石 油 学 报

（石油加工）

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ACTA PETROLEI SINICA

(PETROLEUM PROCESSING SECTION)

Vol. 27 No. 1 Feb. 2011

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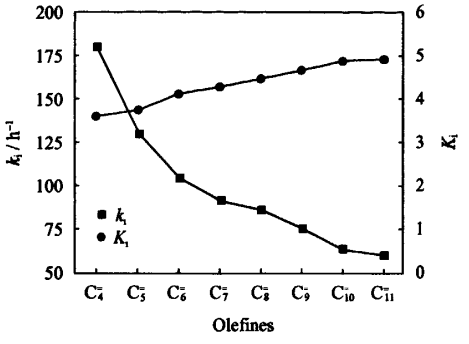
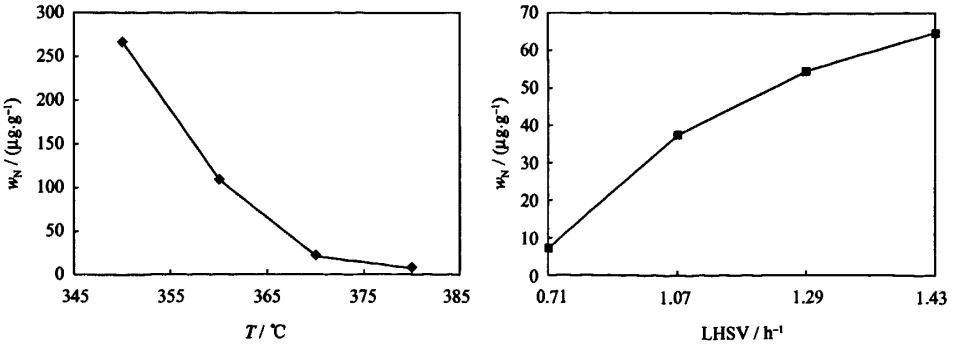
Research Articles



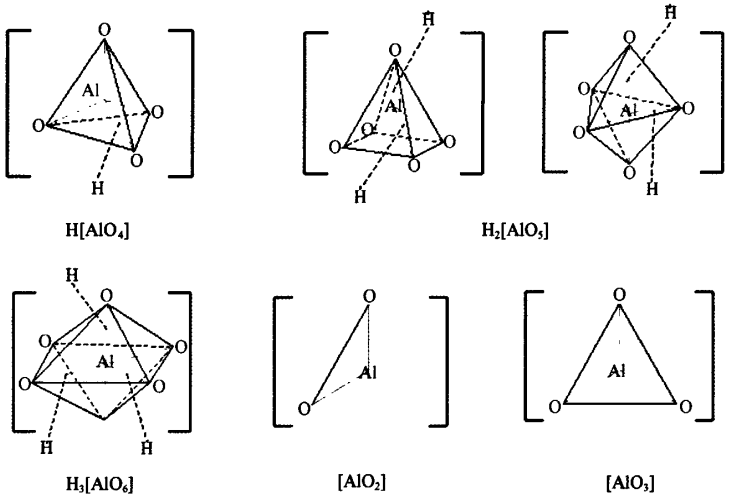


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 11-19 **doi**: 10.3969/j.issn.1001-8719.2011.01.003

Formation and Structural Characteristics of Acidic Centers of Silica-Alumina Catalyst

HE Zhenfu DAI Zhenyu LONG Jun

The catalytic activity of silica-alumina catalyst heavily depends on its acidic properties. The silica-alumina catalyst has three kinds of Brønsted acid centers and two kinds of Lewis acid centers. One 4-coordinated Brønsted acid center can provide one hydrogen proton. One 5-coordinated Brønsted acid center can provide two hydrogen protons. One 6-coordinated Brønsted acid center can provide three protons. The [AlO_2] unit is a 2-coordination Lewis acid center, and the [AlO_3] unit is a three-coordination Lewis acid center.

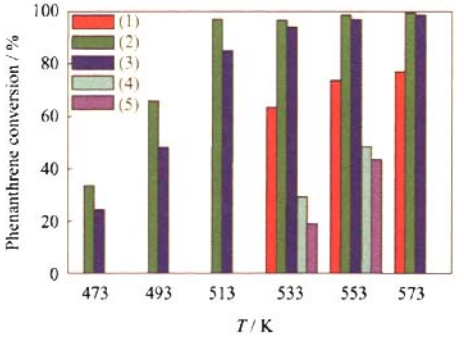


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 20-25 **doi**: 10.3969/j.issn.1001-8719.2011.01.004

Hydrogenation of Phenanthrene Over Different Catalysts

LI Huifeng LIU Feng LIU Zelong LI Mingfeng NIE Hong

Compared with $CoMo/Al_2O_3$, $NiMo/Al_2O_3$ and NiW/Al_2O_3 exhibit higher activity in phenanthrene hydrogenation moreover, $NiMo/Al_2O_3$ shows better hydrogenation activity than NiW/Al_2O_3 at relatively lower reaction temperatures, which is mainly due to the difference of the promoting effect of Ni and Co on Mo (W).



