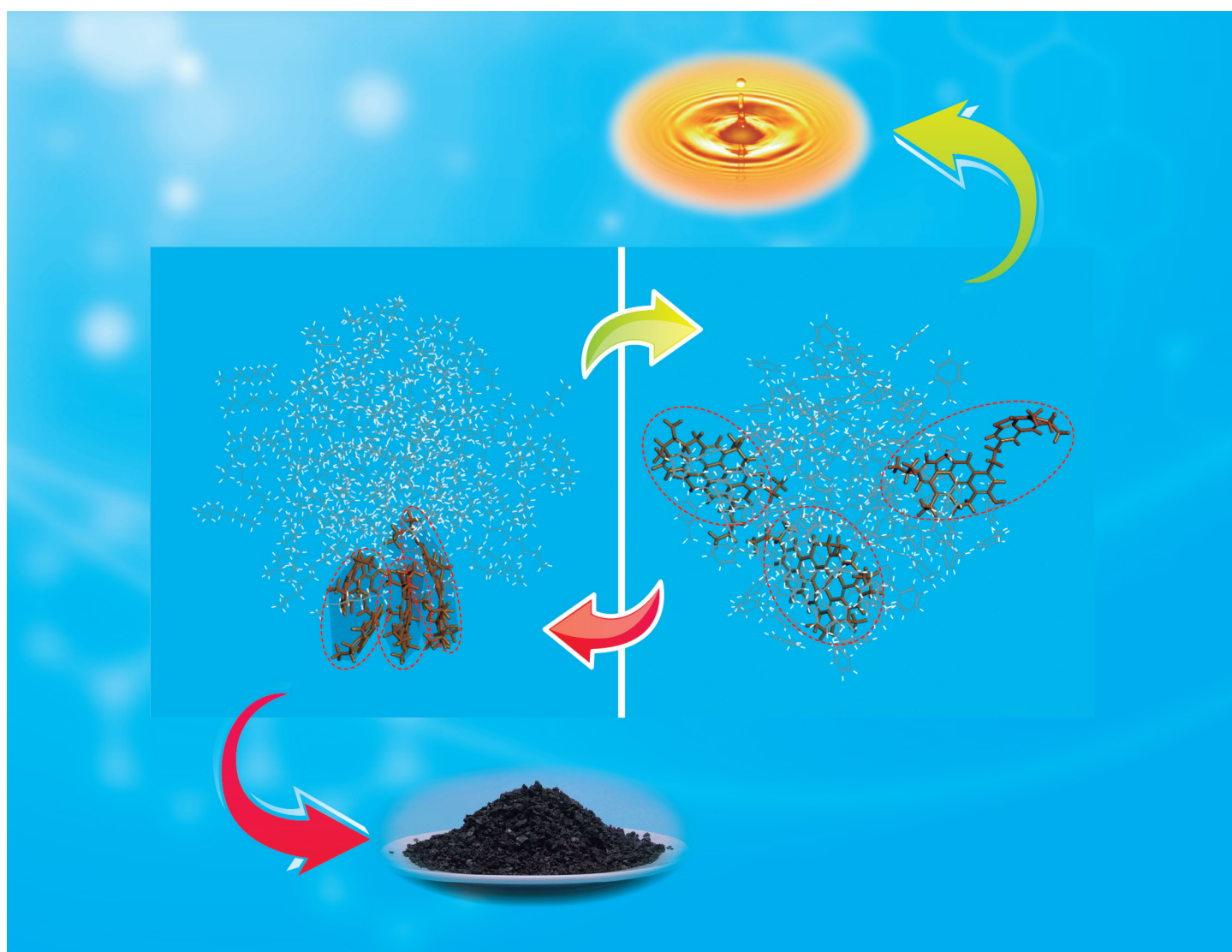


(石油加工)

ACTA PETROLEI SINICA (PETROLEUM PROCESSING SECTION)



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石 油 学 报

(石油加工)

