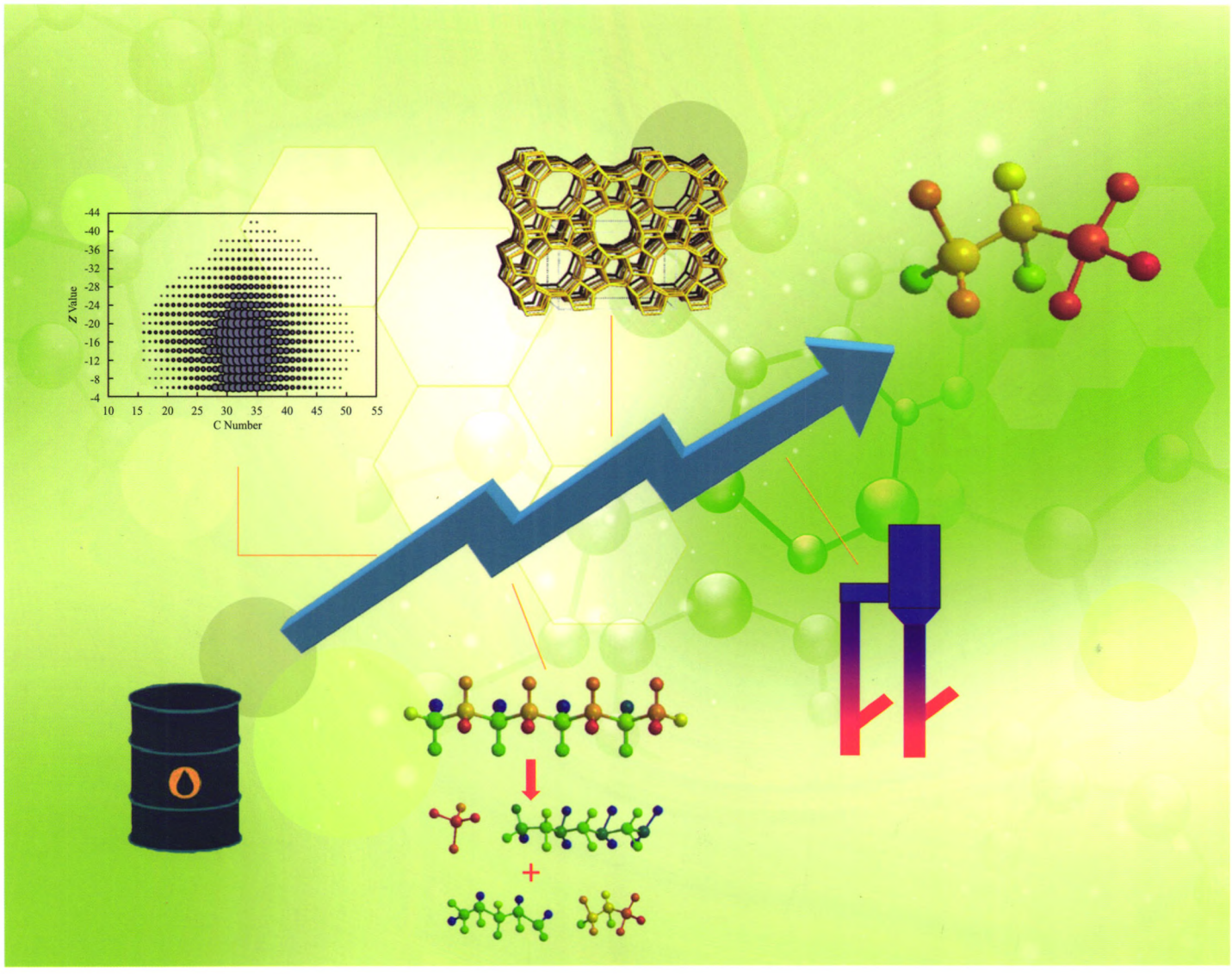
中文核心期刊 Ei核心期刊
本刊被Ei Compendex,CA,AJ,CBST,Scopus等
国际重要检索数据库收录

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

QK1806890

石油学报(石油加工)

ACTA PETROLEI SINICA
(PETROLEUM PROCESSING SECTION)



ISSN 1001-8719
中国石油学会主办
石油化工科学研究院承办
2018
1
Vol.34

石 油 学 报

（石油加工）

第 34 卷 第 1 期 2018 年 1 月

目 次

*** 封面文章**

期刊基本参数：CN11－2129/TE * 1985 * b * A4 * 202 * zh＋en * P * ¥20.00 * 1200 * 26 * 2018－01 **本期责任编辑**：白 雪

特约英文编审：孙树瑜教授（沙特阿卜杜拉国王科技大学计算传质现象实验室主任，博士生导师）

ACTA PETROLEI SINICA

(PETROLEUM PROCESSING SECTION)