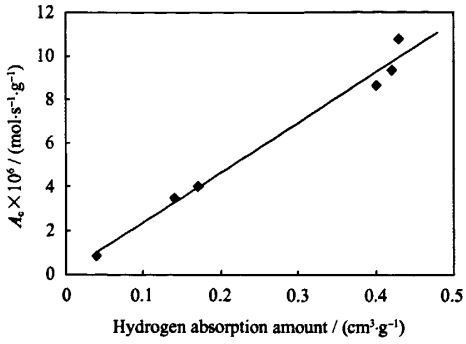
(1) $CoMo/Al_2O_3$; (2) $NiMo/Al_2O_3$; (3) NiW/Al_2O_3;
(4) Mo/Al_2O_3; (5) W/Al_2O_3

Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 26-31 **doi**: 10.3969/j.issn.1001-8719.2011.01.005

Influence of Cobalt Loading on Catalytic Performance of Co/γ-Al_2O_3 Catalysts in Fischer-Tropsch Synthesis

LUO Xi HOU Chaopeng WU Yu XIA Guofu NIE Hong

A series of Co/γ-Al_2O_3 with different Co loadings were prepared. The results showed that both the catalytic activity and the reduction extent of Co/γ-Al_2O_3 catalyst first increased then decreased with the increase of Co loading. There was a linear relationship between the catalytic activity and hydrogen absorption amount of H_2 for Co/γ-Al_2O_3 catalyst.

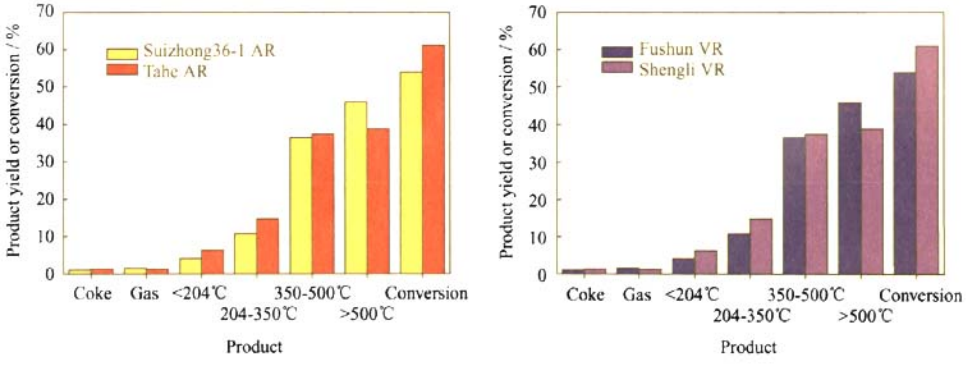


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 32-36 **doi**: 10.3969/j.issn.1001-8719.2011.01.006

Hydrotreating Reaction Performance of Different Residua

SUN Yudong YANG Chaohe SHAN Honghong ZHAO Hui SHEN Benxian

Four kinds of residue were hydrotreated in autoclave. It is demonstrated that the poor residua (high asphaltene content) have high conversion, high light oil yield, low residue yield and slightly high coke yield. Asphaltene is mainly hydrocracked to the compounds of smaller molecule in residue hydrotreating when asphaltene content is high in feedstock.

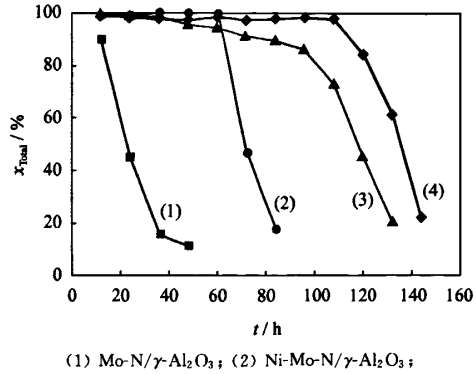


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 37-41 **doi**: 10.3969/j.issn.1001-8719.2011.01.007

Synthesis and Hydrodeoxygenation Activity of Mo, Ni-Mo Nitride and Carbide Supported on γ-Al_2O_3

ZHANG Wei ZHANG Ye ZHAO Liangfu WEI Wei

Mo and Ni-Mo nitride and carbide catalysts were synthesized by means of temperature-programmed reaction. The hydrodeoxygenation (HDO) performance of the catalysts was investigated by using ethyl benzoate as a model compound. The results indicated that both the nitride and carbide catalysts exhibited high activities for HDO of ethyl benzoate, but carbide was superior to nitride in stability.