第 36 卷 第 5 期 2020 年 9 月

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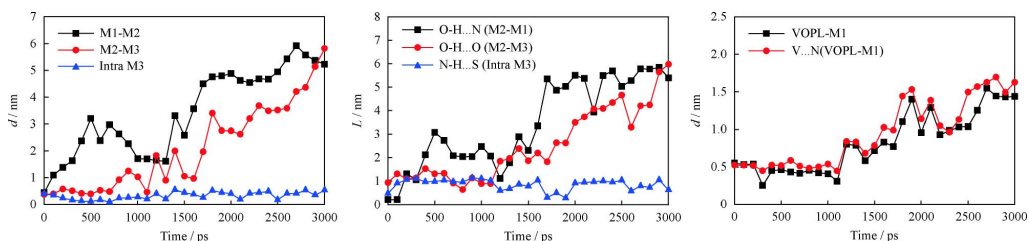
Research Articles

Acta Petrolei Sinica (Petroleum Processing Section), 2020, 36(5): 0889-0898 doi: 10.3969/j.issn.1001-8719.2020.05.001

Theoretical Study on Disaggregation Strategies of Asphaltene Aggregates

CAI Xinheng LONG Jun REN Qiang DONG Ming HOU Huandi WANG Wei

Through study of π - π interaction and hydrogen bonding caused by the special structure of asphaltenes, it was found that adding π -electron cloud dilute component, intensifying molecular thermal motion, hydrogenation of aromatic ring and removing heteroatoms can be taken as strategies for disaggregation of asphaltene aggregates.

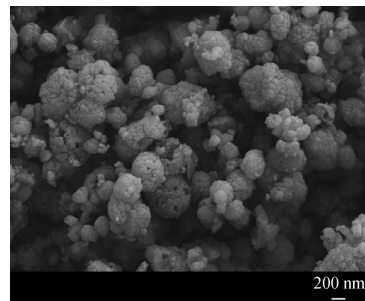


Acta Petrolei Sinica (Petroleum Processing Section), 2020, 36(5): 0899-0908 doi: 10.3969/j.issn.1001-8719.2020.05.002

Synthesis, Modification and Catalytic Properties of Aggregated ZSM-5 Zeolite Nanocrystals for Olefin Conversion

WU Zhijie ZHANG Chenggang ZHOU Kuanyu JU Ya'na LI Tianshu
GE Shaohui

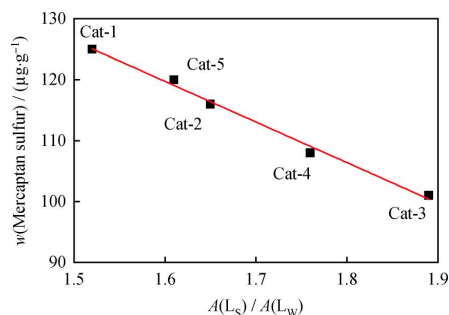
We reported a synthetic strategy for aggregated ZSM-5 zeolite nanocrystals via hydrothermal synthesis without using mesopore templates, and developed an effective modified ZSM-5 zeolite catalyst for the olefin reduction of heavy FCC gasoline by the hydrothermal treatment with ammonia solution and impregnation of lanthanum and phosphorus.



Characterization and Catalytic Performance of Ce Modified CoMo /Al₂O₃ Catalyst for Mercaptan Sulfur Formation in Selective Hydrodesulfurization

YU Pei KE Ming WANG Qi DING Yalong JIN Yi

CoMo/Ce-Al₂O₃ catalysts were prepared for investigating the physicochemical properties and catalytic performance for mercaptan sulfur formation in selective hydrodesulfurization. The performance of catalysts is correlated to the content of CoMoS structure and the amount ratio of strong Lewis acid to weak Lewis acid ($A(L_s)/A(L_w)$).