Vol. 34 No. 1 Jan. 2018

CONTENTS

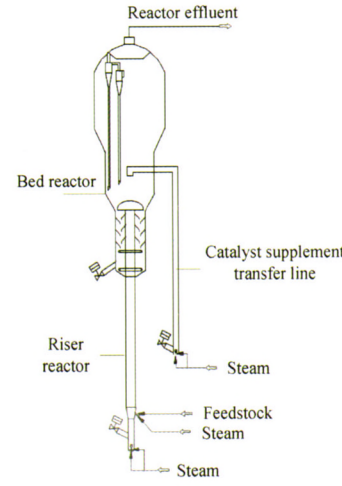
Special Articles

Acta Petrolei Sinica (Petroleum Processing Section), 2018, 34(1): 0001-0006 **doi**: 10.3969/j.issn.1001-8719.2018.01.001

Study on Influencing Factors of Propylene Selectivity in a Deep Catalytic Cracking Process

XIE Chaogang

In order to reduce the dry gas yield, to improve the yield and selectivity of propylene in the DCC process, novel FCC technology called the DCC-plus process has been developed and commercialized, which is featured by unique configuration of two risers reactor plus dense fluidized bed reactor.

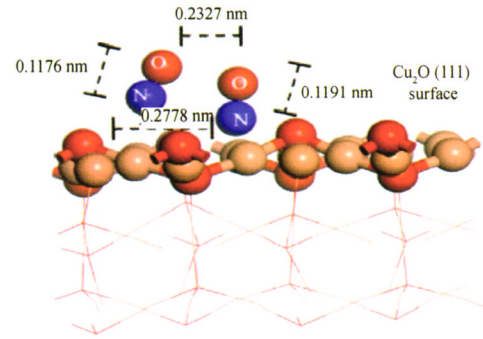


Acta Petrolei Sinica (Petroleum Processing Section), 2018, 34(1): 0007-0017 **doi**: 10.3969/j.issn.1001-8719.2018.01.002

Enhancement of Catalytic Performances for Reduction of NO_x in FCC Flue Gas Over CuO Modified Mg-Al Spinel

SHEN Benxian PI Zhipeng LIU Jichang LIU Yifeng

Double molecular adsorption and decomposition of NO over $Cu_2O(111)$ surface reduces the reduction energy barrier of NO+CO reaction. Mg-Al spinel modified with copper oxide has a much higher activity in denitrification.

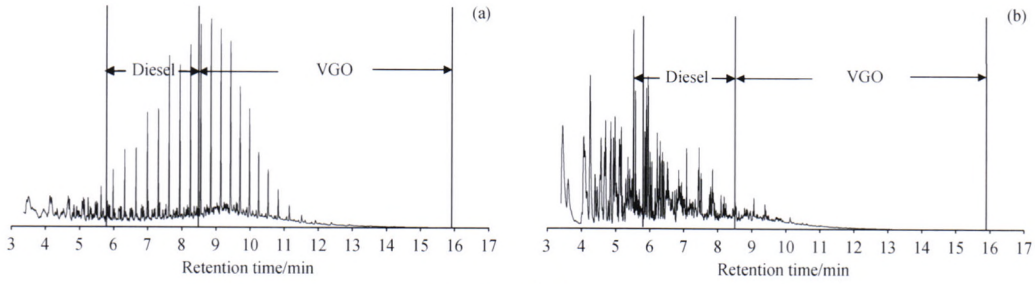


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0018-0023 **doi**: 10.3969/j.issn.1001-8719.2018.01.003

Determination of Hydrocarbon Types of Microactivity Test Liquid Samples With Wide Boiling Point Range

ZHU Xinyi LIU Zelong WANG Naixin TIAN Songbai

A new method for determination of hydrocarbon types of liquid samples in microactivity test with wide boiling point range has been developed by combining solid phase extraction with FID and MS spectra analyzing technology.



(a) Saturates; (b) Aromatics

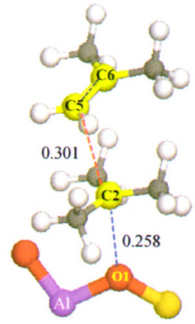
Research Articles

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0024-0033 **doi**: 10.3969/j.issn.1001-8719.2018.01.004

Multi-Scale Computational Study on the Addition Reaction of Butene Alkylation With Isobutane Over HY Zeolite

REN Kui LONG Jun REN Qiang LI Yongxiang DAI Zhenyu

The barrier of addition reaction of TBA and isobutene is lower than that of 2-butene, because the interaction between *t*-butyle alkoxide and isobutene is much more stronger than that of 2-butene in transition state, leading to a much smaller energy difference between transition state and reactants.

