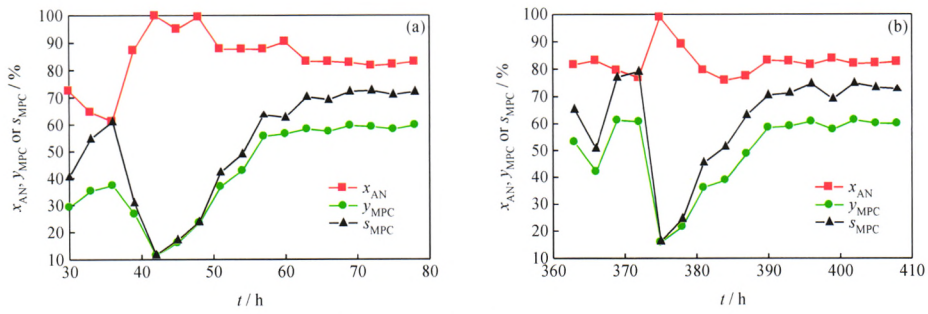


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 996-1002 **doi**: 10.3969/j.issn.1001-8719.2013.06.010

Synthesis of Methyl *N*-phenyl Carbamate From Aniline, Urea and Methanol by Catalytic Distillation

DOU Lingyun SUN Shuai LIANG Ning AN Hualiang WANG Guirong ZHAO Xinqiang WANG Yanji

The catalytic distillation was used in the synthesis of methyl *N*-phenyl carbamate from aniline, urea and methanol with γ-Al_2O_3 as a catalyst for the first time. The effects of operation conditions on this reaction and the stability of the catalyst were investigated. γ-Al_2O_3 still maintained the original catalytic activity after continuous operation for 408 h, which indicated that it had a satisfactory stability.



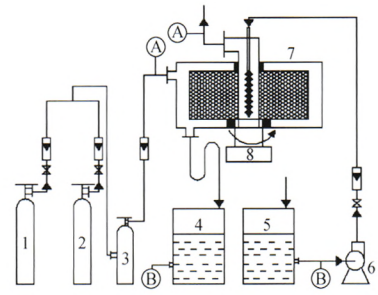
t /h: (a) 30—78; (b) 360—408

Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1003-1008 **doi**: 10.3969/j.issn.1001-8719.2013.06.011

H_2S Removal by Chelated Iron Method With Counter-Current Rotating Packed Bed

YU Yong LIU Youzhi QI Guisheng WANG Jianwei

H_2S removal with chelated iron was investigated in the counter-current rotating packed bed and cross-flow rotating packed bed. Experimental results indicated that counter-current rotating packed bed with the H_2S removal efficiency of more than 99% was more suitable to fine desulfurization for low-concentration H_2S compared with cross-flow rotating packed bed.



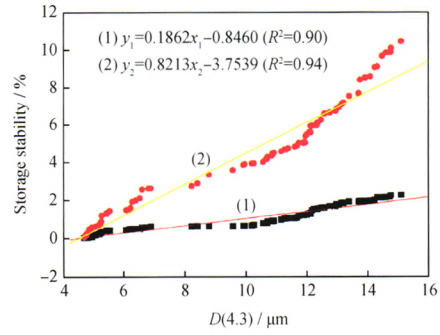
1—H_2S steel container; 2—N_2 steel container; 3—Feed gas buffer tank; 4—Sulfur-rich solution tank; 5—Sulfur-lean solution tank; 6—Pump; 7—Counter-current rotating packed bed; 8—Motor; A—Gas detection sampling point; B—Liquid detection sampling point

Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1009-1014 **doi**: 10.3969/j.issn.1001-8719.2013.06.012

Investigation on Storage Stability of SBS Modified Asphalt Emulsion

WANG Hong WANG Zijun WANG Cuihong SHE Yucheng

Volume average diameter of asphalt particles and emulsion viscosity of modified asphalt emulsion have positive correlations with the storage stability. So the storage stability of modified asphalt emulsion could be improved by adjusting the emulsification conditions according to the relationship between physical properties and storage stability.



