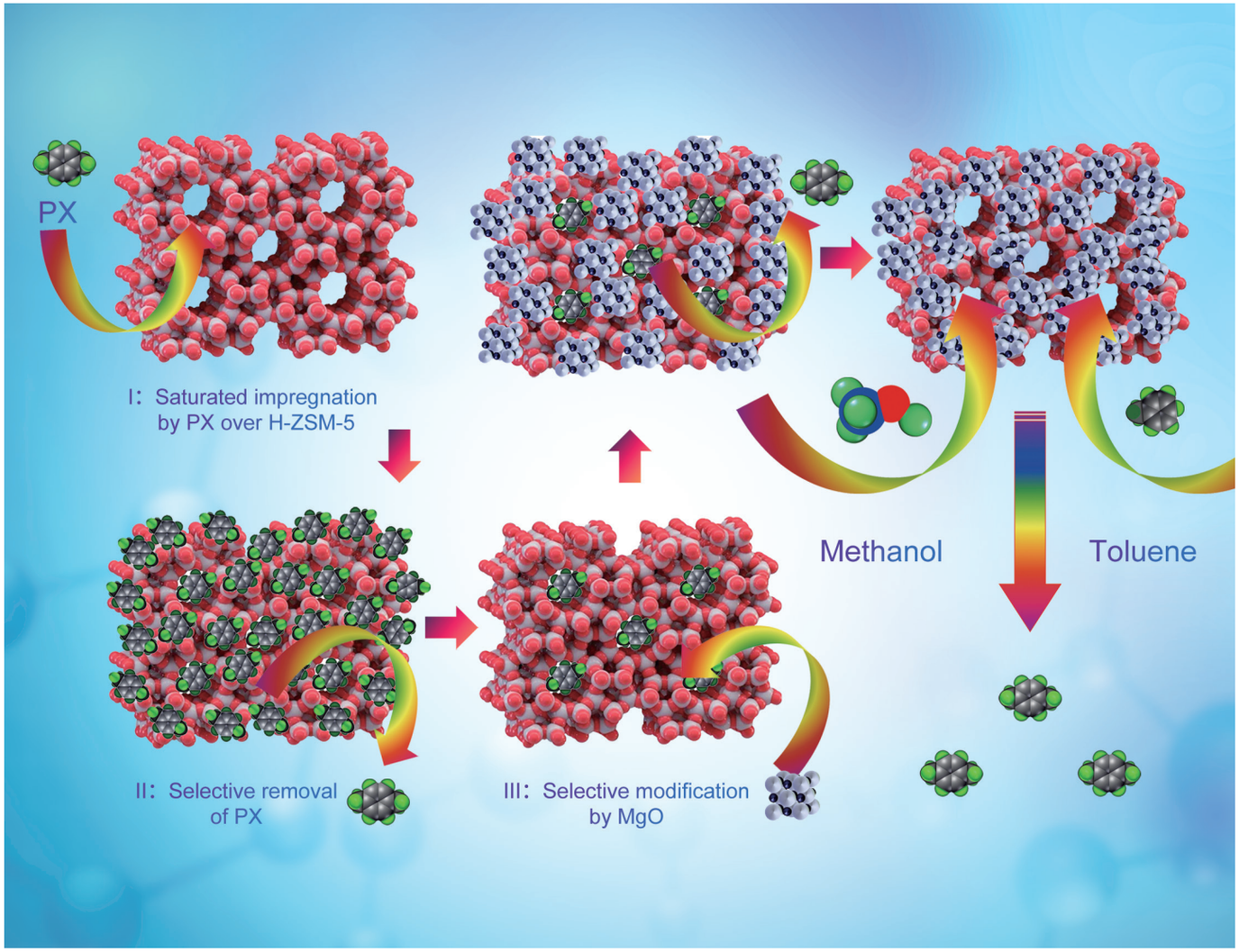
（石油加工）

ACTA PETROLEI SINICA
(PETROLEUM PROCESSING SECTION)



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ACTA PETROLEI SINICA

(PETROLEUM PROCESSING SECTION)

Vol .37 No .3 May 2021

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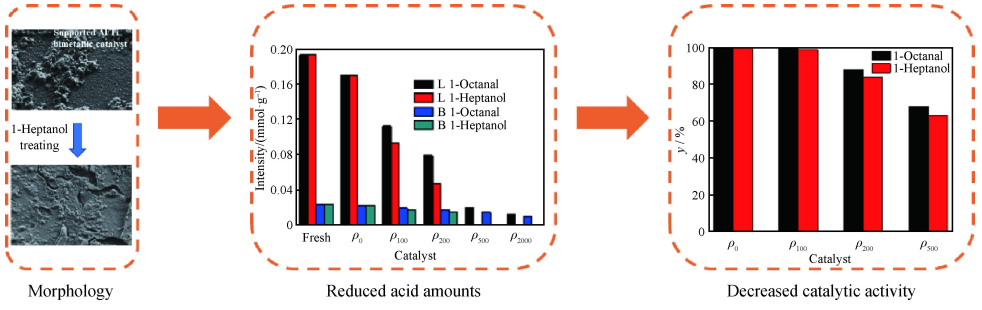
Research Articles

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0486-0497 **doi**: 10.3969/j.issn.1001-8719.2021.03.003

Effects of Two Oxygenates on Al/Ti-Bimetallic Catalyst for α-Olefin Oligomerization and Properties of Synthesized PAO

TAN Jialun JIANG Hao WANG Dan SUN Hui SHEN Benxian LIU Jichang

After treatment with 1-heptanol or 1-octanal, the microscopic surface structure of supported Al/Ti-bimetallic catalyst can be changed. This causes reduced amounts of Lewis acid and Brönst acid. Therefore, the oxygenate-treated catalyst shows reduced catalytic activity for PAO synthesis.