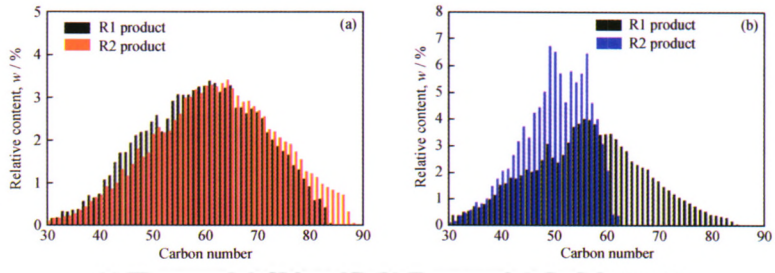


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0034-0041 **doi**: 10.3969/j.issn.1001-8719.2018.01.005

Transformation of Different Compounds During Fixed Bed Residue Hydrotreating

ZHANG Longgang NIE Hong DAI Lishun YANG Qinghe JIA Yanzi LIU Tao

The transformation differences along the reactor flow direction of key compounds between Yichang AR and Saudi Arabian AR have been investigated. The S1 compounds in Saudi Arabian AR are easily removed, while the N1 compounds in Yichang AR are not, which may mainly attribute to the transformation difference on the HDCCR catalyst.



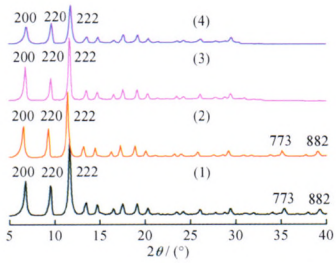
(a) N1 compounds in Yichang AR; (b) S1 compounds in Saudi Arabian AR

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0042-0047 **doi**: 10.3969/j.issn.1001-8719.2018.01.006

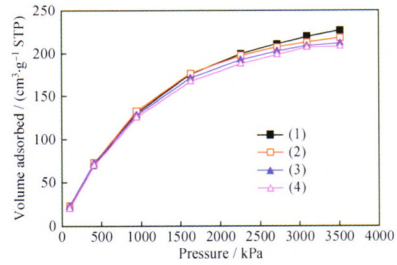
Investigation on Mother Liquor of HKUST-1 Metal-Organic Framework Synthesis and Its Recrystallization Performance

ZHAO Liang XING Bing FANG Xiangchen WANG Gang WU Chang'an

The mother liquor of HKUST-1 synthesis was recrystallized. Characterization results show that the recrystallized products possess similar crystal structure and microstructure as parent HKUST-1. CH_4 adsorption capacity of the third recrystallized products is 207 cm^3/g, which suggests that recrystallized products have a potential application in gas adsorption.



(1) HKUST-1; (2) HKUST-1-1; (3) HKUST-1-2; (4) HKUST-1-3



(1) HKUST-1; (2) HKUST-1-1; (3) HKUST-1-2; (4) HKUST-1-3

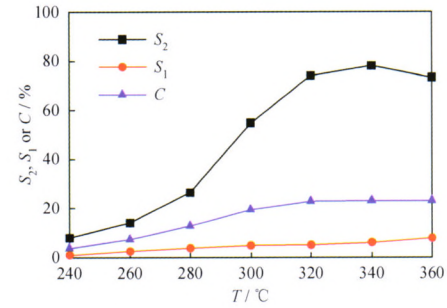
Adsorption temperature of 25℃

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0048-0055 **doi**: 10.3969/j.issn.1001-8719.2018.01.007

Effects of Acidity and Mesopore Structure of *β* Zeolites on Hydrogenation and Ring-Opening Performances in Hydrotreating of Catalytic Light Cycle Oil

WANG Jian QIN Bo LI Wenlin DU Yanze ZHENG Jiajun LI Ruifeng

Two hydrogenation catalysts were prepared by mixing and kneading mesopore *β* zeolite with Ni and Mo compounds, respectively. Compared with M*β*-1 zeolite, M*β*-2 zeolite shows higher ring-opening activity due to its higher acidity and more appropriate pore structure.

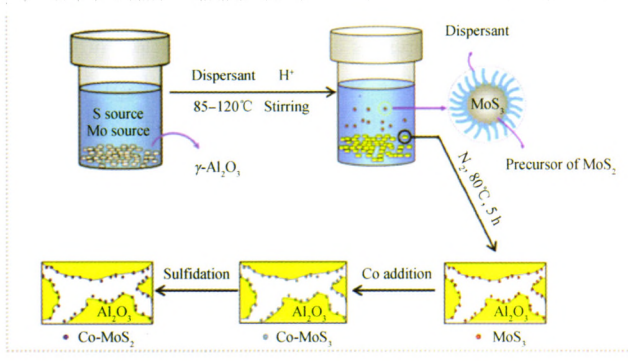


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0056-0063 **doi**: 10.3969/j.issn.1001-8719.2018.01.008

Synthesis of MoS_3/Al_2O_3 Composites and Its Application in Preparation of Hydrogenation Catalysts

GAO Yang HAN Wei LONG Xiangyun HU Anpeng NIE Hong

MoS_3/Al_2O_3 composites were synthesized by the chemical deposition method and then used as precursors to prepare pre-sulfided bimetallic $Co/MoS_3/Al_2O_3$ catalysts, with better HDS activity than conventional oxidized catalysts.