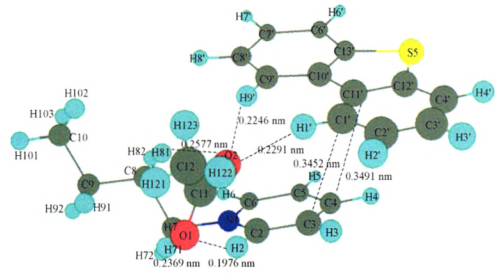
■ 1 d; ● 5 d; — 1 d Correlation curve; — 5 d Correlation curve
Gap=0.2 mm; n=3600 r/min; w(Modified asphalt)=65%; w(Soap)=35%

Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1015-1022 **doi**: 10.3969/j.issn.1001-8719.2013.06.013

Theoretical Study on Interactions Between Pyridinium-Based Ionic Liquids and Thiophenic Compounds

LÜ Renqing LIN Jin WANG Shutao

The interactions between thiophene (TS), benzothiophene (BT), dibenzothiophene (DBT), naphthalene (NAP) and *N*-butylpyridinium acetate ([BPY][Ac]) were investigated by density functional theory. The occurrence of hydrogen bonds, $\pi\cdots$H—C, $\pi\cdots\pi$ interactions between [BPY][Ac] and TS, BT, DBT, NAP was confirmed by NBO and AIM methods at the molecular level.

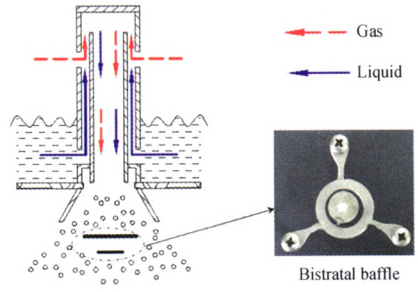


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1023-1029 **doi**: 10.3969/j.issn.1001-8719.2013.06.014

Hydrodynamic Performance of a Gas-Liquid Separated Flow Distributor

WANG Zhenyuan CHENG Zhenmin YU Kun

A novel gas-liquid separated flow distributor was designed to make liquid distributed uniformly. Besides, a kind of bistratal baffle was designed and installed under the distributor to help distributing the liquid uniformly.

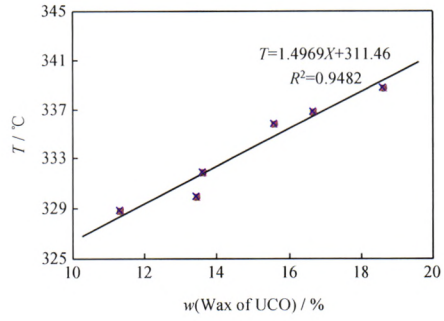


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1030-1034 **doi**: 10.3969/j.issn.1001-8719.2013.06.015

Relationship of Wax Mass Fraction in Hydrocracker Unconverted Oil and Hydroisomerization Dewaxing Reaction Temperature

LI Ming GONG Weiguo WANG Zeai HUANG Xiaozhu

Controlling main operating parameters of 400 kt/a hydroisomerization dewaxing unit and properties of main product base oil 150N almost the same, when the wax mass fraction in the hydrocracker unconverted oil increases by 1%, the hydroisomerization dewaxing reaction temperature should be increased by 1.5℃.