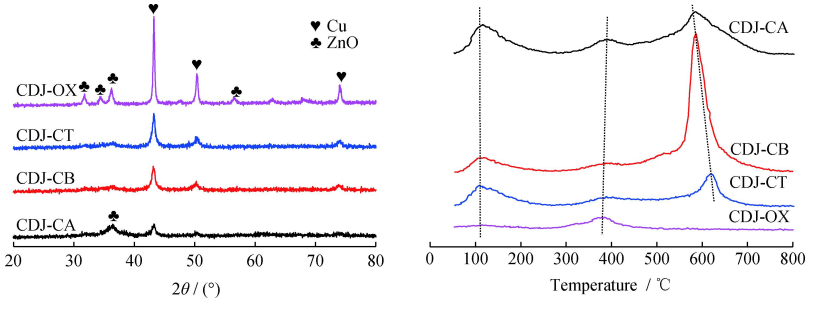


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0498-0507 **doi**: 10.3969/j.issn.1001-8719.2021.03.004

Effect of Precipitants on the Performance of CuZnAl Catalyst in CO Hydrogenation to $C_{2+}OH$

WANG Jingrong GAO Zhihua HUANG Wei

Precipitators determine the structure of catalyst. And Cu species in high dispersion state are more conducive to the improvement of catalyst activity, while an appropriate proportion of surface weak and medium strong base sites is in favor of the formation of $C_{2+}OH$.

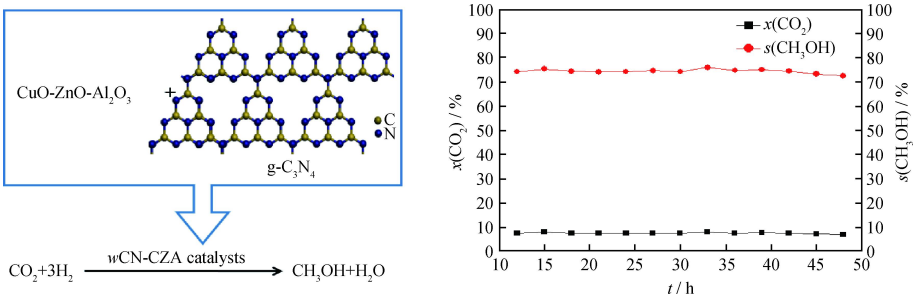


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0508-0517 **doi**: 10.3969/j.issn.1001-8719.2021.03.005

Effect of Carbon Nitride Addition on Cu-ZnO-Al_2O_3 Catalytic Performance for CO_2 Hydrogenation to Methanol

ZHANG Yifan YANG Wenbing MA Qingxiang GAO Xinhua ZHANG Jianli LI Peng ZHAO Tiansheng LI Rong

Catalytic performance of *w*CN-CZA catalysts for methanol synthesis from CO_2 hydrogenation is significantly impacted by g-C_3N_4 content. With 5% mass fraction g-C_3N_4 in the catalyst, optimum methanol production can be obtained. g-C_3N_4 addition can improve copper active species dispersion and increase medium-strong base sites in the catalyst. Both of them can improve methanol synthesis from CO_2 and H_2.

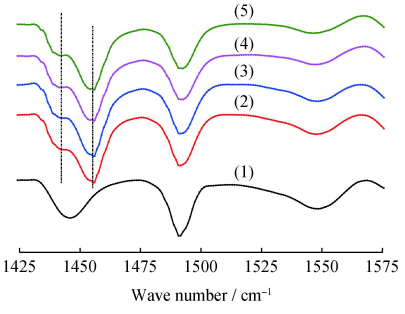


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0518-0529 **doi**: 10.3969/j.issn.1001-8719.2021.03.006

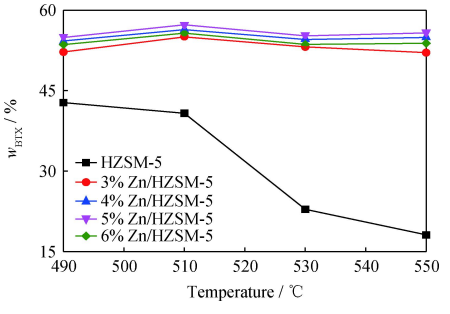
Catalytic Performance of Zn Modified HZSM-5 Catalyst in *n*-Alkane Hydroaromatization

ZHANG Kongyuan ZHENG Chuanfu WANG Chong GUO Yudong LIU Chenguang

A series of Zn/HZSM-5 catalysts with different ZnO loading contents were prepared by the equal volume impregnation method. Results show that Zn modification can adjust the acid properties of the HZSM-5 catalyst and the selectivity of BTX firstly increases and then decreasing with the increases of ZnO loading content. Moreover, the highest catalytic performance is obtained when ZnO loading mass fraction is 5%.