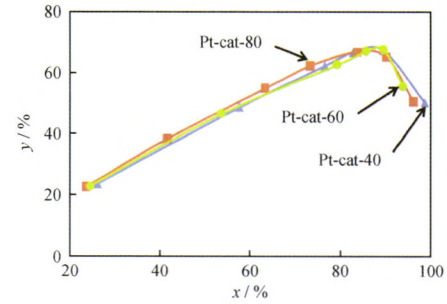


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0064-0070 **doi**: 10.3969/j.issn.1001-8719.2018.01.009

Investigation on the Hydroisomerization Catalyst——The Effect of the Hydrogenation Function

BI Yunfei XIA Guofu HUANG Weiguo FANG Wenxiu

It is revealed that the paraffin hydrogenation/dehydrogenation is the controlling step during the hydroisomerization if the hydrogenation capacity over a hydroisomerization catalyst is less. However, the selectivities of the isomers for different hydroisomerization catalysts are similar regardless of the metal character and zeolite content in the catalysts.

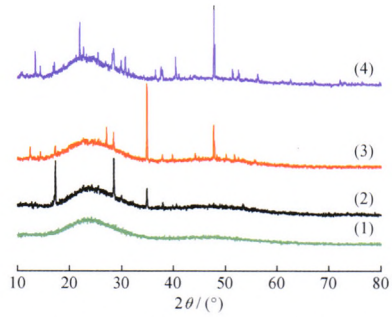


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0071-0077 **doi**: 10.3969/j.issn.1001-8719.2018.01.010

Composite Ionic Liquids Immobilized on Silica Gel as Efficient Catalysts for the Synthesis of Propylene Carbonate From CO_2 and Propylene Oxide

GUO Liying DENG Lili JIN Xianchao WU Hao
YIN Longzhu

Three efficient catalysts composed of silica gel supported imidazolium composite ionic liquids with different side chain lengths were prepared. The results show that the side chain length of ionic liquids strongly influences the structure and catalytic activity of the immobilized catalysts.



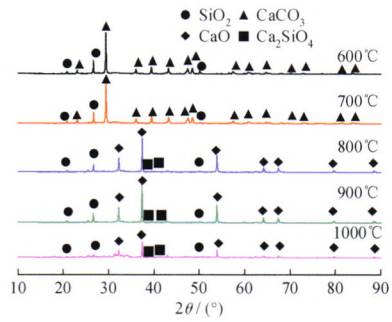
(1) SiO_2; (2) SiO_2/[C_4MIM][Zn_2Br_5]; (3) SiO_2/[C_{14}MIM][Zn_2Br_5]; (4) SiO_2/[C_{18}MIM][Zn_2Br_5]

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0078-0085 **doi**: 10.3969/j.issn.1001-8719.2018.01.011

Green Biomass Ash Catalyst for Biodiesel Synthesis

LI Chuan HU Xianguo

Cedar ash catalyst (green biomass ash catalyst) was prepared with primary calcination-hydration-secondary calcination method. The active component of cedar ash catalyst is CaO, and under the optimal conditions, the biodiesel yield reaches 91.52%.

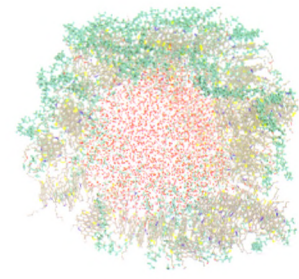


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0086-0093 **doi**: 10.3969/j.issn.1001-8719.2018.01.012

Molecular Simulation Study on the Stabilization Mechanism of Crude Oil Emulsion

MIAO Jie LONG Jun REN Qiang QIN Bing WANG Zhenyu

Compared with the asphaltenes, demulsifier exhibits greater interfacial activity, and thus it can penetrate stabilizing films at the oil-water interface, destroy the supramolecular architecture of asphaltenes, and break the hydrogen bonding between asphaltenes and water.

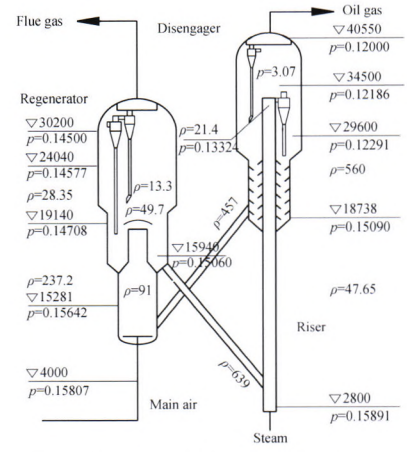


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0094-0100 **doi**: 10.3969/j.issn.1001-8719.2018.01.013

Cause Analysis of Catalyst Conveying Fault in Standpipe of FCC Units

YAN Chaoyu WANG Di JIA Mengda SUN Liqiang
WEI Zhigang SONG Jianfei WEI Yaodong

Standpipes act as the main passage for catalysts conveying process, which have important effects on the stable operation of FCCUs. The cause analysis of catalyst conveying fault in standpipes is discussed, from the viewpoints of pressure balance and flow regime transition in this work.