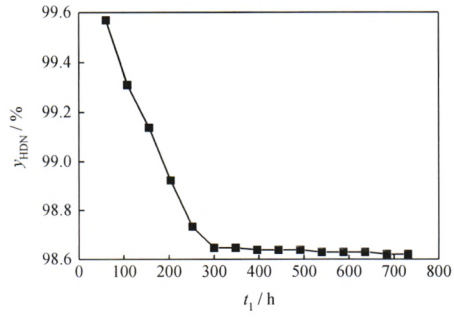


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1035-1039 **doi**: 10.3969/j.issn.1001-8719.2013.06.016

Kinetics of Coal Tar Hydrodenitrogenation

SUN Zhihui LI Dong LI Wenhong LI Zhen LEI Yuchen

The kinetic model of coal tar hydrodenitrogenation and the expression of catalyst deactivation function were established on the base of a large number of experimental data in a fixed-bed hydrogenation unit during the metaphase slow inactivation phase of a hydrodenitrogenation catalyst.

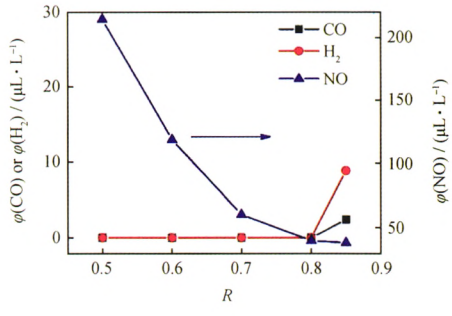


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1040-1046 **doi**: 10.3969/j.issn.1001-8719.2013.06.017

CFD Study on Air Staged Burner of Tube Furnace

LIU Bo WANG Shulei WANG Yuanhua ZHAO Huazhang GUAN Junling WANG Xianghong

An air staged burner with the variable secondary staged air volume rate R was studied by using the commercial software FLUENT. When R increased from 0.5 to 0.85, the furnace outlet temperature increased by 0.65% and the NO volume fraction in emission gas declined from 214.4 μL/L to 37.9 μL/L. Among the five experimental cases, R of 0.8 can be used as the optimized reference.

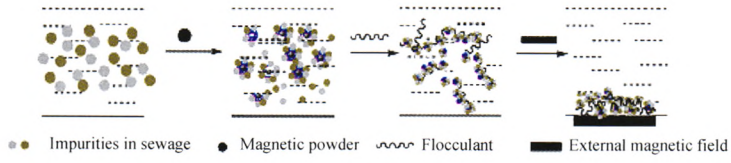


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1047-1053 **doi**: 10.3969/j.issn.1001-8719.2013.06.018

Coagulation-Supporting Effect and Mechanism of Fe_3O_4 Magnetic Nanoparticles

JIANG Cuiyu LI Liang WEI Qing SONG Linhua PENG Zhihua

Based on the properties such as small volume with large surface and strong magnetism, magnetic nanoparticles could adsorb suspended solids and emulsify drops strongly in wastewater. Combined with the effect of the conventional water treatment agents, the big and concrete magnetic composite flocs could be formed with a higher sedimentation rate.



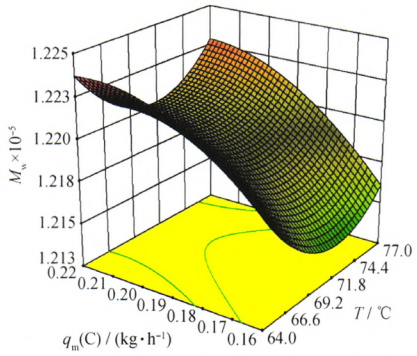
Research Notes

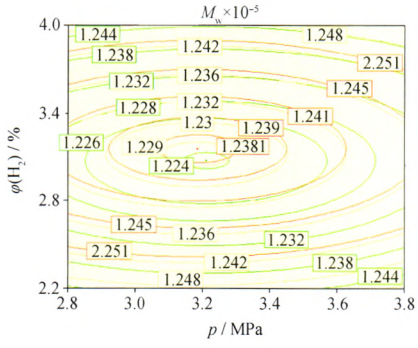
Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1054-1061 **doi**: 10.3969/j.issn.1001-8719.2013.06.019

Optimization and Simulation of Relative Molecular Mass of Polypropylene Produced in a Loop Reactor by Response Surface Methodology

SUI Shuhui HONG Dingyi HONG Dongfeng

On the basis of the process simulation for liquid phase bulk propylene polymerization in loop reactor by using Aspen Polymers Plus software, a five-factor, three-level Box-Behnken experimental design combined with response surface methodology(RSM) was employed to investigate the individual and interactive effects of temperature, pressure, mass flow of catalyst, mass flow of propylene, and H_2 volume fraction on M_w of PP. A quadratic model ($R^2=0.983$) for the prediction and optimization of M_w of PP was developed. The developed model can be used to predict the M_w of PP in industrial production.