(1) HZSM-5 catalyst; (2) 3% Zn/HZSM-5; (3) 4% Zn/HZSM-5; (4) 5% Zn/HZSM-5; (5) 6% Zn/HZSM-5



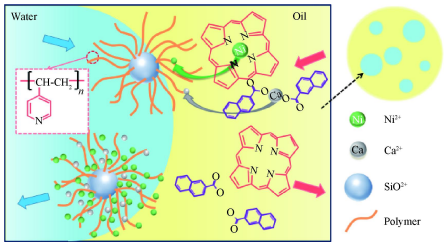
p=2.0 MPa; LHSV=1.5 h^{-1}; $V(H_2)/V(Oil)$=100

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0530-0540 **doi**: 10.3969/j.issn.1001-8719.2021.03.007

Study on Crude Oil Metal Removal Mechanism of Pyridine Polymer Brush With High Absorption Capacity

GENG Tong XU Jun REN Mannian CAO Fahai

Pyridine based polymer brush (P4VP@SiO_2) was prepared for nickel and calcium removal from crude oils. Due to high density pyridine groups in the inner layer of spherical polymer brush, P4VP@SiO_2 exhibits excellent absorption capacity for both nickel and calcium. Nickel and calcium removal ratios can be 68.4% and 62.2%, respectively.

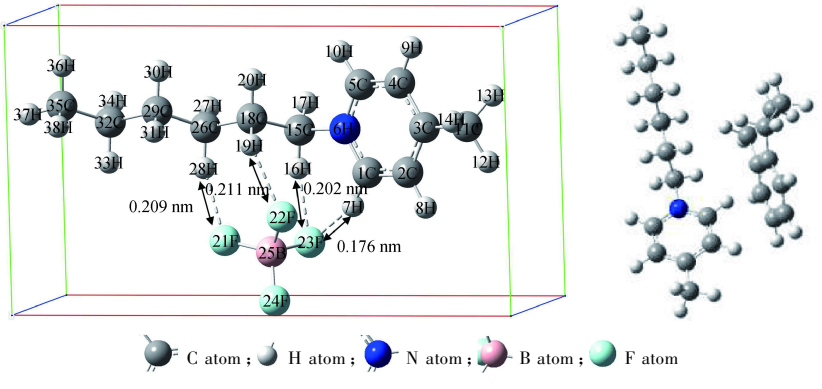


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0541-0548 **doi**: 10.3969/j.issn.1001-8719.2021.03.008

Interaction Mechanism Between [C6MPy][BF_4] Ionic Liquid and Hydrocarbons

SHI Junjun WU Wei XI Lei

The dominant force between [C6MPy][BF_4] and aromatic molecules is found to be the C—H—π interactions between cations of [C6MPy][BF_4] and the aromatic ring. The strength of the C—H—π interaction is related to the conjugation π bond delocalization degree of aromatics, and weakens the hydrogen bonding between cations and anions.

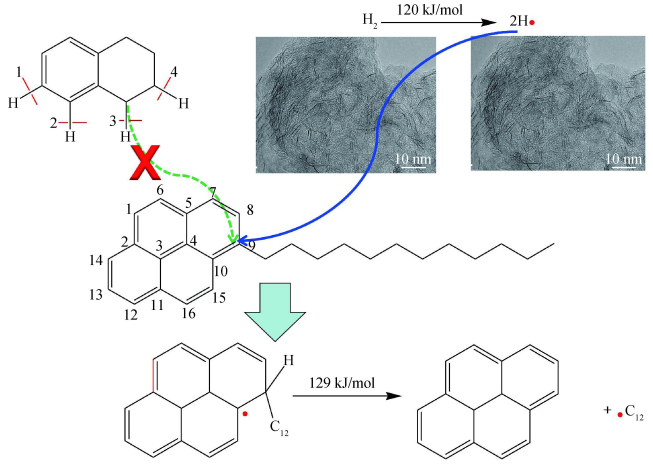


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0549-0555 **doi**: 10.3969/j.issn.1001-8719.2021.03.009

Effects and Mechanisms of Different Hydrogen Sources on Dodecyl Pyrene Thermal Cracking Reactions

HOU Huandi ZHAO Yi WANG Zijun DAI Zhenyu QUAN Yi DONG Ming LONG Jun

Hydrogen radicals generated by the dispersed catalyst activation can be easily attached on the Ipso-carbon position in dodecyl pyrene. Thus, cracking barrier of the alpha C—C bond in the side chain can be significantly reduced and easily broken. Although THN can provide α position hydrogen, there is a large steric hindrance between α position hydrogen in THN and Ipso-carbon in dodecyl pyrene. Therefore, α position hydrogen in THN can't provide directional hydrogenation and improve cracking reactions. The main function of THN is to stabilize the free radicals and inhibit free radical propagation reaction.