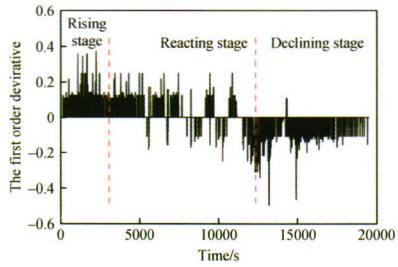
Elevation: ▽(mm); Pressure: p(MPa); Mass concentration: ρ(kg/m^3)

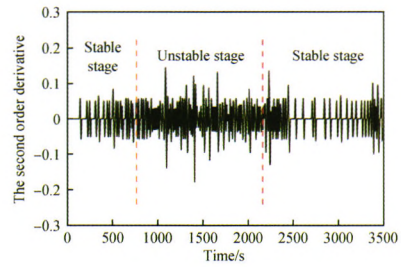
Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0101-0107 **doi**: 10.3969/j.issn.1001-8719.2018.01.014

Study on Abnormal Situation Ultra-Early Warning of Batch Process Based on Trend Analysis

HU Jinqiu GUO Fang ZHANG Laibin

The first-order differential control limits were obtained by applying the differential calculation to the history data fitting curve, and used to identify the process condition. The second-order differential control limits were obtained by using the second derivative in the fitting curve to realize the early warning monitoring.





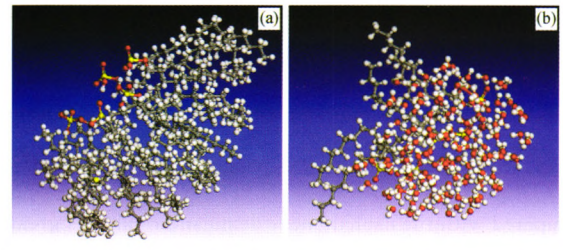
Research Notes

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0108-0114 **doi**: 10.3969/j.issn.1001-8719.2018.01.015

Interaction Mechanism of Surfactant Molecules With Oil-Water Interfacial Molecules

HOU Yanbo REN Qiang DAI Zhenyu ZHOU Han

The interaction of oligomeric surfactant with water molecule and oil molecule was higher than that of single chain and dimer type surfactant. The oil bound to the molecules of the oligomeric surfactant is more likely to be detached from the original attachment due to a greater force than a single chain type of surfactant molecule.



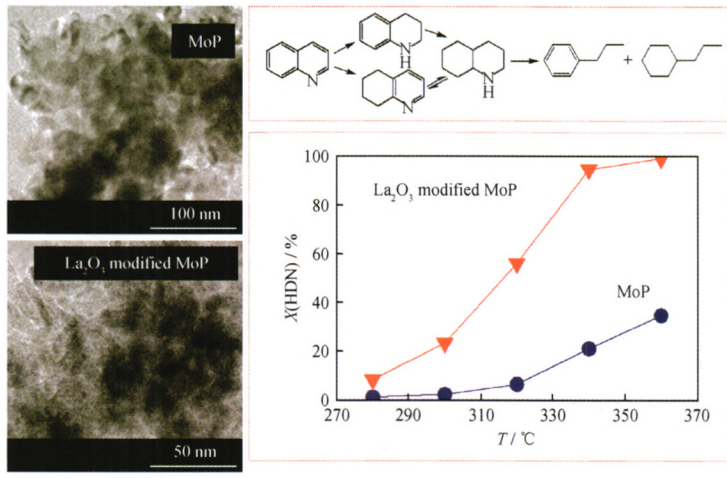
(a) Oligomeric surfactant in the oil; (b) Oligomeric surfactant in the water

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0115-0122 **doi**: 10.3969/j.issn.1001-8719.2018.01.016

Influence of Lanthanum Oxide on the Hydrodenitrogenation Performance of Bulk MoP

XU Yanchun LI Xiang WANG Anjie YU Zhiquan CHEN Yongying

La_2O_3 is an effective promotor for MoP hydrodenitrogenation catalyst. Both the hydrogenation activity and the C—N bond cleavage activity of MoP are enhanced by the addition of La_2O_3.

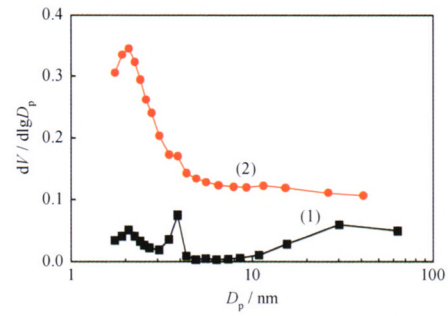


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0123-0127 **doi**: 10.3969/j.issn.1001-8719.2018.01.017

Synthesis of Hierarchical ZSM-5 Zeolite From Mixed Clay by Using *in-situ* Crystallization Method

HE Lijun ZHENG Shuqin REN Shao ZHANG Jiance YU Hongxia

Hierarchical ZSM-5 zeolite was synthesized by an *in-situ* crystallization technology using mixed clay as raw materials. The synthesized sample possesses 53% of relative crystallinity and widepore structure, with large specific surface area and pore volume and strong hydrothermal stability.