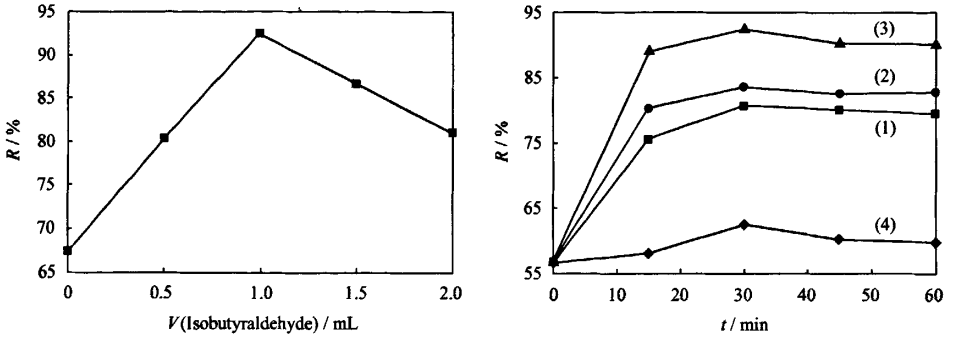
(1) Mo-N/γ-Al_2O_3; (2) Ni-Mo-N/γ-Al_2O_3; (3) Mo-C/γ-Al_2O_3; (4) Ni-Mo-C/γ-Al_2O_3

Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 42-46 **doi**: 10.3969/j.issn.1001-8719.2011.01.008

Deep Oxidation Desulfurization of FCC Gasoline With Ferrous Sulfate/Isobutyraldehyde/Formic Acid/Hydrogen Peroxide System

LIN Peng GUO Wei WANG Chengyong LÜ Xiaoping

The oxidation desulfurization of FCC gasoline by using the system of ferrous ion / isobutyraldehyde / formic acid / hydrogen peroxide was studied. The results showed that this system greatly enhanced the oxidation desulfurization. Under particular conditions, the desulfurization rate of FCC gasoline can reach 92.39% in 30 min.



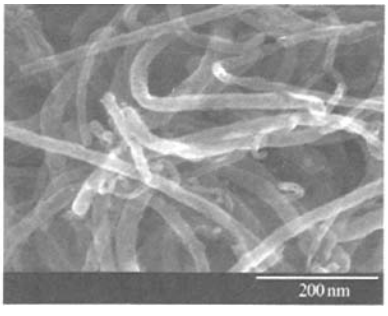
θ/℃: (1) 25; (2) 40; (3) 60; (4) 80

Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 47-53 **doi**: 10.3969/j.issn.1001-8719.2011.01.009

Catalytic Oxidation Reaction of Cyclohexane on Co_3O_4 Supported Carbon Nanotube Catalysts

JIN Haibo YUAN Weiwei GUO Zhiwu

Carbon nanotubes supported Co_3O_4 catalysts were prepared by using the method of impregnation-deposition. The effects of cobalt nitrate concentration, reaction time, system temperature, amounts of catalyst and initiator on cyclohexane oxidation reaction were investigated. Under the optimum oxidation reaction conditions, the conversion of cyclohexane oxidation was 14.2%, and the total selectivity of cyclohexanol, clohexanone and cyclohexyl hydroperoxide was 90.2%.

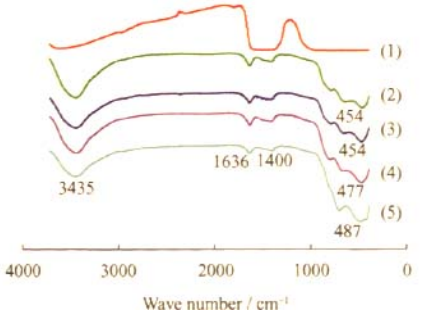


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 54-61 **doi**: 10.3969/j.issn.1001-8719.2011.01.010

Preparation of Biodiesel by Transesterification Over Fluorine-Modified Mg-Al Mixed Oxides

WU Gongde WANG Xiaoli WEI Wei SUN Yuhan

Fluorine-modified Mg-Al mixed oxides were prepared at different calcination temperatures. In the preparation of biodiesel by transesterification of soybean oil and methanol, the obtained samples exhibited much better catalytic performance than the pure Mg-Al mixed oxides, which could be ascribed to the appearance of MgF_2 species.