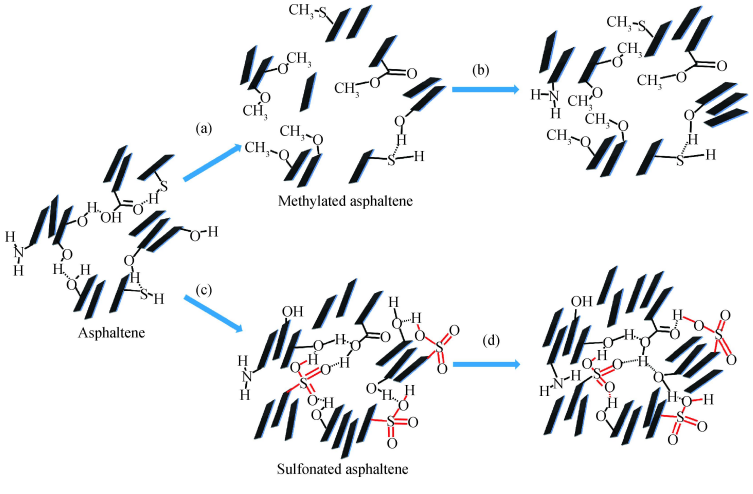


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0556-0565 **doi**: 10.3969/j.issn.1001-8719.2021.03.010

Effects of Hydrogen Bonding Interactions on the Asphaltene Supramolecular Aggregation

WEI Shengchao YAO Zhilin BIAN He KAN Aiting GAO Zhijian ZHU Lijun XIA Daohong

By studying the effect of methylation, carboxylation and sulfonation on the asphaltenes structures and aggregation, the mechanism of hydrogen bonding affecting asphaltene aggregates has been proposed, in which the introduction of methyl inhibits the asphaltene aggregation, while the introduction polar functional groups (e.g., carboxyl and sulfonic acid group) promotes the aggregation.



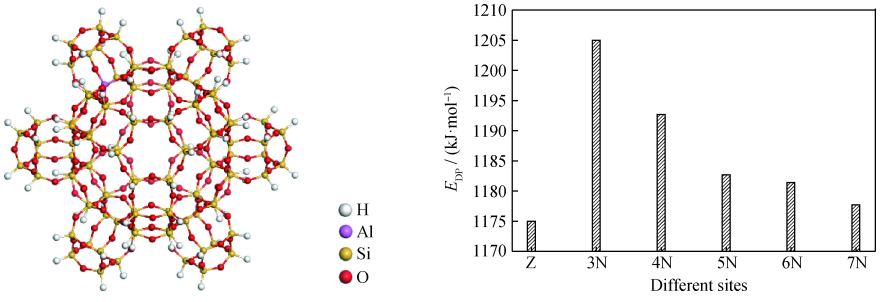
(a) Methylation; (b) Re-aggregation; (c) Sulfonation; (d) Re-aggregation

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0566-0571 **doi**: 10.3969/j.issn.1001-8719.2021.03.011

Effects of Al Atom Distribution on Acid Strength of Y Zeolite

YE Weizhen REN Qiang ZHAO Yi DAI Zhenyu WANG Chunlu

The effect of Al atom distribution on acid strength of Y zeolite was studied, the results show that the acid strength of Y zeolite decreases when Al atoms locate at NNN and NNNN positions, and the effect on acid strength of Y zeolite is negligible when Al atoms locate at further positions.



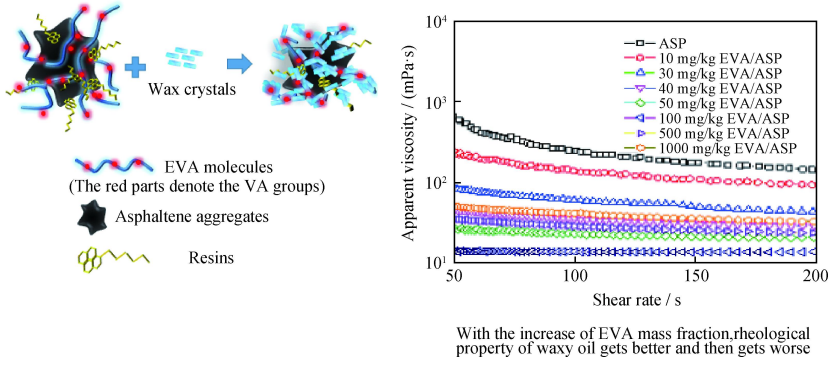
Z: The initial Y zeolite cluster model; E_{DP}: The energy required to remove one H^+ from the zeolite, indicating the acid strength of the zeolite; 3N—7N: Positions of Al atom

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0572-0583 **doi**: 10.3969/j.issn.1001-8719.2021.03.012

Effects of EVA Additive Dosage on Rheological Properties of Asphaltenic Waxy Oils

YANG Fei CHEN Jinxiu YAO Bo LI Chuanxian SUN Guangyu

Additive EVA can adsorb on the surface of associated asphaltenic colloidal particles to form EVA-asphaltene composite particles, which can demonstrate synergistic effect on improving rheological property of waxy oils. It was observed that, with increasing EVA mass fraction, this synergistic effect is good at the beginning but become bad later.



