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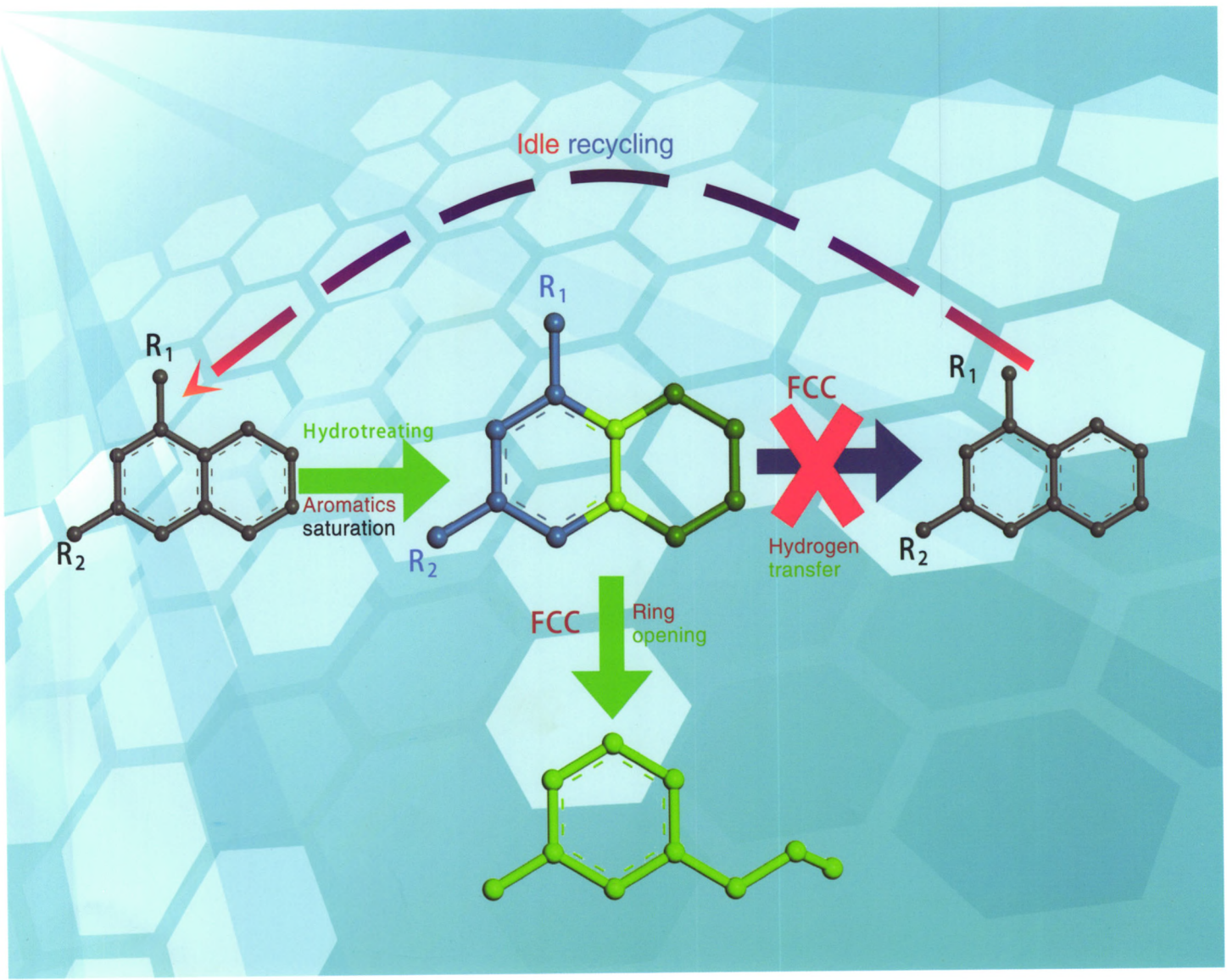
ACTA PETROLEI SINICA
(PETROLEUM PROCESSING SECTION)



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（石油加工）

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* 封面文章

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ACTA PETROLEI SINICA

(PETROLEUM PROCESSING SECTION)

Vol. 32 No. 5 Oct. 2016

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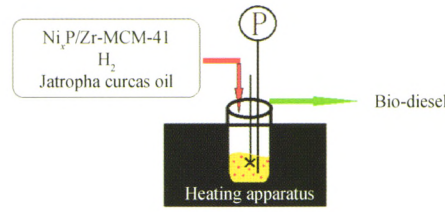
Research Articles

Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 891-897 **doi**: 10.3969/j.issn.1001-8719.2016.05.004

Preparation, Characterization and Catalytic Performance of the New Catalysts Ni_xP/Zr-MCM-41

GUO Wei CAO Yang LI Jin LUO Nan ZHAO Ziwei

Ni_xP/Zr-MCM-41 catalysts were synthesized by co-impregnation, calcination, the temperature program reduction(H_2-TPR) and passivation. The bio-diesel was produced from hydrodeoxygenation of jatropha curcas oil catalyzed by Ni_xP/Zr-MCM-41 under the reaction temperature of 350℃ and the reaction pressure of 4.0 MPa.