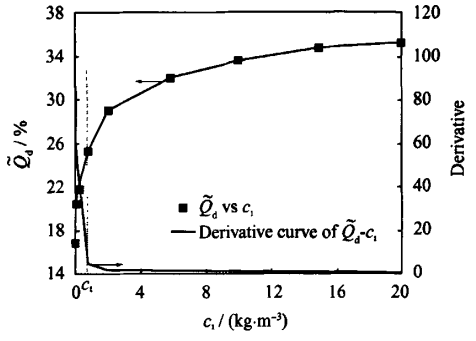
(1) $Mg_3(Al)O$-450; (2) $F/Mg_3(Al)O$-400; (3) $F/Mg_3(Al)O$-450; (4) $F/Mg_3(Al)O$-600; (5) $F/Mg_3(Al)O$-800

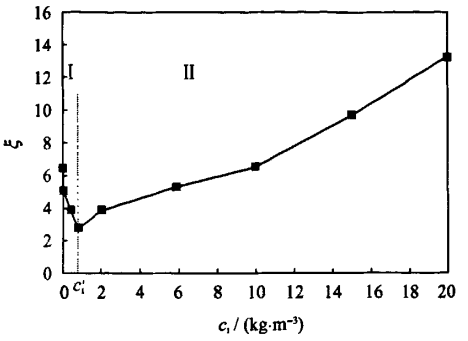
Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 62-68 **doi**: 10.3969/j.issn.1001-8719.2011.01.011

Gas-Leakage Ratio of Rough-Cut Cyclone Dipleg in FCC Disengager

LIU Shuxian SUN Guogang FU Xuan SHI Mingxian

Gas-leakage ratio of rough-cut cyclone increased with the solid concentration going from steep to mild, with turning point around concentration (c_t) of 0.8 kg/m^3, in correspondence with the concentration-pressure drop relation, which was caused by the wrapping function of agglomerated particles and the reduction on gas flow cross section by solid layer onto the wall.



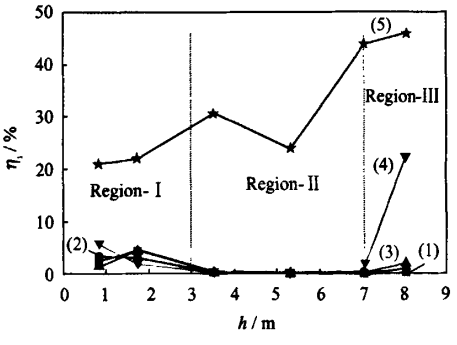


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 69-76 **doi**: 10.3969/j.issn.1001-8719.2011.01.012

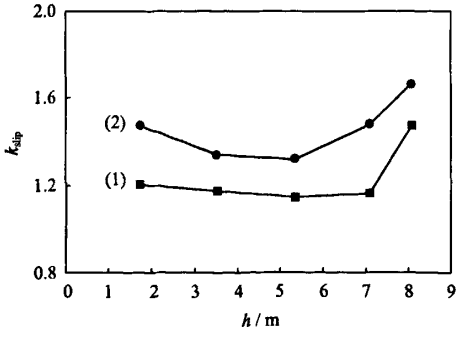
Downward Particle Distribution and Its Effects on Particle Flow in the Riser Section of Riser-Fluidized Bed Reactor

WANG Dewu LU Chunxi YAN Chaoyu

The downward particles in the outlet restriction region of the riser distributed mainly in the region close to wall with the non-dimensional radial position $r/R \geqslant 0.70$. The downward particle fraction was mainly affected by outlet restriction resistance, which increased with an increase of outlet restriction resistance.



r/R: (1) 0; (2) 0.3; (3) 0.5; (4) 0.7; (5) 0.9



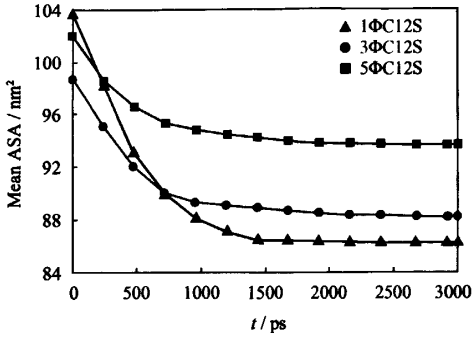
(1) Without the effect of downward particle;
(2) With the effect of downward particle

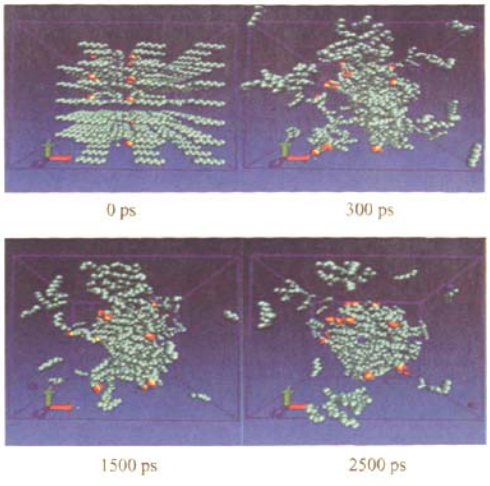
Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 77-84 **doi**: 10.3969/j.issn.1001-8719.2011.01.013