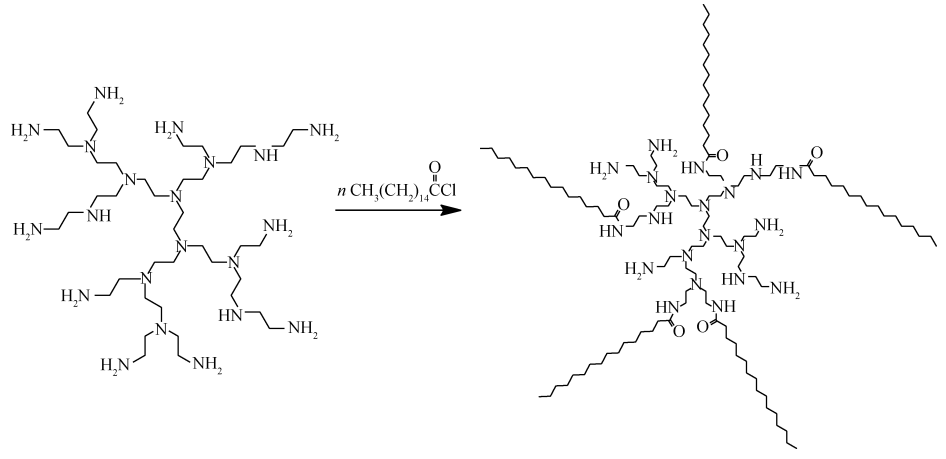
With the increase of EVA mass fraction,rheological property of waxy oil gets better and then gets worse

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0584-0592 **doi**: 10.3969/j.issn.1001-8719.2021.03.013

Synthesis of Modified Hyperbranched Polyethyleneimine and Its Application in Demulsification

ZHANG Lifeng ZHAN Ningning CHEN Cuiting QIN Lijuan ZHAO Xinxing TENG Houkai FANG Wenjun

HPEI-C_{16} was developed to meet the requirements of the O/W emulsion demulsification. Due to the specific highly branched structure, the demulsifier rapidly destroys the interface film and causes large oil droplets to aggregate. Then, oil-water separation arises in the emulsion due to gravity action.

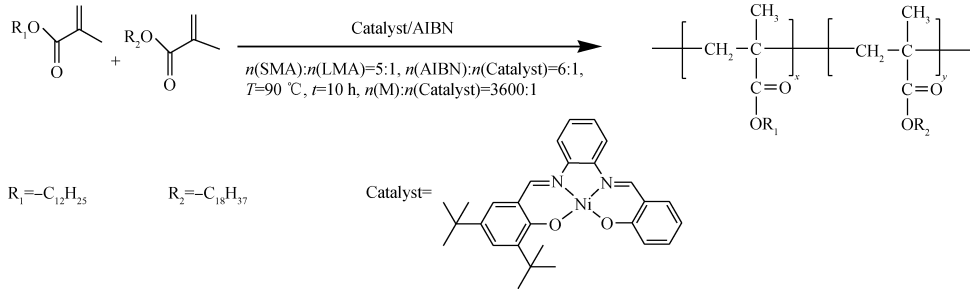


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0593-0600 **doi**: 10.3969/j.issn.1001-8719.2021.03.014

Controllable Synthesis of Lauryl Methacrylate-Stearyl Methyl Acrylate Copolymer and Its Pour Point Depression Performance

DING Liqin FEGN Hao GUO Xiao LIANG Shengrong LI Hong

Poly (lauryl methacrylate-stearyl methyl acrylate) (PHMA) was controllably synthesized with Salen-Ni-Salicylaldehyde/azodiisobutyronitrile (AIBN) catalyst system. For Salen-Ni-Salicylaldehyde, catalyst activity is 11.035×10^4 g/(mol·h). The synthesized copolymer M_n is from 0.864×10^5 to 2.532×10^5. With adding the above copolymer, either the pour point of diesel fraction (300—340 ℃) or lubricant fractions (380—400 ℃) can be decreased. When 0.5% mass fraction copolymer was added to the lubricant fraction (380—400 ℃), the pour point depression has the best effect ($\Delta T_{SP}=15$ ℃). It was also found that pour point depression of copolymer is better than that of blend polymer.

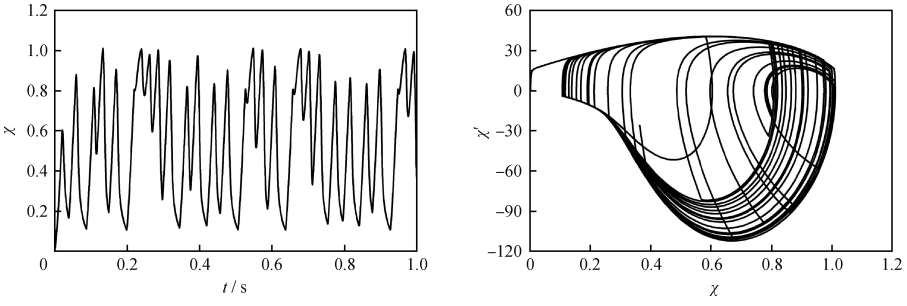


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0601-0610 **doi**: 10.3969/j.issn.1001-8719.2021.03.015

Dynamic Simulation and Response of Emulsion Droplets Excited by Chaotic Frequency Electric Field

GONG Haifeng LIAO Zhixiang PENG Ye QIU Zhi YU Bao ZHANG Xianming LIU Yunqi

The chaotic frequency pulse electric field is constructed by using the Chaotic-Pulse-Position Modulation method, which has the best pulse width to excite the droplet chaotic vibration. The droplet gets a large amount of tensile deformation at high frequency, but relatively small and stable at low frequency.