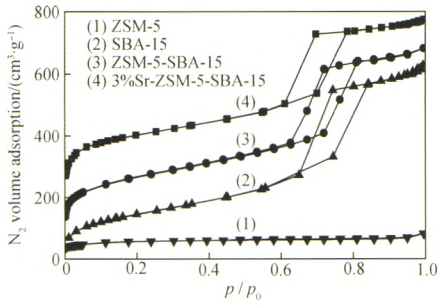


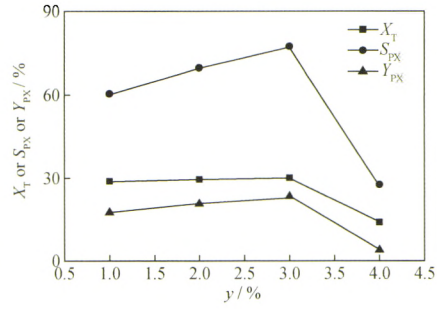
Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 898-905 **doi**: 10.3969/j.issn.1001-8719.2016.05.005

Preparation of Sr-ZSM-5-SBA-15 Composite Molecular Sieves

ZHAN Jinyou ZHANG Lulu SUN Yao SHEN Jian WANG Lei

The micro-mesoporous composite molecular sieve of Sr-ZSM-5-SBA-15 was first synthesized successfully, and applied to catalyze the alkylation reaction of toluene with methanol. It was observed that 3% Sr-ZSM-5-SBA-15 prepared at crystallization time of 20 h, acid content of 40 mL and calcination temperature of 550℃ exhibited the best alkylation catalytic performance.



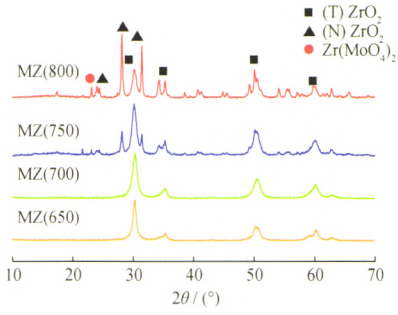


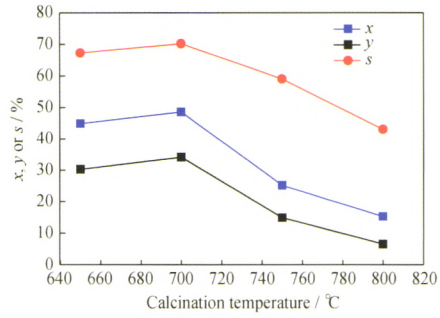
Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 906-912 **doi**: 10.3969/j.issn.1001-8719.2016.05.006

Effects of Calcination Temperature on the Structure of MoO_3-ZrO_2 and Its Isomerization Catalytic Performance

WU Wenyu WANG Zhe BAI Yingzhi WANG Haiyan MA Jun

With CTAB and PS emulsion as a composite template, MoO_3-ZrO_2 composite oxide with macropores and disorderly piled mesopores was prepared by hydrothermal synthesis, and applied to catalyze *n*-hexane isomerization. The influences of calcination temperature on the properties of catalyst was examined, and it is found that the optimum calcination temperature was 700℃.





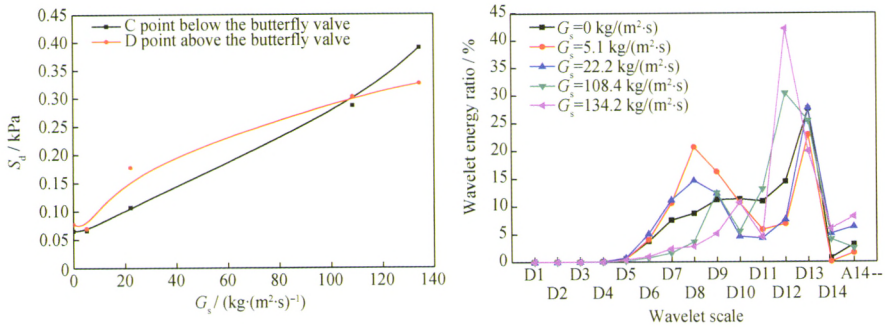
T=350℃; p=2.5 MPa; MSHV=1.0 h^{-1}; $n(H_2)/n(n\text{-}C_6)$=4

Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 913-920 **doi**: 10.3969/j.issn.1001-8719.2016.05.007

Characteristics of Pressure Fluctuations in the Particle-Transport Inclined Standpipe of a Circulating Fluidized Bed

CAO Xiaoyang ZHOU Faqi CHEN Yong ZHANG Huimin WEI Zhigang WEI Yaodong

The standard deviation of the dynamic pressures below the butterfly valve possessed a linear relation with the solid mass flux, which could be used to characterize the real-time dynamic pressures in the inclined standpipe. There existed a main frequency and a secondary frequency in pressure fluctuations.