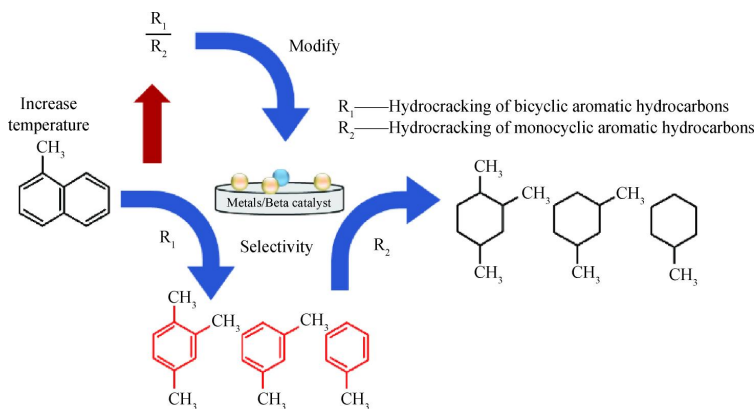


$A(L_s)/A(L_w)$ —The ratio of strong Lewis acid amount to weak Lewis acid amount

Effect of Reaction Temperature and Metal Oxide Loadings of Catalysts on Catalytic Performance in 1-Methylnaphthalene Hydrocracking to BTX

DU Jia'nan ZHANG Yanting WU Tao CHEN Jiangfeng CHEN Shengli

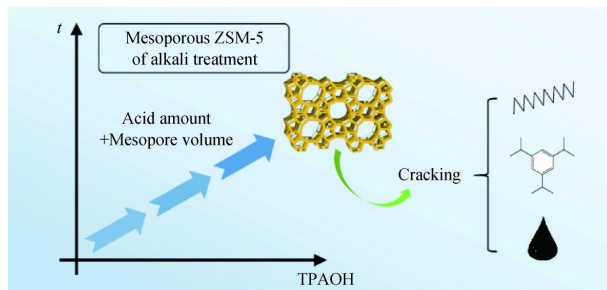
High temperature improves the selectivity of 1-methylnaphthalene hydrocracking to BTX. Increasing the reaction temperature changes the hydrogenation ability of the metal centers. The loadings of W-Ni needs to be modified when the reaction temperature becomes increased.



Preparation of Mesoporous ZSM-5 Zeolites and Its Catalytic Cracking Performance

GUO Simin GAO Zhihong CUI Xingyu LIU Yujian
LI Ruifeng

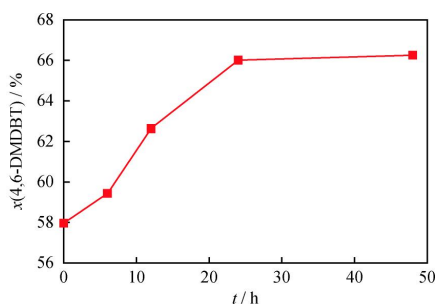
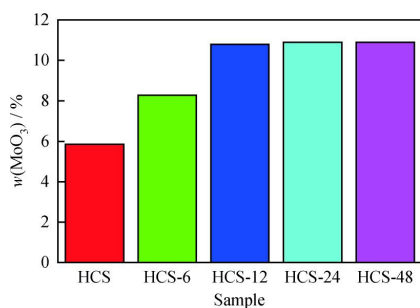
Mesoporous ZSM-5 zeolite with high relative crystallinity was prepared by alkali treatments. Desilication is further promoted by adding TPAOH into NaOH solution. Mesoporous ZSM-5 zeolite possesses more acid amount and larger mesopore volume, hence, leading to cracking bulk molecules consisting of long-chain alkane, alkylbenzene and heavy distillate.



Effect of Hydrothermal Treatment Duration on the Performance of Alumina Support and Catalytic Activity in Hydrodesulfurization

ZENG Shuangqin YANG Qinghe NIE Hong SANG Xiaoyi

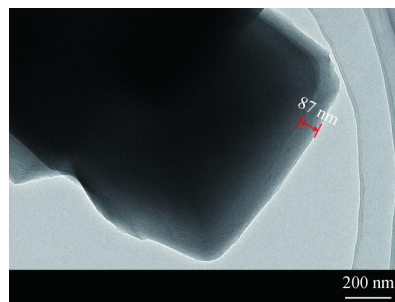
The HDS activity of the catalyst is closely relevant with the Mo equilibrium adsorption amount of the carrier, which indicates that the increase of $-OH$ groups that can adsorb active metals is in favor of the increase of catalyst activity.