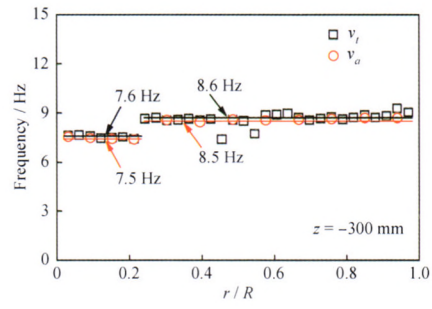
(1) Synthesized ZSM-5 zeolite; (2) Reference ZSM-5 zeolite

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0128-0135 **doi**: 10.3969/j.issn.1001-8719.2018.01.018

Experimental Research on the Flow Instability in a Spray Granulation Tower

FENG Liuhai BU Yifeng SUN Zhongwei ZHAO Fan MAO Yu
MEN Zhuowu

The instantaneous velocity in a spray granulation tower was obtained by using the PDPA. A quasi-periodic unsteady velocity flow was observed and the frequencies calculated from the instantaneous velocity component are almost the same. There are two groups of different fundamental frequencies which are divided by $r/R = 0.2$, and the frequency amplitude in the central region is greater than the outer region.

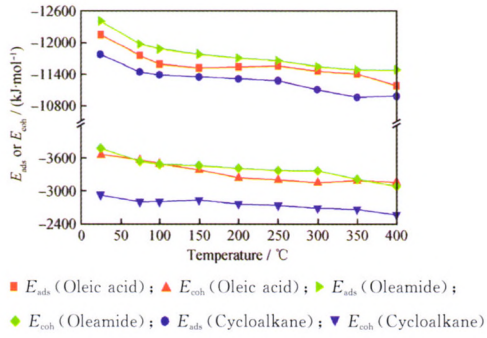


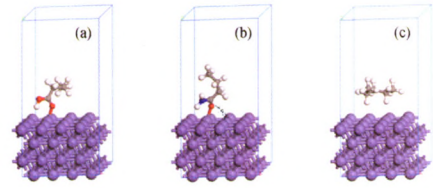
Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0136-0143 **doi**: 10.3969/j.issn.1001-8719.2018.01.019

Molecular Simulation on Friction Reducing Performance of Friction Modifiers

LI Yiya LONG Jun ZHAO Yi DUAN Qinghua DAI Zhenyu SU Shuo

Oleic acid and oleamide adsorbed on Fe(110) surfaces through van der Waals and chemical interaction between $O_{C=O}$ and Fe atom, and combined through van der Waals, electrostatic and hydrogen bonding. The adsorption energy and cohesive energy of oleic acid and oleamide were more than those of cycloalkane, so their adsorption film was more stable.





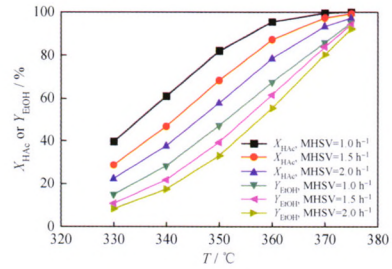
(a) Butyric acid; (b) Butyramide; (c) Pentane

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0144-0152 **doi**: 10.3969/j.issn.1001-8719.2018.01.020

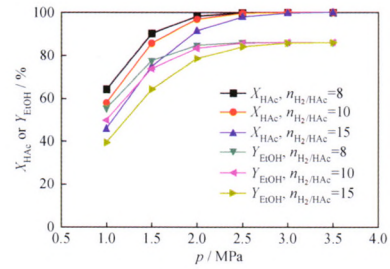
Apparent Kinetics of Hydrogenation of Acetic Acid to Ethanol Over Supported Nickel Phosphide Catalyst

REN Jie WU Hongjun YUAN Haikuan SHEN Lian

The reactions of acetic acid hydrogenation to ethanol over supported nickel phosphide catalyst were carried out in a fixed bed reactor. The apparent kinetic model of acetic acid hydrogenation to ethanol was investigated. The study results indicated that the conversion of acetic acid and ethanol yield could reach 99.92% and 94.79%, respectively.



p=2.5 MPa; $n_{H_2/HAc}$=10



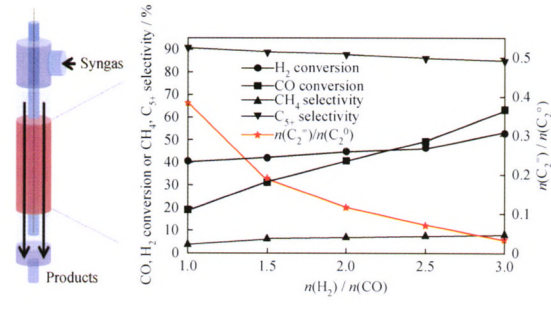
T=370℃; MHSV=1.0 h^{-1}

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0153-0160 **doi**: 10.3969/j.issn.1001-8719.2018.01.021

Reaction Law and Kinetics of Fischer-Tropsch Synthesis in Microchannel Reactor

GU Chang HOU Chaopeng XU Run HU Zhihai

The reaction law and kinetics of Fischer-Tropsch synthesis in microchannel reactor are studied. Temperature and $n(H_2)/n(CO)$ show a significant positive effect on reaction activity and space-time yield of C_{5+}, which is proved by the kinetic model. However, the effects of pressure and space velocity on the selectivity are not obvious.