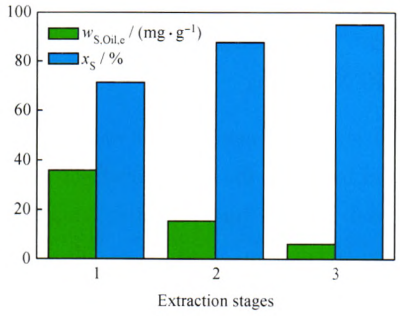


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1062-1066 **doi**: 10.3969/j.issn.1001-8719.2013.06.020

Desulfurization of Sulfones From Pre-oxidized Diesel by Extraction With Ionic Liquid [BMIM][BF_4]

HAN Xinghua LI Xiang WANG Anjie WANG Yao CHEN Yongying HU Yongkang

The sulfones of oxidized diesel were removed by extraction with ionic liquid [BMIM][BF_4]. The polarity of sulfones is larger than that of DBTs, thus the sulfones were easily extracted into ionic liquid phase. At extraction temperature of 30℃ and V_{IL}/V_{Oil} of 0.5, the sulfur mass fraction of the oxidized diesel was reduced from 125.1 μg/g to 6.2 μg/g by three-stage extraction and the desulfurization efficiency was about 95.0%.

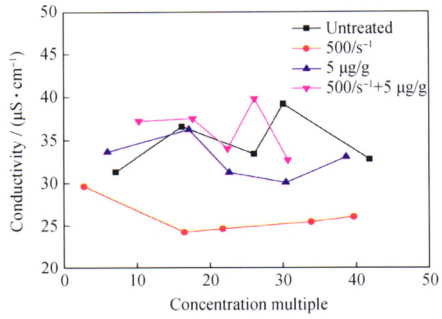


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1067-1071 **doi**: 10.3969/j.issn.1001-8719.2013.06.021

Effect of Non-Thermal Plasma Treatment of Viscous Oil Wastewater on Its Evaporation Recovery

ZOU Longsheng CHEN Dezhen ZHOU Weiguo ZHANG Yi

The effect of non-thermal plasma on water quality, and then elaborates impact of non-thermal plasma treatment on distilled water quality was studied. Figure shows that non-thermal plasma treatment can reduce the conductivity of distilled water effectively, improving the quality of distilled water, thus being beneficial to feed water for steam injection boiler.

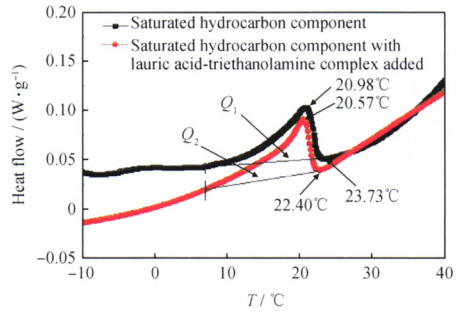


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1072-1077 **doi**: 10.3969/j.issn.1001-8719.2013.06.022

Small Molecule Flow Improvers for Heavy Oil and Their Interaction Mechanism

ZHANG Jie LI Xiaolong CHEN Gang

The effects of small molecule flow improver of fatty acid-amine complex on the pour point depression and viscosity decrease of heavy oil from Nanyang oil field were evaluated. The result indicated that this series of small molecule flow improver could depress the pour point of heavy oil with the highest pour point depression of 7℃, and could reduce the viscosity of heavy oil with the highest viscosity reduction rate of 57.1%.