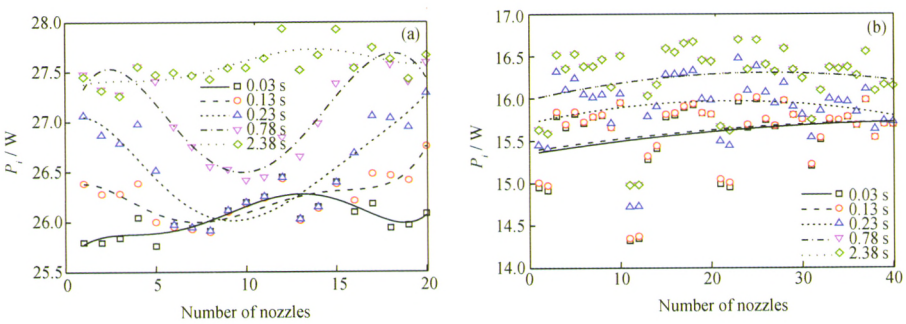


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 921-929 **doi**: 10.3969/j.issn.1001-8719.2016.05.008

Temperature Distribution During Pre-Heating Process in a 0.12 t/d Oil Shale Retorting Reactor

QIN Hong LI Weiwei ZHANG Lidong LIU Yunyu LIU Hongpeng WANG Qing LIU Bin

The temperature distribution in retorting reactor depends on the jet nozzle heating power and gas flow field in furnace. For nozzles of wall, the power variations of jet nozzle No. 5—15 are the greatest. As for centre nozzles, the distribution of heating power is similar to that of gas flow.

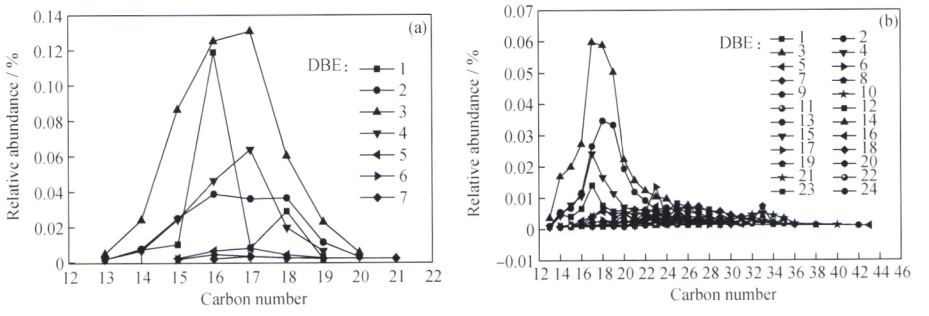


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 930-934 **doi**: 10.3969/j.issn.1001-8719.2016.05.009

Effect of Oxidation on Long-Term Storage Stability of Visbreaking Products

ZHANG Na

The viscosity increase of visbreaking product was inhibited and the long-term storage stability of the visbreaking product was improved by adding antioxidant T501 and DPA. The oxidation of visbreaking product resulted in the increase of naphthenic acid type and more amount of polycyclic naphthenic acid.



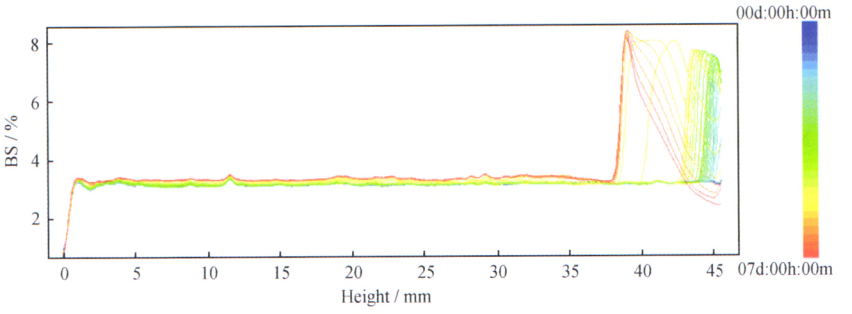
Storage time/d: (a) 0; (b) 90

Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 935-942 **doi**: 10.3969/j.issn.1001-8719.2016.05.010

Effect of Dispersants on the Properties of PCWS

SUN Meijie ZHENG Jianping CHU Tiancheng LU Chao CAO Zhihua

In view of the present situation of poor stability of petroleum coke water slurry(PCWS) and the relatively backward research methods, the influence of dispersant on the stability of PCWS was studied by using standing observation and Turbiscan Lab stability analyzer methods.