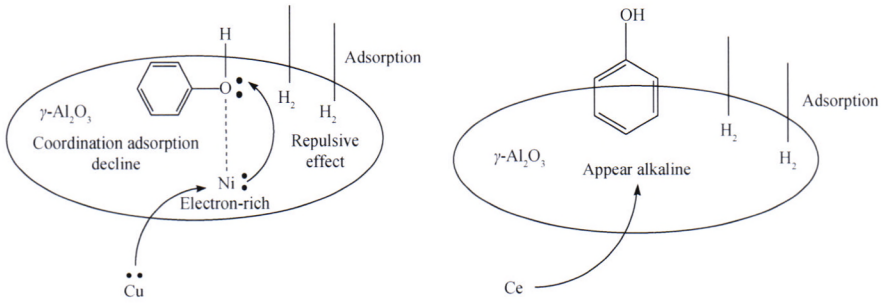


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0161-0166 **doi**: 10.3969/j.issn.1001-8719.2018.01.022

Characterization of Amorphous Ni-Cu-Ce-B Catalysts and Their Surface Interaction Mechanism in Phenol Hydrogenation

XU Haisheng WANG Bo WANG Hao

The coordination adsorption between Ni and hydroxyl oxygen of phenol becomes weakened via enhancing electron transferring from Cu to Ni, and the noncoplanar space effect of phenol molecules and support is strengthened with the addition of Ce. Consequently, the contact of phenol and hydrogen absorbed on the surface of the Ni-B/γ-Al_2O_3 catalyst can be reduced.

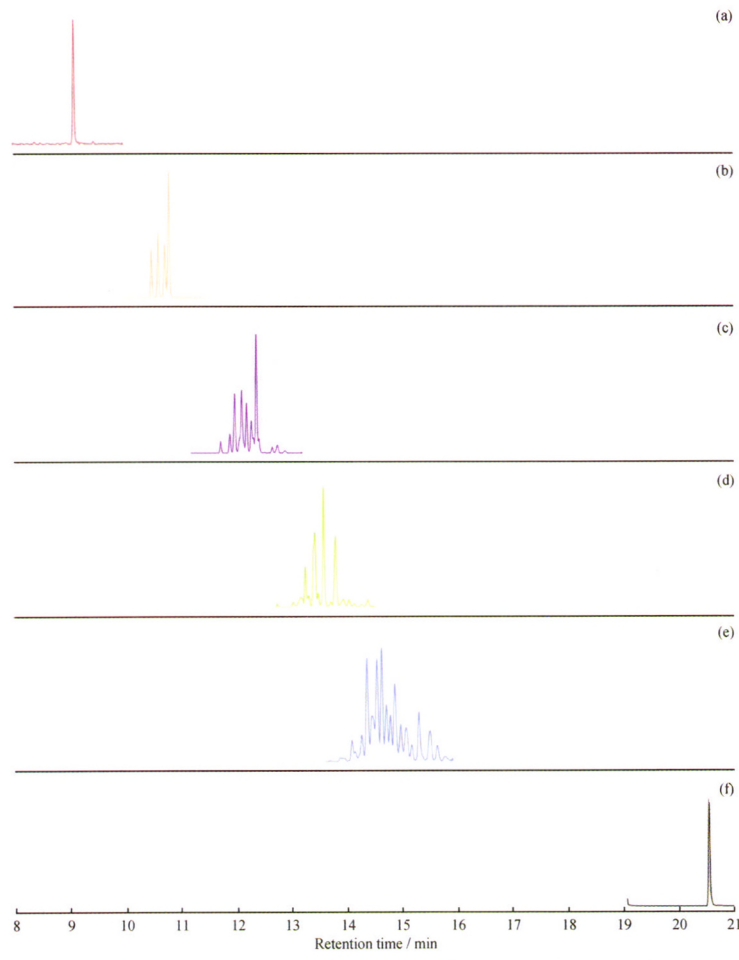


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0167-0174 **doi**: 10.3969/j.issn.1001-8719.2018.01.023

Analysis of Benzothiophenes in Deep Hydrodesulfurization Diesel

REN Xujin ZHU Xinyi LI Ying LIU Zelong

A qualitative and quantitative analysis method of benzothiophenes (BTs) was established based on accurate mass Quadrupole Time-of-Flight Mass coupled with Gas Chromatography (GC-QTOF MS). The method had high stability and accuracy so that it could be used for BTs' identification and quantitation in ultra-low-sulfur diesel.