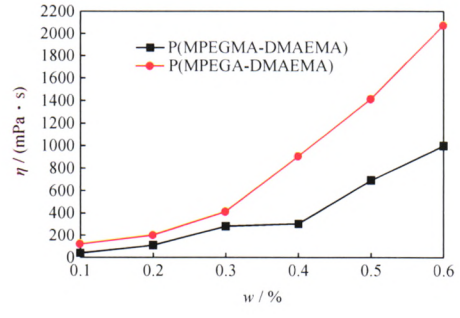


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1078-1082 **doi**: 10.3969/j.issn.1001-8719.2013.06.023

Synthesis and Performance Evaluation of Hydrophobic Association Copolymer P(MPEGA-DMAEMA)

WANG Jun ZHANG Na LI Cuiqin LI Haiyan ZHU Xiuyu

Hydrophobically associating copolymer P(MPEGA-DMAEMA) was synthesized by using *N*,*N*-dimethylaminoethyl methacrylate and methoxy polyethylene glycol acrylate as raw materials. Compared with the copolymer P(MPEGMA-DMAEMA), the relative molecular mass of P(MPEGA-DMAEMA) was bigger and its solution apparent viscosity was higher. P(MPEGA-DMAEMA) had better salt-resistant, and its aqueous solution presented pseudoplastic fluid character, and the solution apparent viscosity would rise under recovering shearing action. The apparent viscosity of the copolymer solution declined with the increase of mass fraction of sodium dodecyl sulfate.

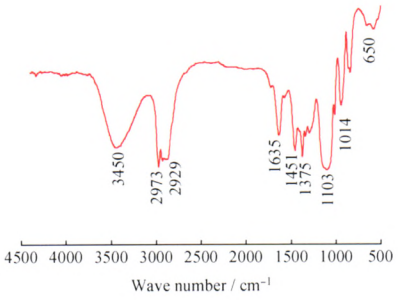


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1083-1089 **doi**: 10.3969/j.issn.1001-8719.2013.06.024

Synthesis and Evaluation of Demulsifier for Heavy Crude Electrical Desalting

LIU Yucheng XU Junzhong CHEN Mingyan LIU Zheng

WS demulsifiers used for electrical desalting of heavy crude oil were synthesized, and characterized by FT-IR. Experimental results indicated that the WS-5 demulsifier had the best demulsification effect for Tahe heavy crude oil among the WS series. By using WS-5 demulsifier the salt content of crude oil was 2.76 mg/L under the optional conditions of electrical desalting.

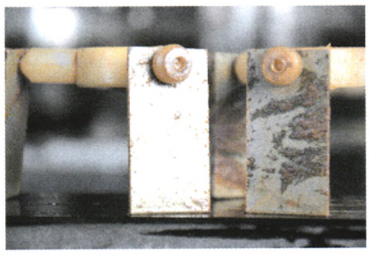


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1090-1095 **doi**: 10.3969/j.issn.1001-8719.2013.06.025

The Biological Enzyme Corrosion Inhibitors in the Circulating Water System With Diesel Leak

LU Xianhui LIU Fang LU Jinjin ZHONG Huiyun YANG Wei ZHANG Li

When the diesel dosage was 80 mg/L in circulating cooling water, the optimal compound program was 50 mg/L, 10 mg/L and 75 mg/L for lysozyme, lipase and laccase, respectively, the stable inhibition effect could be achieved. The contrast of carbon steel between blank and compound agents was shown in the photo below.