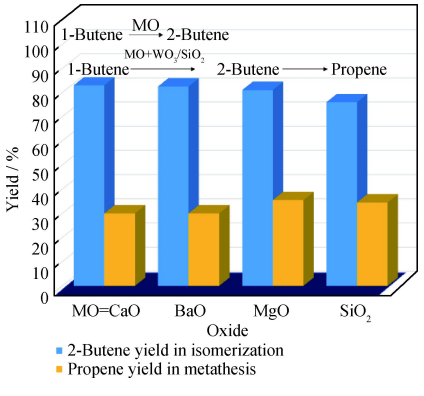
Research Notes

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0611-0618 **doi**: 10.3969/j.issn.1001-8719.2021.03.016

Effect of Different Oxides on Olefin Isomerization-Metathesis Catalyzed by WO_3/SiO_2 Catalyst

JIANG Weili JI Xing GUO Wei FENG Shuo LI Zhengxi SUN Manying CHEN Yaqi ZHOU Guanglin ZHOU Hongjun

It is found that MgO shows the best promoting effect on the isomerization-metathesis tandem reaction of 1-butene to produce propene catalyzed by WO_3/SiO_2, although its butene isomerization function is not the best.

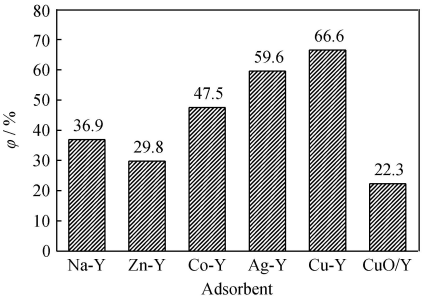


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0619-0625 **doi**: 10.3969/j.issn.1001-8719.2021.03.017

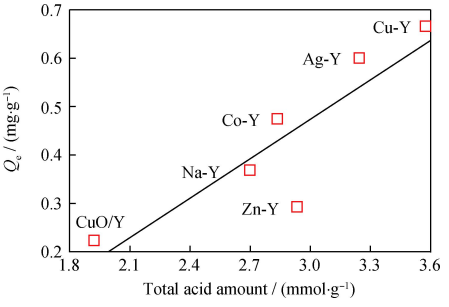
Adsorption of 1-Chloroctane in Model Oil Using Modified Y Zeolite

XIE Guoying GONG Yujie ZHOU Dongxu FENG Haijiao WANG Jiafeng ZHANG Chen ZHANG Wei LI Cuiqing

The acidity of modified Y zeolite plays a very important role on its adsorption capacity for 1-chloroctan. And high total acid amount of Y zeolite favors the increase of adsorption capacity.



φ—The removal rate of chlorine



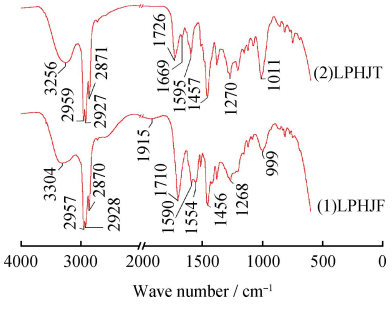
Q_e—The adsorptive capacity of chlorine

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0626-0634 **doi**: 10.3969/j.issn.1001-8719.2021.03.018

Storage Stability of Liquid-Phase Hydrogenating Jet Fuels

PAN Guangcheng CHEN Qingling JIANG Lei TANG Rulin TAO Zhiping

Storage stability of the liquid-phase hydrogenating jet fuels was invested according to the No.3 jet fuel national standard. The unstable components show significant negative effects on the thermal stability of liquid-phase hydrogenating jet fuels during storage, which are mainly phenol, carboxylic acid or ketone, heavy aromatics and polymers, etc., except for a small amount of sulfur-containing and nitrogen-containing compounds.

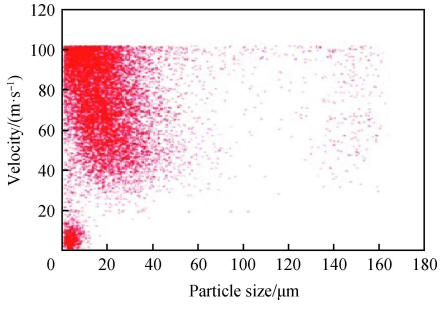


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0635-0641 **doi**: 10.3969/j.issn.1001-8719.2021.03.019

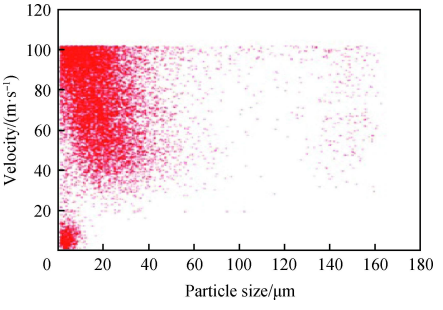
Effects of Detergents on the Spatial Distribution of Diesel Atomizing Droplets

ZHONG Liang ZHU Min

The law of distribution of diesel atomization under detergents was investigated by PDA. The results show that detergents could improve the capabilities of diesel atomization droplets under different pressures, and the attenuation of droplets with detergents is faster than that of droplets without detergents at far positions from nozzle.