Preparation of Silicalite-1 Films on X Zeolite and Its Formation Mechanism

GAO Ningning WANG Huiguo LIU Yusi TUO Pengfei ZHONG Jin
GAO Junkui

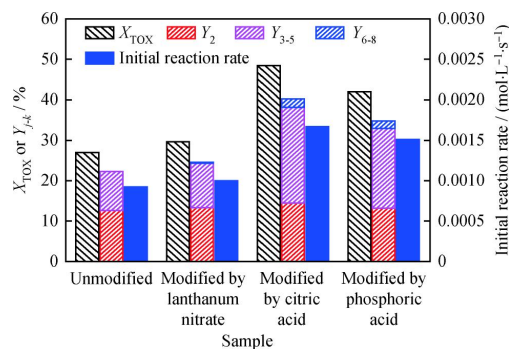
Continuous silicalite-1 films with the thickness of 87 nm were prepared on the surface of X zeolite successfully, and there are no single silicalite-1 crystals appearing in the final product. The X/silicalite-1 core shell zeolite exhibited higher separation factors than those of X zeolite.



Catalytic Synthesis of Polyoxymethylene Dimethyl Ethers by Modified Beta/Al₂O₃ Under Anhydrous Conditions

YAN Ximing WANG Baoyu HUANG Guiqiu LI Gen
ZHANG Xingyuan LI Faping

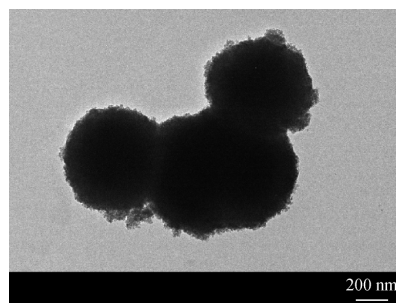
Beta/Al₂O₃ catalyst was modified in three different methods, and used for synthesizing polyoxymethylene dimethyl ethers. Results show that catalyst modified with citric acid has better catalytic activity, with the conversion of trioxane increased by 80%, and the initial reaction rate increased by 80%.



Preparation of TiO₂/γ-AlO(OH) Nanocomposite Powder by Low-Temperature Solution Method and Its Photocatalytic Activity Performance

WANG Feihong PAN Kunming ZHU Pengfei XU Liuji
ZHAO Yang ZHU Hongxi

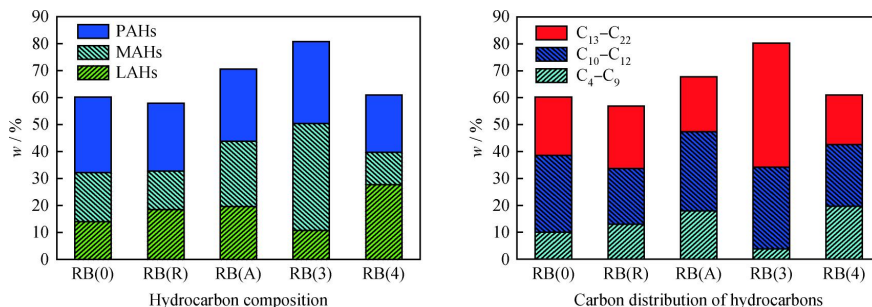
TiO₂/γ-AlO(OH) composite powder is prepared from low-temperature hydrothermal synthesis method in the alcohol solution. Composite powder has large surface area, special pore structure and adsorption capacity. Those can effectively increase the concentration of organic dyes on the catalyst surface and thus exhibit a high catalytic activity.