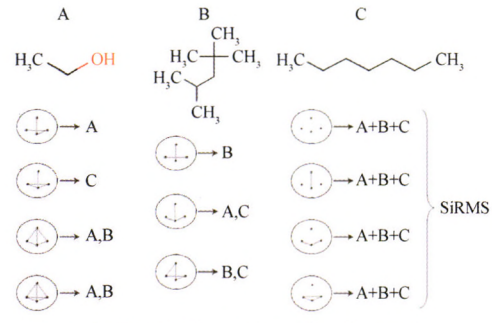
(a) BT; (b) C_1-BTs; (c) C_2-BTs; (d) C_3-BTs; (e) C_4-BTs; (f) $C_{18}D_{14}$

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0175-0181 **doi**: 10.3969/j.issn.1001-8719.2018.01.024

Prediction of Octane Number for Ethanol-Primary Reference Fuel Mixtures Based on Quantitative Structure-Property Relationship Studies for Mixtures

ZHANG Pengfei PAN Yong GUAN Jin JIANG Juncheng

Molecular structure characterization of the ethanol- primary reference fuel mixtures by the simplex descriptors of mixtures based on tetratomic fragments.



A: Ethanol; B: Isooctane; C: *n*-heptane;
SiRMS: Simplexes of mixtures of molecules A+B+C

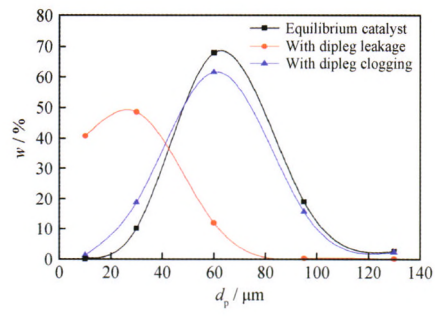
Reviews

Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0182-0189 **doi**: 10.3969/j.issn.1001-8719.2018.01.025

Preliminary Analysis of CFB Fault Diagnosis Technology Based on Particles Properties

SONG Jianfei WANG Di SUN Liqiang YAN Chaoyu WEI Yaodong

The particle properties vary with their positions in particle circulation loop such as size distribution, morphology and element content during normal and abnormal operation. Taking particles as the carrier of fault information, this paper puts forward to build relationship model between particle properties and fault for CFB fault diagnosis.

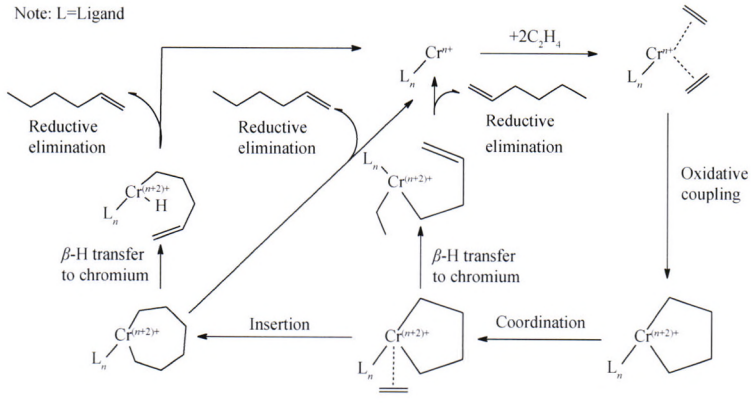


Acta Petrolei Sinica (*Petroleum Processing Section*), 2018, 34(1): 0190-0202 **doi**: 10.3969/j.issn.1001-8719.2018.01.026

Research Progress of Chromium-Based Catalysts for Selective Oligomerization of Ethylene

FENG Zhichao MAO Guoliang WU Wei LIU Zhenhua

Chromium catalysts have become a hotspot in ethylene selective oligomerization process because of their high activity, high selectivity and convenience to adjust the ligand structures. The progress of chromium-based ethylene selective oligomerization catalysts is reviewed from the aspects of the oxidation state, ligand structure, and immobilization of homogeneous chromium metal centers.



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 34 卷 第 1 期 2018 年 1 月 25 日

ACTA PETROLEI SINICA

(PETROLEUM PROCESSING SECTION)

Editor in Chief Wang Xieqing

Bimonthly

(Started in March 1985)

Vol. 34 No. 1 January. 25, 2018

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：北京市海淀区学院路 18 号

邮编：100083

电话：010-62310752，010-82368282

网址：www. syxbsyjg. com

E-mail：syxb8282. ripp@sinopec. com，

syxb8282@163. com

副 主 编：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, Haidian District, Beijing 100083, China

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

Http://www. syxbsyjg. com

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

syxb8282@163. com

Deputy Editor in Chief: 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: Local Post Offices 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