Molecular Dynamics Simulation of Anionic Surfactant Aggregation at the Interface

LIU Guoyu GU Daming DING Wei YU Tao CHENG Jiecheng

The separation process of oil-water and the properties of sodium dodecyl benzene sulfonate adsorbed at the water-oil interface were investigated by using molecular dynamics (MD) simulations, considering the variation of molecular structure and the concentration of sodium dodecyl benzene sulfonate in oil-water system.



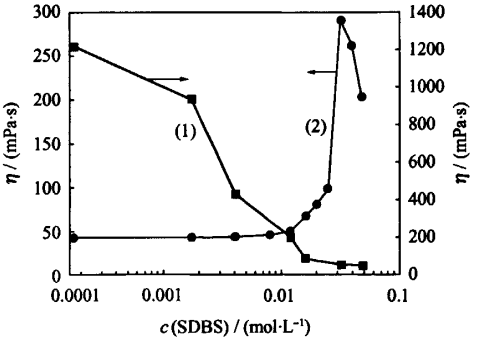


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 85-90 **doi**: 10.3969/j.issn.1001-8719.2011.01.014

Interactions Between AM-AA-AMPS Copolymer With Super-High Molecular Mass and SDBS in Aqueous Solution in the Presence of Sodium Chloride

SUN Huanquan ZHANG Yuxi LI Zhenquan CAO Xulong WU Feipeng

In the presence of sodium chloride (NaCl), acrylamide (AM)/sodium acrylate(AA)/2-acrylamido-2-methyl-1-propanesulphonate sodium (AMPS) copolymer and sodium dodecylbenzene sulphonate (SDBS) could form a complex of copolymer-SDBS with cross-linked networks in aqueous solution, which exhibited special viscosity behavior. The copolymer-SDBS complex was sensitive to temperature, with the temperature rising, the complex gradually dissolved in aqueous solution.



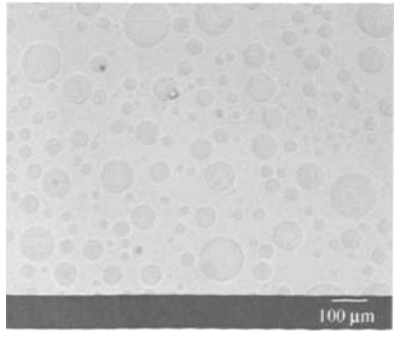
ρ(NaCl) / (g·L⁻¹): (1) 0; (2) 15

Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 91-94 **doi**: 10.3969/j.issn.1001-8719.2011.01.015

Physicochemical Properties of the Emulsions Made by Diesel, Methanol and Emulsifier

JIAO Weizhou LIU Youzhi QI Guisheng SHANGGUAN Min

By using the advanced video-microscopy technique, it is found that the droplet size of disperse phase in emulsified fuel decreased with the augment of the emulsifier amount, and almost contrary to the methanol content. The mean diameter of the disperse phase can be adjusted in the range of 12－50 μm through the control of operation conditions.

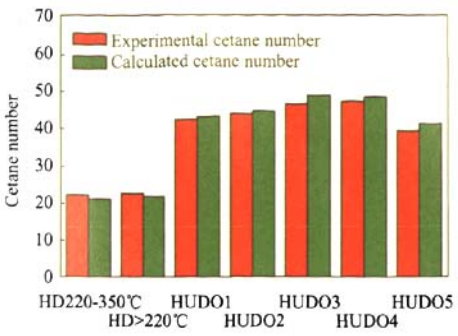


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 95-100 **doi**: 10.3969/j.issn.1001-8719.2011.01.016

Cetane Number Prediction of Shenhua Direct Coal Liquefaction Diesel Oil With Hydrocarbon Group Composition

WU Xiuzhang JIN Huannian SHI Yulin

A correlation equation between cetane number of the direct coal liquefaction diesel oil and hydrocarbon group composition was established, which could well predict its cetane number, with the absolute error of below 3 and the standard deviation of 1.47.