Catalytic Upgrading of Bio-Oils by Different Ti Sources Modified HZSM-5 Coupled With Cold Plasma Discharge

FAN Yongsheng HOU Guangxi XIONG Yonglian CAI Yixi ZHAO Weidong

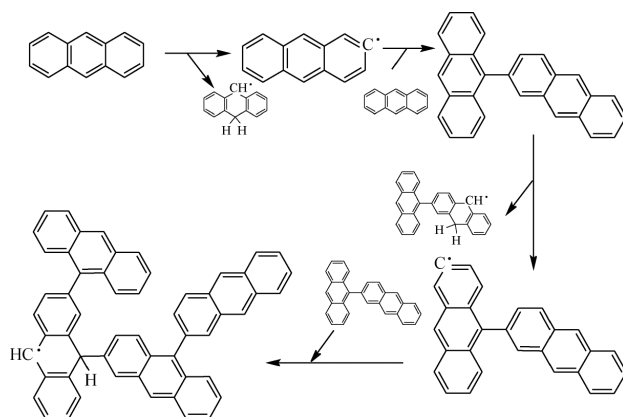
Online upgrading of bio-oils was carried out by using different Ti sources modified HZSM-5 coupled with Cold Plasma Discharge (CPD). TiCl₃ modification could increase refined bio-oils yield and HHV to 14.22% and 36.47 MJ/kg, respectively. The refined bio-oils have high potential as alternatives of diesel, since they consist of large amounts of hydrocarbons, especially C₁₀—C₂₂.



Reactive Molecular Dynamics Simulation on the Early Stage of Anthracene Coking Process

YANG Haiyang REN Qiang FAN Qiming ZHOU Han
WANG Lixin

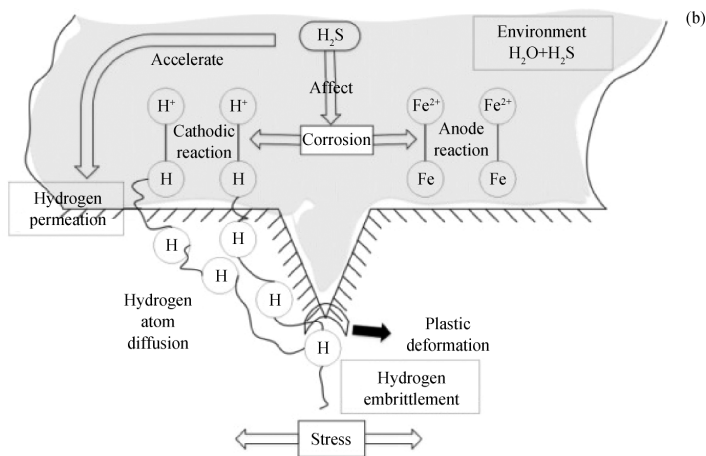
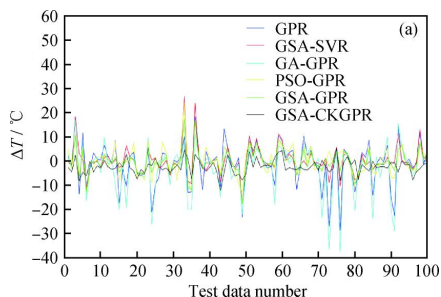
Main reaction mechanism of anthracene to its tetramer was investigated. First of all, free radicals were formed from anthracene through intermolecular hydrogen transfer. Then free radical reactions and hydrogen transfer reactions happened, and anthracene oligomers were formed.



Corrosion Mechanism and Temperature Model Prediction of Delayed Coking Start-Up Pipeline

REN Jia WANG Xigang ZHAO Meng'en JIN Haozhe

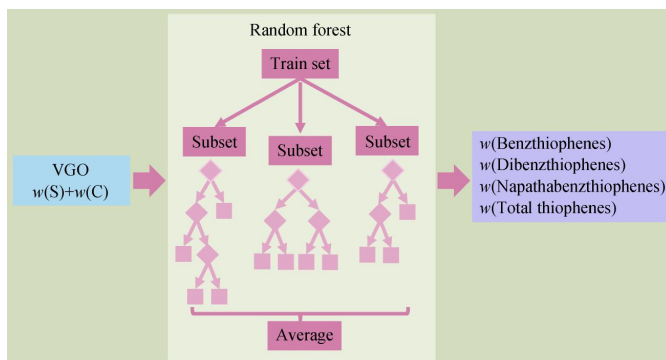
A Gaussian process regression model with composite kernel functions and optimized by gravity search algorithm (GSA-CKGPR) is proposed. This model can provide accurate and stable prediction of delayed coking start-up pipeline temperature. It has superiority compared with other traditional models. This model can be used as the tool in device corrosion risk assessment and early warning.