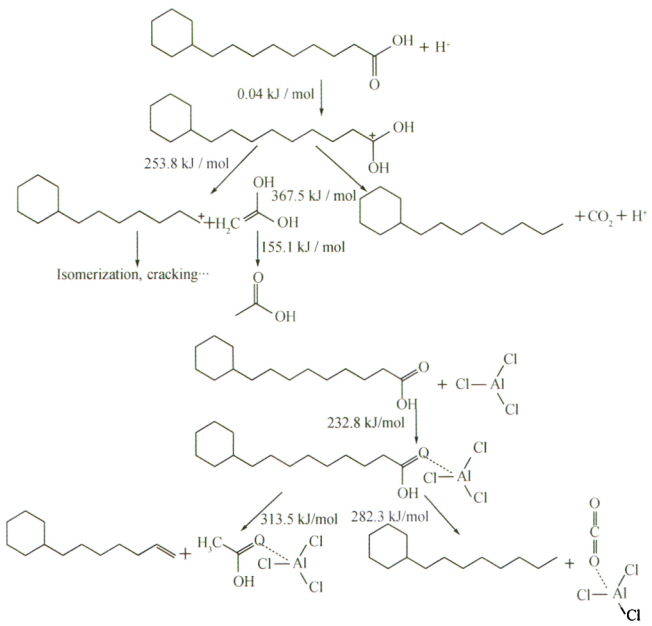


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 943-950 **doi**: 10.3969/j.issn.1001-8719.2016.05.011

Study on the Mechanism of Catalytic Decarboxylation of Naphthenic Acid

YE Weizhen LONG Jun ZHAO Yi DAI Zhenyu ZHOU Han

From the comparison of energy barriers for the two reaction paths in the presence of B acid and L acid, it is found that 9-cyclohexylnonanoic acid was more likely to generate small acid in the presence of B acid, while more likely to generate CO_2 in the presence of L acid.

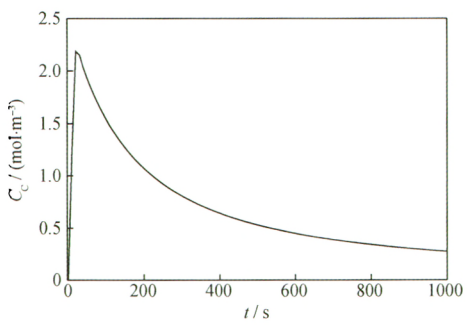


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 951-958 **doi**: 10.3969/j.issn.1001-8719.2016.05.012

Numerical Simulation of the Carbon Deposition Effect in Tubular Fixed Bed Methane Reforming Reactor Over Ni-Catalyst

CAO Jun ZHANG Li XU Hong XING Yaohua

As the reaction rate and catalyst activity are both larger at the beginning, the concentration of movable coke at the exit of reaction channel is higher, however, with the prolong of reaction time, the concentration of movable coke decreases as the reaction rate decreases.

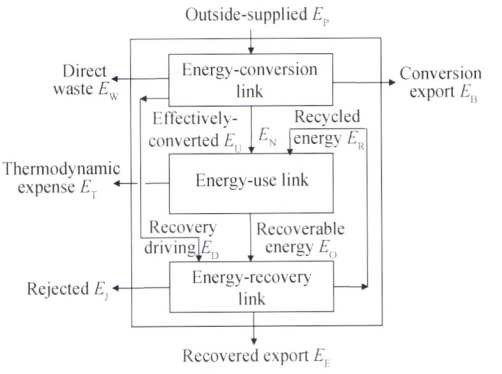


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 959-966 **doi**: 10.3969/j.issn.1001-8719.2016.05.013

Energy-Use Analysis and Optimization of a Toluene Disproportionation and Transalkylation Unit

CHEN Ting CHEN Qinglin

With the three-link energy structural model, in which the common law of energy structure in the process system was revealed, the total system was divided into three links (sub-systems) with different functions according to the changing course of energy, i.e. energy-conversion link, energy-use link and energy-recovery link.

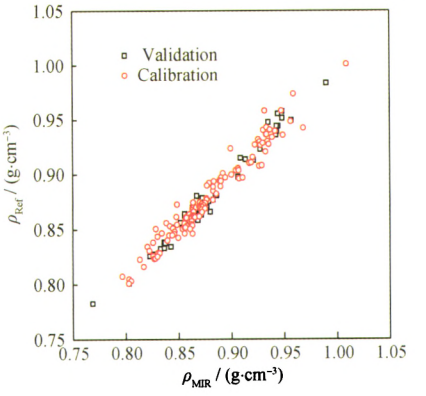


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 967-973 **doi**: 10.3969/j.issn.1001-8719.2016.05.014

Application of Nonlinear Algorithm Based on Kernel Methods in Fast-Evaluation of Crude Oil

LI Jingyan CHU Xiaoli TIAN Songbai

The calibration models of density, TAN and sulfur mass fraction were established by Least squares support vector machines (LSSVM) and Kernel partial least squares(KPLS), by which the predicted results were very close to those determined by standard methods. Compared with classic PLS algorithm, the KPLS showed high predictive accuracy, LSSVM method provided the advantages such as high-speed, simplicity, and high precision.