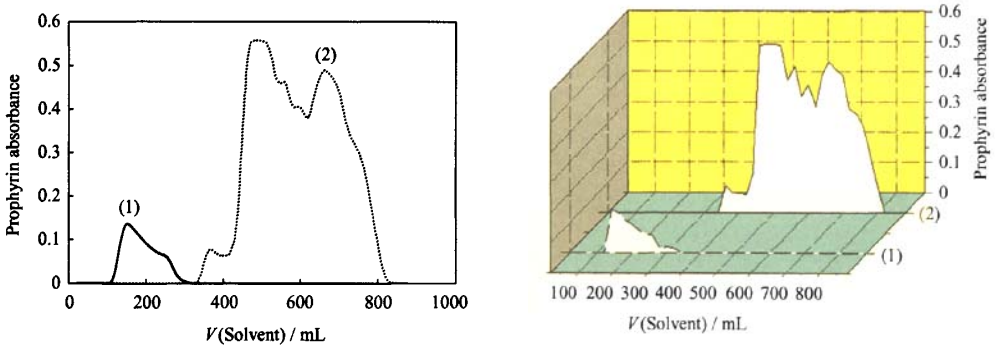
HD—Hydrogenation product, HUDO—Hydro-upgrading diesel oil

Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 101-106 **doi**: 10.3969/j.issn.1001-8719.2011.01.017

Isolation and Characterization of Vanadium Porphyrins in Venezuela Crude Oil

GAO Yuanyuan SHEN Benxian LIU Jichang

The various types of porphyrins could be separated efficiently by using silica gel column. The contents of ETIO and DPEP homologues in vanadium porphyrins of Venezuela crude oil are 80.7% and 19.3%, respectively. Furthermore, the C_{28}-ETIO and the C_{31}-DPEP show the largest abundance.



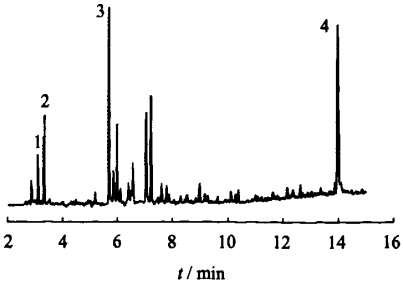
(1) Nickel porphyrin; (2) Vanadium porphyrin

Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 107-111 **doi**: 10.3969/j.issn.1001-8719.2011.01.018

Pattern Identification and Removal of Organic Chlorine in Naphtha From Liaohe Oilfield

FAN Xiuju ZHU Jianhua SONG Haifeng WU Bencheng

Organochlorines in naphtha were identified and quantified by gas chromatography with ECD. The results showed that the organic chlorines in naphtha were existed mainly in the forms of chloroform, carbon tetrachloride, tetrachloroethane and 1,2-dichlorobenzene, and their mass concentration were 0.16, 0.02, 3.32 and 4.52 mg/L, respectively.



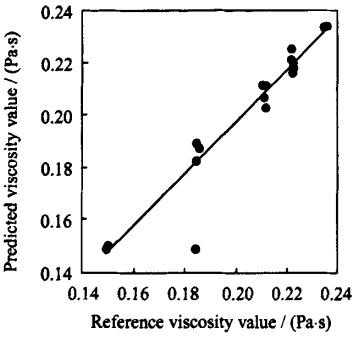
1—Chloroform; 2—Carbon tetrachloride;
3—Tetrachloroethane; 4—1,2-Dichlorobenzene

Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 112-116 **doi**: 10.3969/j.issn.1001-8719.2011.01.019

Fast and Nondestructive Detection for Viscosity of Lubricating Oil Using Visible/Near Infrared Spectroscopy

JIANG Lulu ZHANG Yu LIU Fei TAN Lihong HE Yong

Visible/near infrared spectroscopy was successfully used for the fast and nondestructive determination of viscosity of lubricating oil. The optimal calibration model was achieved by back propagation neural network (BPNN) with the principal components extracted by principal component analysis (PCA), and the correlation coefficient (r) of validation set was 0.971.

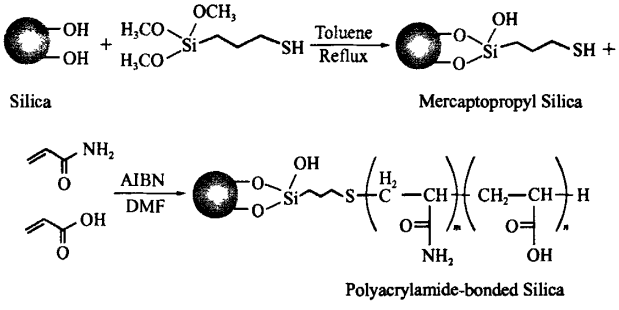


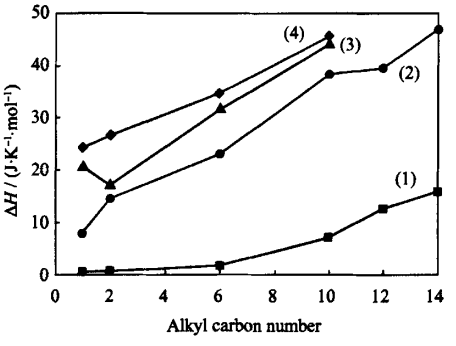
Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 117-122 **doi**: 10.3969/j.issn.1001-8719.2011.01.020