p=20 MPa; w(Detergent)=1000 μg/g; Axial position: 0 mm



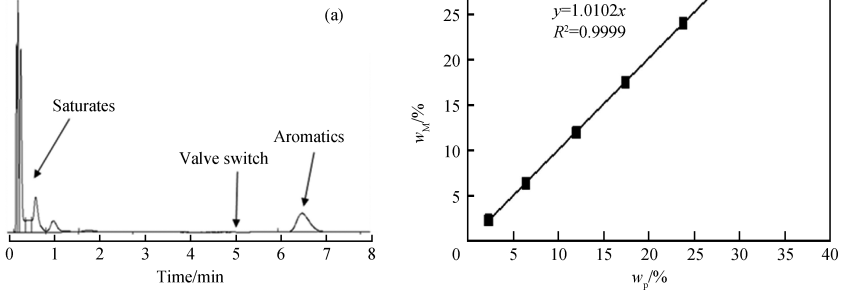
p=20 MPa; w(Detergent)=1000 μg/g; Axial position: 12 mm

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0642-0652 **doi**: 10.3969/j.issn.1001-8719.2021.03.020

Determination of Aromatics in Jet Fuel by Gas Chromatography With Reversible Adsorption-Desorption Materials

SHI Yanqiang XU Guangtong CHANG Chunyan ZHANG Zhihua TAO Zhiping

Gas chromatography (GC) with column packed with reversible adsorption-desorption materials for aromatics was used to analyze total aromatics in jet fuel. The accuracy and repeatability of GC method can satisfy the requirement of jet fuel quality control. The proposed GC method can significantly improve analysis efficiency.



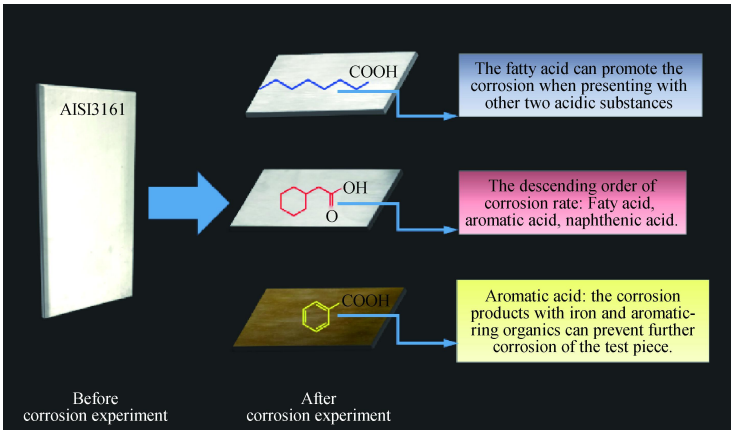
(a) Separation chromatogram of saturates and aromatics in jet fuel;

(b) Linear correlation between measured aromatic mass fraction (w_M) and prepared aromatics standard mass fraction (w_P) in sample No. 8—15

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0653-0661 **doi**: 10.3969/j.issn.1001-8719.2021.03.021

Corrosivity and Interactions of Different Acidic Species in Petroleum Fractions

GE Lin LÜ Ya JIA Lingyan

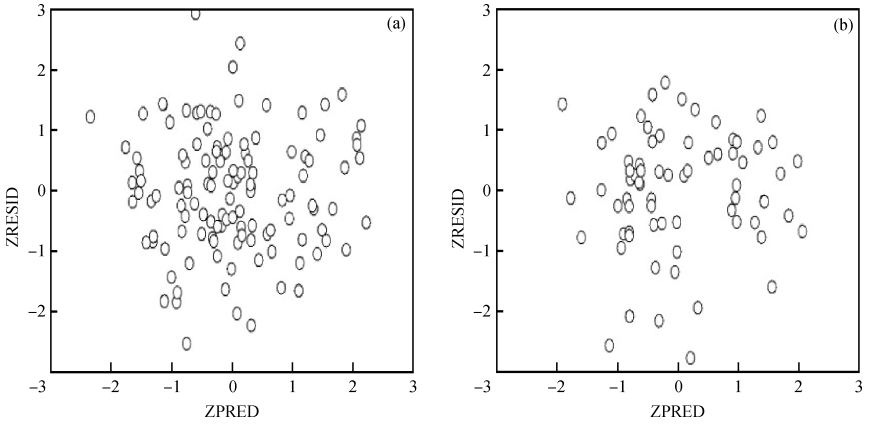


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0662-0668 **doi**: 10.3969/j.issn.1001-8719.2021.03.022

Regression Model of FCC Feedstock and Liquid Products Hydrogen Content

CUI Shouye

The standardized residual of the regression are independent on the variable value level, and there are almost no outliers, indicating that the regression models are relatively ideal. The constructed model could be used to predict the hydrogen mass fraction of FCC feedstock and liquid products quickly and effectively.



ZRESID—Standardized residual scatter; ZPRED—Standardized predicted value

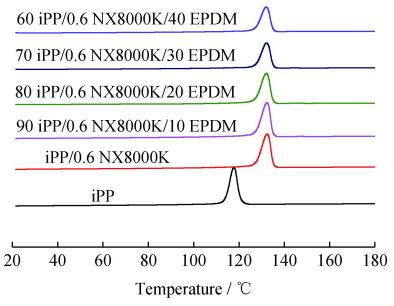
(a) Feedstock; (b) Gasoline

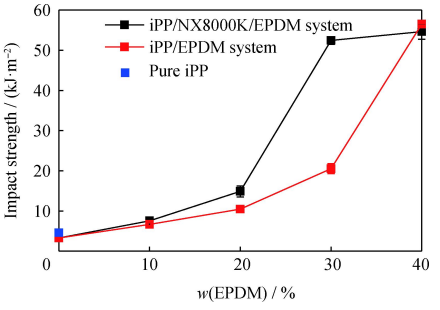
Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0669-0676 **doi**: 10.3969/j.issn.1001-8719.2021.03.023

Effects of EPDM and NX8000K on the iPP Structure and Performance

WANG Mengke LUO Faliang YIN Jiajie LI Lei JIN Zhengwei

When the NX8000K mass fraction is 0.6% and EPDM has a higher mass fraction being 40%, the crystallization temperature of iPP/EPDM/NX8000K still reaches 132.0 ℃, and the relative crystallinity is 53.5%. Moreover, when EPDM mass fraction is 30%, the impact strength of iPP/EPDM/NX8000K reaches 52.4 kJ/m^2, which is 2.6 times of the corresponding iPP/EPDM binary blend.