Prediction of Composition Distribution of Thiophene Sulfides in VGO Based on Random Forest Regression Algorithm

REN Xiaotian CHU Xiaoli TIAN Songbai

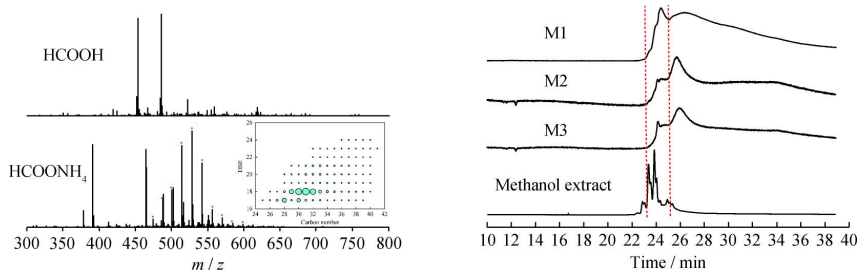
Based on random forest algorithm, we can predict the mass fraction of benzothiophenes, dibenzothiophenes, naphthalenothiophenes and total thiophenes in VGO accurately only from its mass fraction of sulfur and carbon.



Characterization of Parts of Vanadyl “Non-porphyrins” in Petroleum

WU Yangyang ZHENG Fang LU Jincheng SHI Quan

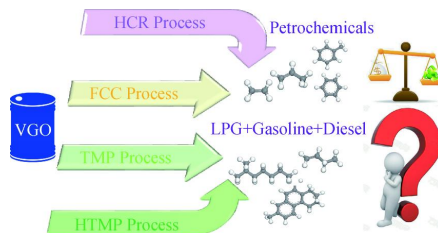
Series of regular vanadyl porphyrins have been detected in the “non-porphyrins” enriched component. This provided an evidence for the assumption that part of “non-porphyrins” have identical core skeletons with porphyrins. The subfractions of “non-porphyrins” were further characterized by HT GC-AED, and the results show that the structures of “non-porphyrins” are different with those of regular porphyrins. However, parts of the porphyrins can interact with the asphaltenes, and generate apparent “non-porphyrins”.



Comparative Analysis of Medium-Based Vacuum Gas Oil Processing Routines in Sensitive Price Range

ZHOU Xin CHEN Chunlan ZHAO Hui LIU Yibin CHEN Xiaobo
LIU Dengfeng YANG Chaohe

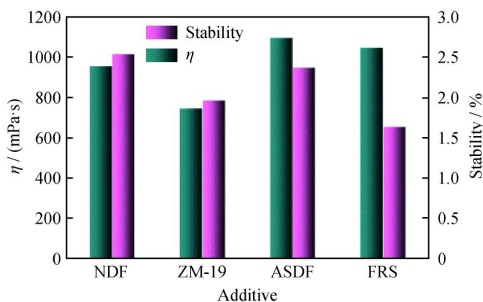
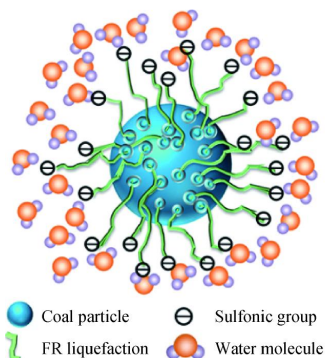
Systematic comparison of four different processing strategies for medium-based vacuum gas oil has been performed. Economic and environmental impacts have been studied to select either petrochemical or light fuel strategies. Hydrogenation and catalytic cracking coupling process (HTMP) demonstrate more advantages in both economic and environmental performance.