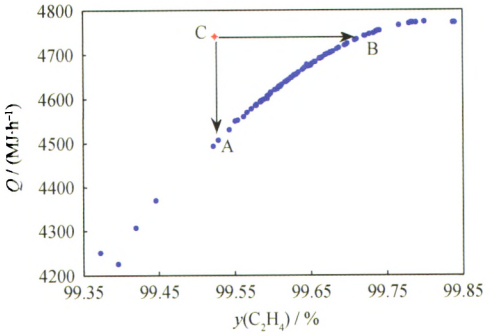


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 974-980 **doi**: 10.3969/j.issn.1001-8719.2016.05.015

Multi-Objective Optimization of the Demethanization System Based on PSO Algorithm

SUN Xiaoxing SU Chengli LI Ping

An effective improved PSO algorithm for optimization and operation of the demethanization system was proposed. The optimization results demonstrated that by using the improved algorithm the required ethylene yield would be maintained and further the energy consumption would be reduced. And a theoretical basis for the optimization of other separation processes was provided.

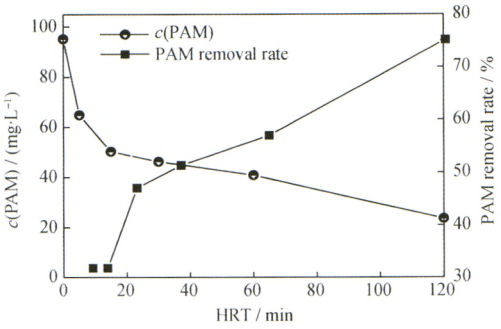


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 981-986 **doi**: 10.3969/j.issn.1001-8719.2016.05.016

Degradation of Polymer-Contained Sewage by Fe Chelate-UV Catalytic Ozonation Process

WANG Song YU Zhongchen ZHONG Liubo HAN Lu NIU Yuanlin LI Zhuan WU Jiang

The polyacrylamide (PAM) wastewater could be treated by complex formed by EDTA and Fe(II) catalytic ozone. The PAM removal rate of 100 mg/L PAM solution reached 75% under the conditions of the gas phase ozone mass concentration of 4.5 mg/L, EDTA molar concentration of 0.050 mmol/L, Fe(II) molar concentration of 0.050 mmol/L and HRT of 120 min.



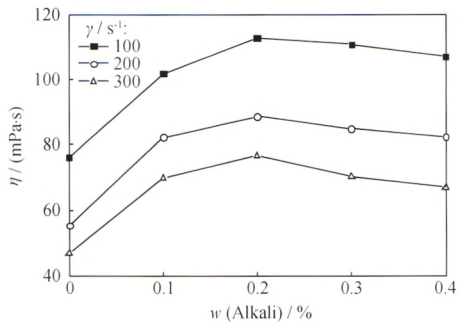
Research Notes

Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 987-996 **doi**: 10.3969/j.issn.1001-8719.2016.05.017

Influencing Factors and Prediction Model of Apparent Viscosity of Heavy Oil O/W Emulsion

SUN Nana JING Jiaqiang JIANG Huayi QI Hongyuan JIANG Xuantao

The formulated alkali possessed a positive synergistic effect with surfactant at low alkali content, by which an increasing amount of petroleum soap was obtained. In addition, triethanolamine (TEOA) is a compound of surface-active small molecule, which can form a cross-multiple adsorptive and hydrogen bonding structure with the surfactant and petroleum soap.

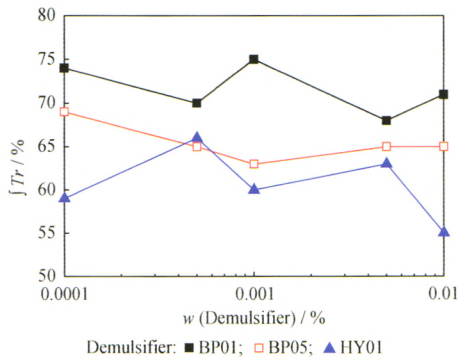


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 997-1004 **doi**: 10.3969/j.issn.1001-8719.2016.05.018

Study on the Emulsion Stability of Shengli Oilfield Chunliang Crude Oil

CAO Jiahua XU Zhicheng GONG Qingtao JIN Zhiqiang ZHANG Lei ZHANG Lu

The linear demulsifier BP01 has effective ability to destroy the crude emulsion at low content, and the demulsifier PA05 with branched structure has weaker effect than BP01, while the cationic reversed-phase demulsifier HY01 has little effect on the stability of crude emulsion.