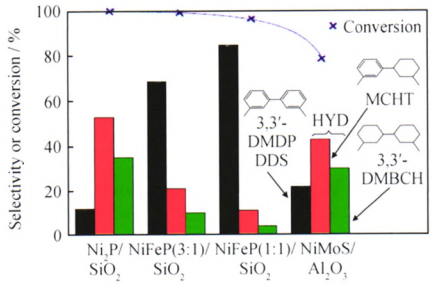
Reviews

Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1096-1108 **doi**: 10.3969/j.issn.1001-8719.2013.06.026

Advance in the Preparation and Modification on Nickel Phosphide Catalysts for Hydrodesulfurization

SONG Hua WANG Jian LI Feng LIU Yanxiu ZHANG Jiaojing SONG Hualin

Preparation methods of Ni_2P catalyst were introduced and compared. The recent progress in the modification on the aspects of active phase and support was reviewed.

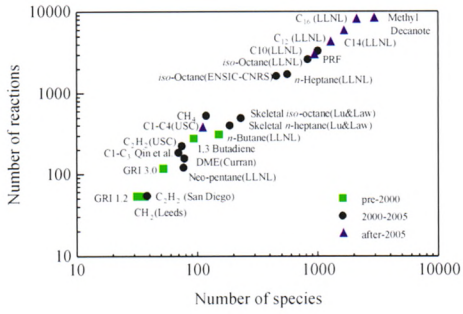


Acta Petrolei Sinica (*Petroleum Processing Section*), 2013, 29(6): 1109-1116 **doi**: 10.3969/j.issn.1001-8719.2013.06.027

Recent Status and Prospect of Research on Combustion Characteristics of Liquid Hydrocarbon Fuels

LI Bo ZHANG Hai

The current status of studies on the combustion characteristics of liquid hydrocarbon fuels were reviewed, and some comments on the future works were given. More high-pressure experiments and experiments on C_{12} above hydrocarbons, and developments of chemical kinetic mechanisms and reliable reduced mechanisms for the liquid hydrocarbons are suggested.



石油学报(石油加工)

SHIYOU XUEBAO (SHIYOU JIAGONG)

主 编 汪燮卿

双 月 刊

(1985 年 3 月创刊)

第 29 卷 第 6 期 2013 年 12 月 25 日

ACTA PETROLEI SINICA

(PETROLEUM PROCESSING SECTION)

Editor in Chief Wang Xieqing

Bimonthly

(Started in March 1985)

Vol. 29 No. 6 Dec. 25, 2013

主 管:中国科学技术协会

主 办:中国石油学会

编辑、出版:《石油学报(石油加工)》编辑部

地址:北京市学院路 18 号

邮编:100083

电话:010-62310752 或 010-82368282

传真:010-82368697

网址:www. syxbsyjg. com

E-mail:syxb8282. ripp@sinopec. com

或 syxb8282@163. com

执行主编:李才英

副 主 编:冯薇荪 胡晓春

印 刷:北京科信印刷有限公司

发 行:

国 内:北京市报刊发行局

国 外:中国国际图书贸易总公司

(中国国际书店)

北京市 399 信箱

国内订阅处:全国各地邮局

报刊登记证:(BJ)第 1404 号

Responsible Institution: China Association for Science and Technology

Sponsored by: China Petroleum Society

Edited and Published by: Editorial Office of Acta Petrolei Sinica

(Petroleum Processing Section)

Add: No. 18 Xueyuan Road, Beijing 100083, China

Tel: +86-010-62310752; +86-010-82368282

Fax: +86-010-82368697

Http://www. syxbsyjg. com

E-mail: syxb8282. ripp@sinopec. com;

syxb8282@163. com

Executive Chief Editor: Li Caiying

Deputy Editor in Chief: Feng Weisun Hu Xiaochun

Printed by: Beijing Kexin Printing Co., Ltd.

Distributed by:

Domestic: The Bureau of Periodical Distribution, Post Office of Beijing

Abroad: China International Book Trading Corporation (Guoji Shudian), P. O. Box 399, Beijing

(Code No. BM845)

Subscripted by: Any Post Office in China

Periodical Registration: (BJ) No. 1404

ISSN 1001-8719

CN 11-2129/TE

国内邮发代号:82-332

国外发行代号:BM845

定价:20.00 元/期

120.00 元/年