Effects of the Furfural Residue Based CWS Additive on the Slurring Performance of Low Rank Coal and the Interaction Mechanism

CHEN Xiaoyan LI Heping LIU Wanyi SONG Manrong SUN Yanyan ZHAN Haijuan

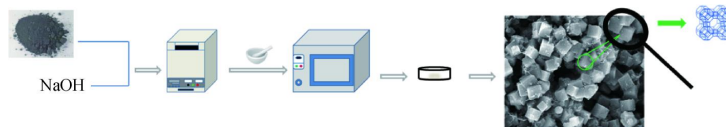
The furfural residue based additive with hydrophobicity and hydrophilicity was prepared. The results show that the stability of the additive to coal water slurry is better than commercial additives.



Preparation of Single Phase Zeolite A by Solid Phase Alkali Fusion Synthesis of Fine Slag From Ningdong Coal Gasification

ZHAO Pengde JI Wenxin ZHANG Shiyue ZHANG Shasha MA Yulong

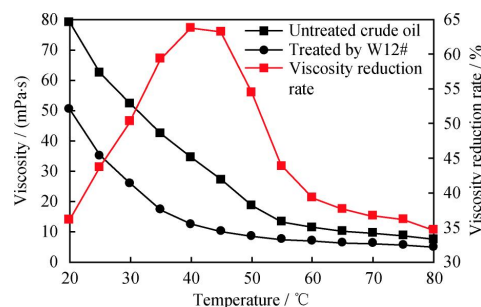
Without using template agent, single-phase type A zeolite is successfully synthesized by solid phase alkali fusion of coal gasification fine slag from Ningdong Coal Chemical industry, China. The synthesis method is easy, low-cost and green. The optimum conditions for solid phase alkali fusion of single phase zeolite A are $m(\text{NaOH})/m(\text{CGS})$ 1.2, solid phase alkali fusion temperature 823 K, hydrothermal reaction temperature 353 K, reaction time 12 h, and liquid/solid ratio 5 mL/g.



Effect of Petroleum Hydrocarbon Decomposing Bacteria *Pseudomonas* sp. and Its Biosurfactants on Crude Oil Treatment

WANG Weiqiang CUI Jing WU Shangshu DONG Mei
ZHANG Haijuan

Strain could decompose heavy components in crude oil. It can reduce crude oil viscosity under different temperatures. It was found that viscosity reduction ratio could reach the maximum value at 40 °C. Therefore, the strain can effectively improve crude oil flow properties.

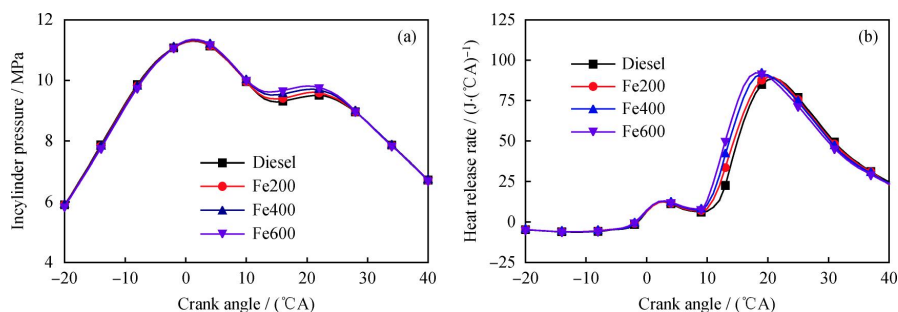


Research Notes

Effects of Fe-Based Fuel Borne Catalyst on Combustion and Emission Characteristics of a Common-Rail Diesel Engine

ZHANG Qi SUN Ping WEI Mingliang SHI Kunpeng JI Qian LIU Junheng

Fe-based fuel borne catalyst (Fe-FBC) was mixed into diesel to prepare blended fuels. The results show that the addition of Fe-FBC shortens the ignition delay period of fuel while increases the combustion pressure and heat release rate. Soot emissions are reduced significantly because Fe-FBC inhibits the formation of soot during the combustion phase. Moreover, Fe-FBC reduces the initial oxidation temperature of exhaust particles and accelerates the oxidation rate of particles.