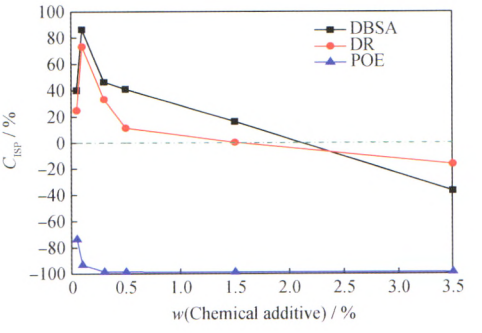


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 1005-1012 **doi**: 10.3969/j.issn.1001-8719.2016.05.019

Dispersion and Stabilization Effectiveness of Chemical Additives on Asphaltene

LI Cheng WANG Xiaowei TIAN Songbai

After adding POE, C_{ISP} of THVR asphaltene samples decreased more than 73%, indicating that their stability increased greatly. The optimal addition amount of POE was 0.05% within the experimental range. The samples with lower addition amount of DBSA or DR got $C_{ISP}>0$, meaning that DBSA and DR acted as flocculating and sedimentation agent, while at higher addition amount of DBSA or DR, they acted as dispersants for asphaltene with the $C_{ISP}<0$.

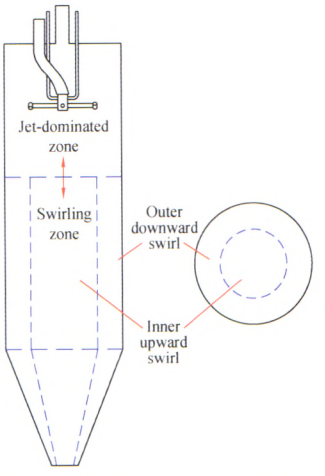


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 1013-1019 **doi**: 10.3969/j.issn.1001-8719.2016.05.020

Effect of Nozzle Position on the Flow Behavior in a Spray Tower

FENG Liuhai ZHAO Fan LIU Meili SHENG Wenjun ZUO Jing MAO Yu

Two distinct zones in the jet-driven swirling flow of spray tower are observed, one is the jet-dominated zone with a complex flow distribution, the other is the swirling zone with a regular flow. The structural parameters of the spray tower have a great effect on the velocity distribution. A general flow pattern is summarized based on the experimental flow field.

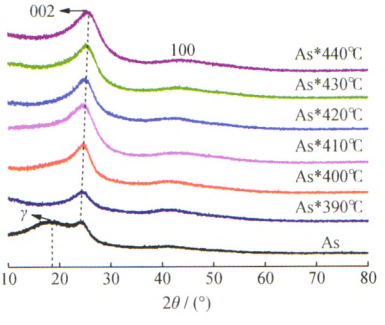


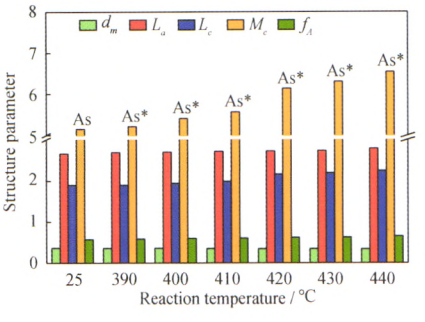
Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 1020-1029 **doi**: 10.3969/j.issn.1001-8719.2016.05.021

Influence of Reaction Temperature on the Hydrothermal Cracking of Deasphalted Oil

HONG Kun MA Fengyun LIU Jingmei ZHONG Mei

With the reaction temperature increasing, the alkyl side chain joined to aromatic rings in As* broke off gradually, so that γ peak disappeared and 002 peak became sharp, meanwhile, the poly-condensation of aromatic nucleus also caused the decrease of d_m, and then L_a, L_c, f_A and M_c much larger.



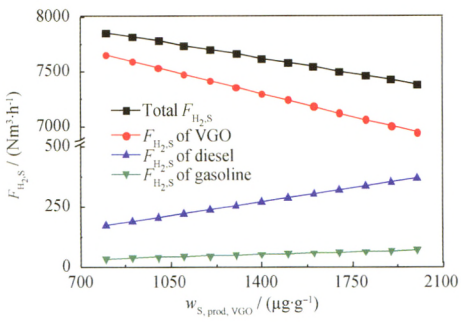


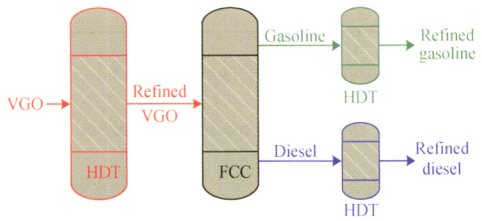
Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 1030-1037 **doi**: 10.3969/j.issn.1001-8719.2016.05.022