Thermodynamics of Sodium *p*-*n*-Alkylbenzene Sulfonates Surfactants on Partial Hydrolytic Polyacrylamide-Bonded Silica Stationary Phase

SUN Min LI Zhenquan SONG Xinwang LIU Xia JIANG Shengxiang

The partial hydrolytic polyacrylamide-bonded silica was prepared and used as a new stationary phase. The thermodynamics of the interaction between sodium *p*-*n*-alkylbenzene sulfonates and partial hydrolytic polyacrylamide was investigated by high performance liquid chromatography. The quantitative analysis of both their interactions and the conformational change of sodium *p*-*n*-alkylbenzene sulfonates were obtained.





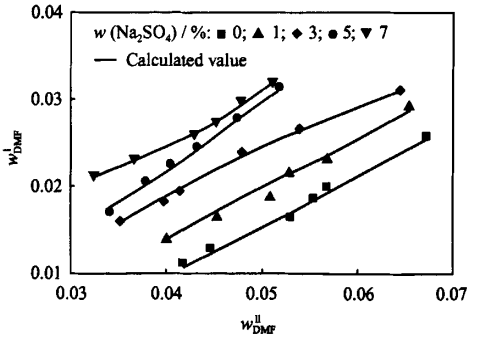
Mobile phase: (1) V(Methanol)/V(H_2O)=10/90; (2) H_2O; (3) Simulated formation water with salinity of 5700; (4) Simulated formation water with salinity of 8800

Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 123-129 **doi**: 10.3969/j.issn.1001-8719.2011.01.021

Liquid-Liquid Equilibrium for Saliniferous Wastewater Containing Low Concentration of DMF in Extraction Process

FANG Jing LI Chunli WANG Honghai LIU Jidong

Liquid-liquid equilibrium data for the saliniferous system of DMF-water-chloroform with different mass fractions of Na_2SO_4 were determined under atmospheric pressure and 293.15 K. The experimental data showed that the partition coefficient of DMF in DMF-water-chloroform system increased with the increase of Na_2SO_4 mass fraction.

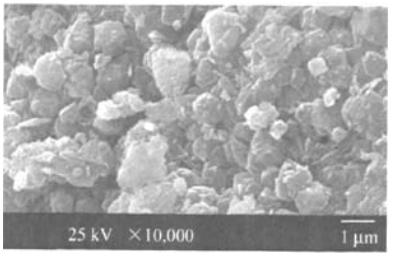


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 130-133 **doi**: 10.3969/j.issn.1001-8719.2011.01.022

In-Situ Synthesis and Characterization of NaY Zeolite From Liuyang Sepiolite

HAN Yong QIAN Dong ZHENG Shuqin HUANG Shi

NaY zeolite with a high surface area, large pore volume and high $n(SiO_2)/n(Al_2O_3)$ ratio in the framework was successfully synthesized by an *in-situ* technique under hydrothermal conditions with calcined sepiolite and metakaolin as the raw materials.

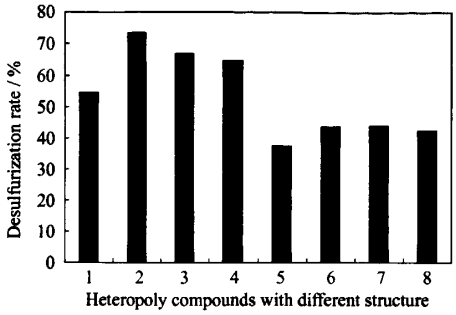


Acta Petrolei Sinica (*Petroleum Processing Section*), 2011, 27(1): 134-137 **doi**: 10.3969/j.issn.1001-8719.2011.01.023

Application of Vanadium Substituted Heteropoly Acid Catalyst in Oxidative Desulfurization Reaction

TANG Bohejin HE Wenqing LI Xiaoyi XU Wuxia XU Jingli

Dawson-type vanadium substituted heteropoly acid of $H_{12}P_2Mo_{12}V_6O_{62}$, $H_{14}P_2Mo_{10}V_8O_{62}$, $H_{15}P_3Mo_{18}V_6O_{84}$ and $H_{12}P_3Mo_{18}V_7O_{85}$ were synthesized. The oxidative desulfurization performances of the catalysts with these heteropoly acids as active components were investigated by using dibenzothiophene (DBT) as model compound. The result showed that $H_{12}P_3Mo_{18}V_7O_{85}/C$ demonstrated excellent catalytic performance in the oxidative desulfurization reaction of DBT.