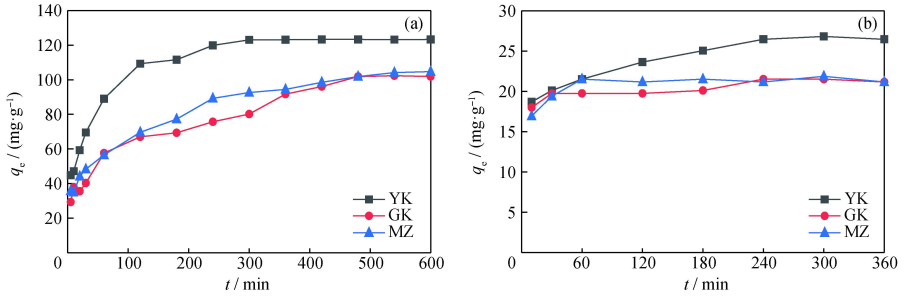


Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0677-0689 **doi**: 10.3969/j.issn.1001-8719.2021.03.024

Adsorption Characteristics of Dissolved Oil on Granular Activated Carbon in Groundwater

SUN Juan WANG Ning SONG Quanwei CHEN Hongkun YANG Xiaoqing ZHENG Xiuzhi ZHAO Chaocheng LIU Fang

The adsorption process of 40—60 mesh coconut shell activated carbon for dissolved diesel oil and crude oil in groundwater follows Lagergren pseudo second order kinetic equation. Salinity has little effects on the adsorption of dissolved oil, and the optimal pH value and temperature are 7 and 25 ℃ respectively.



(a) 0# diesel oil, m(Activated carbon)=0.1 g; (b) Venezuelan crude oil, m(Activated carbon)=0.015 g
V(Groundwater)=100 mL; T=20 ℃; r=135 r/min; Particle size of activated carbon: 40—60 mesh;
The initial mass fractions of diesel oil and crude oil are 123.70 and 4.67 mg/L, respectively.

Reviews

Acta Petrolei Sinica (*Petroleum Processing Section*), 2021, 37(3): 0690-0699 **doi**: 10.3969/j.issn.1001-8719.2021.03.025

Research Progress in the Mechanism of Light Alkane Aromatization

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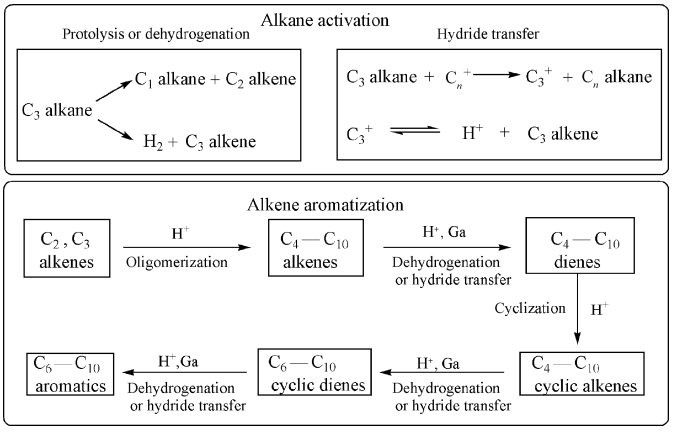
The pathways of light hydrocarbon aromatization can be divided into alkane activation and alkene aromatization. During alkane activation, alkanes are converted to alkene by protolysis, dehydrogenation or hydride transfer reaction. Then, alkenes are finally converted into aromatics through oligomerization, cyclization, cyclization and other reactions.



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Research Progress in Chemical Looping Gasification Technology of Organic Solid Waste

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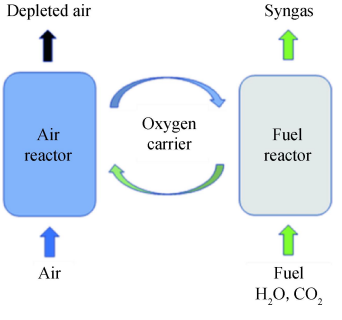
The combination of chemical looping gasification (CLG) with organic solid waste treatment enriched the means of organic solid waste resource and energy utilization. This article takes the types of organic solid wastes, oxygen carriers (OC) types and reaction devices as examples to systematically summarize the current status of CLG treatment of organic solid wastes, and prospects for its future research directions.



特约英文编审:范志明,加拿大不列颠哥伦比亚大学化学及生物工程博士,先后在加拿大自然资源部及加拿大国家研究院工作,现供职 BP 美国公司,研究领域包括重质油加工、石油加工过程中沥青质沉淀及石油化学等。

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