Analysis of Effects of Hydrogenation on Hydrogen Consumption of Hydrotreating System in a Refinery

WU Le TANG Jieguo ZHU Qiang LIU Yongzhong

The hydrogen consumption of desulfurization in gasoline HDT unit and diesel HDT unit increase with the increase of sulfur content in refined VGO, while the hydrogen consumption of desulfurization in the VGO HDT unit reduces and the total hydrogen consumption of desulfurization in the proposed system decrease. Therefore, the increase of sulfur content in refined VGO causes the reduction of hydrogen consumption of desulfurization in the proposed system, which can make full use of the desulfurization of FCC unit.



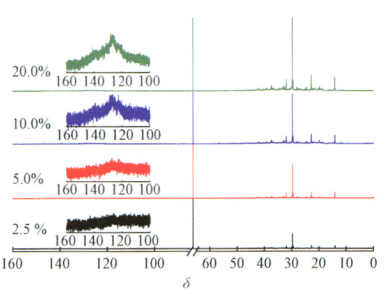


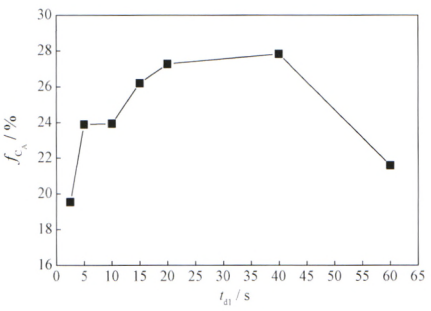
Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 1038-1044 **doi**: 10.3969/j.issn.1001-8719.2016.05.023

Analysis for Chemical Structure of Heavy Crude Oil by NMR

YANG Liqing HUANG Shaokai TIAN Songbai ZHOU Jian GAO Xiuzhi WANG Jing

In ^{13}C-NMR experiment, the appropriate sample mass fraction was 10.0% and delay time was 5.0 s under 30° pulse angle. Furthermore, experimental standard deviation of six repeated experiments of ^{1}H-NMR and ^{13}C-NMR were 0.86% and 1.36%, respectively. The accuracy of ^{1}H-NMR and ^{13}C-NMR analysis method were both within ±10%.



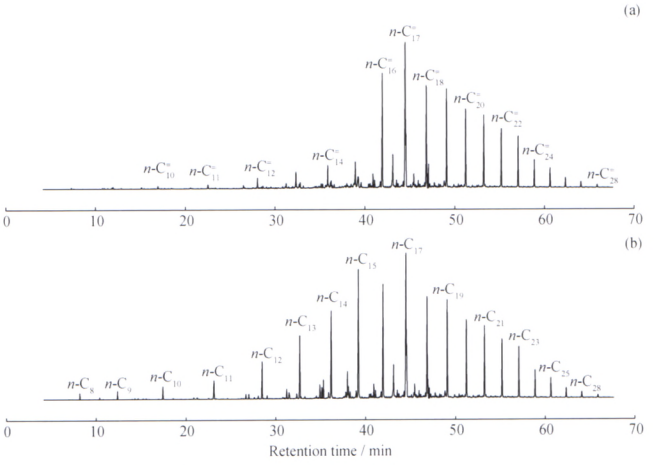


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 1045-1054 **doi**: 10.3969/j.issn.1001-8719.2016.05.024

Spectra Analysis on Structure of Wangqing Shale Oil

WANG Qing JI Tuo CHI Mingshu CUI Da

The Wangqing shale oil was divided into light oil (<300℃) and heavy oil (>300℃). GC-MS was used to analyze the chemical composition of light oil, and FT-IR, ^{1}H and ^{13}C NMR were used to characterize the chemical structure of heavy oil. The obtained molecular fragment information will be combined to provide the basic data for average molecular model of the kerogen, pyrolysis mechanism of the oil shale and the analysis of reaction process.



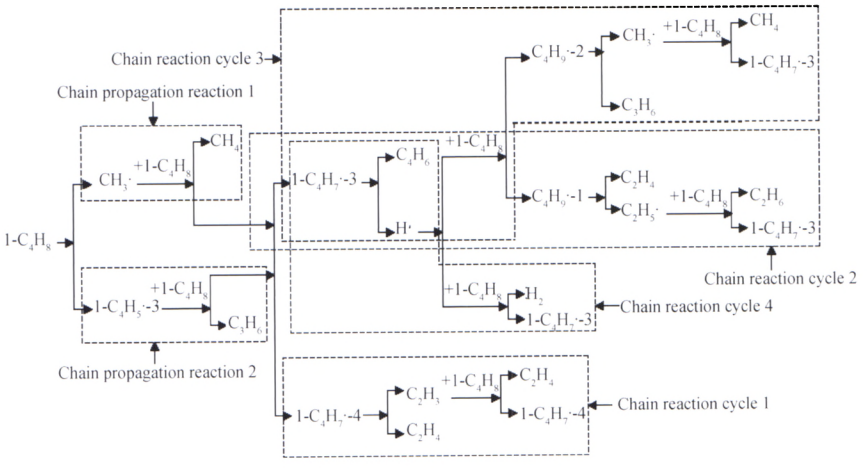
(a) *n*-Alkenes, $m/z=97$; (b) *n*-Alkanes, $m/z=85$

Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 1055-1061 **doi**: 10.3969/j.issn.1001-8719.2016.05.025

Numerical Simulation on Reaction Mechanism of 1-Butene Pyrolysis

LI Jinlian ZHANG Hongmei LI Chunxiu SUN Wei HAO Yulan ZHAO Liang ZHAO Jingying

Through the integration of the Materials studio software and the Aspen plus software, free-radical mechanism of 1-butene thermal cracking is studied by molecular simulation technique. The research results showed that four chain reaction cycles and two chain propagation reactions may occur in 1-butene thermal cracking.

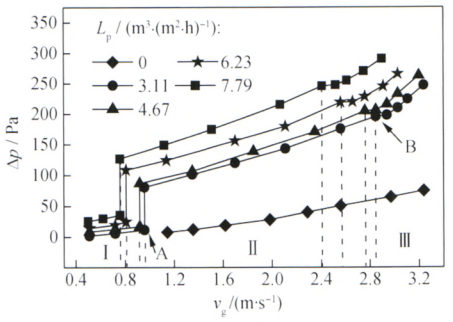


Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 1062-1067 **doi**: 10.3969/j.issn.1001-8719.2016.05.026

Hydrodynamics of a Venturi-Rod Spray Tower

WANG Xincheng SUN Guogang WANG Xiaohan ZHANG Yuming
LI Shouzhuang

Comparing with the grid tray tower and the sieve tray tower, the Venturi-rod tower has the advantages of lower resistance and wider operating range. The hydrodynamics performance of the Venturi-rod tower was systematic studied, and relevant formulas were fitted.



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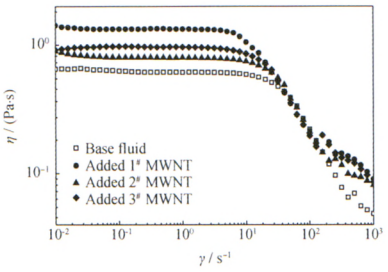
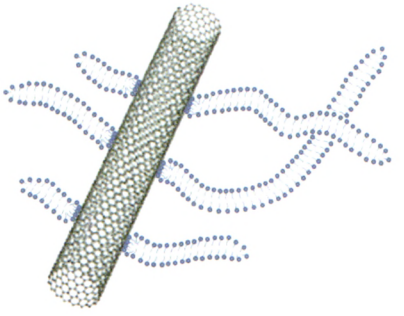
Effect of Carbon Nanotubes on Rheological Properties of Wormlike Micelle Solution

QIN Wenlong YUE Lei JIA Shuai YANG Jiang

The addition of multi-walled carbon nanotubes with high —OH mass fraction and large aspect ratio to cationic wormlike micelle solution could significantly enhance the viscoelasticity and thermal stability of mixture solution, because a more complex three-dimensional network structure was formed by interaction of carbon nanotubes and wormlike micelle.



$T=50℃$; w(CTAC)=2.0%; w(NaSal)=1.0%; w(MWNT)=0.4%



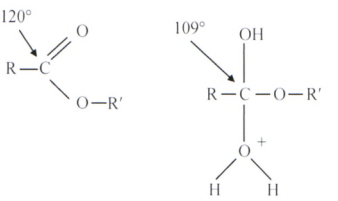
Reviews

Acta Petrolei Sinica (*Petroleum Processing Section*), 2016, 32(5): 1075-1082 **doi**: 10.3969/j.issn.1001-8719.2016.05.028

Research Status of Hydrolysis Performance of Synthetic Ester Lubricating Oil

MA Haihong MA Rui LI Weimin WANG Xiaobo LIU Weimin

The hydrolysis mechanisms, test methods, influencing factors and inhibition methods of synthetic ester were summarized. It is found that optimizing the structure and increasing the purity of synthesis ester as well as addition of hydrolysis inhibitors were effective methods to enhance the hydrolytic stability of the ester.



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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, 010-82368282

传真:010-82368697

网址:www. syxbsyjg. com

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

syxb8282@163. com

执行主编:李才英

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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

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Deputy Editor in Chief: Feng Weisun Hu Xiaochun

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