1—$H_{12}P_2Mo_{12}V_6O_{62}/C$; 2—$H_{12}P_3Mo_{18}V_7O_{85}/C$;
3—$H_{15}P_3Mo_{18}V_6O_{84}/C$; 4—$H_{14}P_2Mo_{10}V_8O_{62}/C$;
5—$H_{12}P_2Mo_{12}V_6O_{62}/SiO_2$; 6—$H_{12}P_3Mo_{18}V_7O_{85}/SiO_2$;
7—$H_{14}P_2Mo_{10}V_8O_{62}/SiO_2$; 8—$H_{15}P_3Mo_{18}V_6O_{84}/SiO_2$

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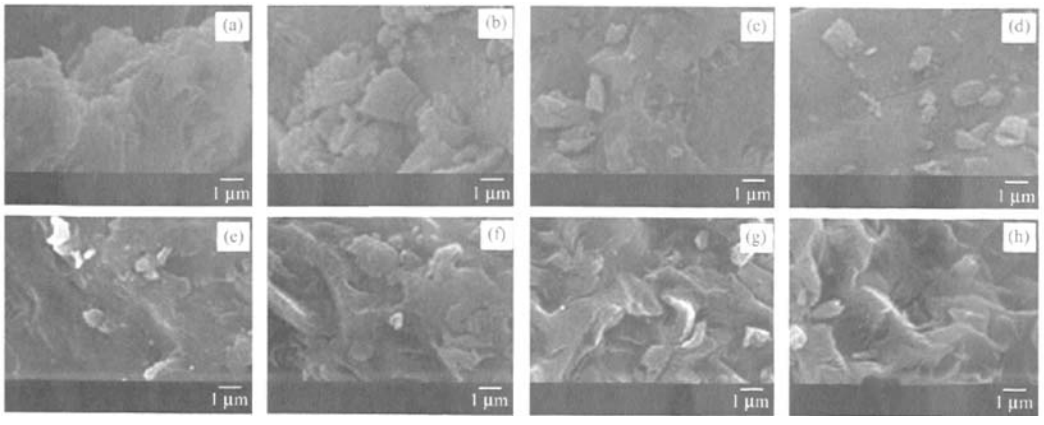
Structure Changes and Gasification Activity of Petroleum Coke After Heat Treatment

LIU Xin ZHANG Baoshen ZHOU Zhijie XU Jianliang WANG Fuchen

The influences of high temperature treatment on the structure, the degree of graphitization and the gasification reactivity of petroleum coke were investigated. The results showed that the high temperature treatment could increase the degree of graphitization and inhibit the gasification reactivity of petroleum coke.



(a),(b),(c),(d) P1; (e),(f),(g),(h) P2

(a),(e) Untreated; T_h/K: (b) 1173; (c) 1473; (d) 1673; (f) 1173; (g) 1473; (h) 1673

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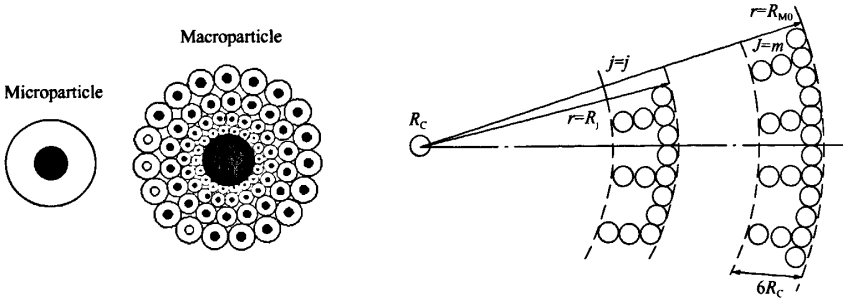
Model of the Slurry Propylene Polymerization Catalyzed by Metallocene Catalysts: Relative Molecular Mass Distribution of Polypropylene

HUANG Kai XIE Ruijin LUO Zhenghong

A particle growth model was suggested to simulate the relative molecular mass distribution (MMD) of polypropylene made via slurry polymerization catalyzed by a silica-supported metallocene catalyst. The simulated results showed that the mass transfer resistance can greatly influence the polymerization during its early stage, which can explain why the MMD broadened.



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Separation Characteristics of Supersonic Swirling Flow Nozzle for Natural Gas

WEN Chuang CAO Xuewen ZHANG Jing YANG Yan ZHANG Wenjing

The channel between the wall and the central body formed a new Laval nozzle, at the entrance of which some twisted vanes were located to generate swirling flow. The effects of the convergent, throat and divergent sections on swirling separation performance were calculated with the RNG k-ε turbulence model.