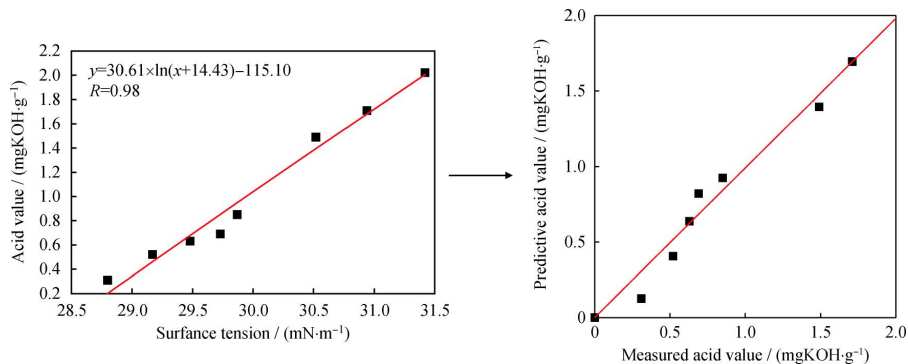
(a) In-cylinder pressure; (b) Heat release rate

$n=2600$ r/min; $p_{BME}=1.220$ MPa

Application and Analysis of Surface Tension Prediction of Oxidation Degree of *Jatropha* Biodiesel

WANG Wenchao LIU Huili LI Fashe LI Ying

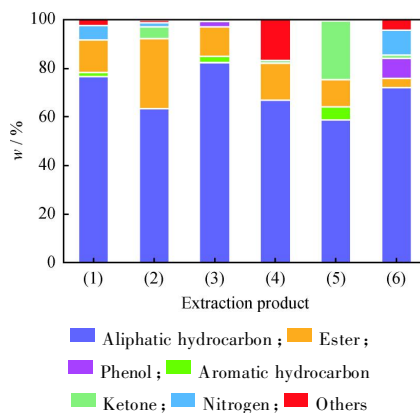
In order to quickly measure the oxidation stability of biodiesel, we found a strong correlation between surface tension and acid value. Based on this, a prediction model for rapid detection of oxidation stability is proposed, which is of guiding significance for the development of rapid detection of oxidation stability.



Ultrasonic Assisted Extraction of Macerals From Yangchangwan Coal by Aromatic Organic Solvents

YANG Yan WANG Qiang MAO Ning WANG Yanmei
ZHANG Jinpeng BAI Hongcun

Two kinds of maceral (vitrinite and inertinite) from YCW coal have been extracted by aromatic organic solvents (benzene, toluene, xylene). The results show that aromatic solvents can effectively separate aliphatic hydrocarbons and esters from the coal, and the extraction yield of vitrinite is higher than inertinite.

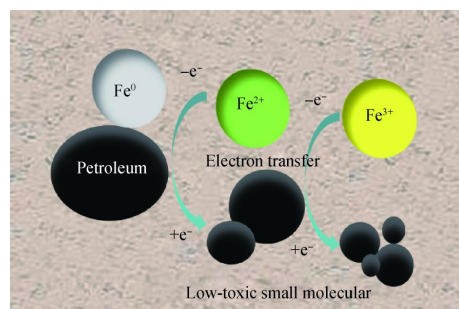


- (1) Vitrinite xylene extract ; (2) Inertinite xylene extract ;
(3) Vitrinite toluene extract ; (4) Inertinite toluene extract ;
(5) Vitrinite benzene extract ; (6) Inertinite benzene extract

Removal Function of Biochar Supported Zero-Valent Iron Composite Materials for Petroleum Pollutants in Soil

XU Wenfei REN Wenhai ZHANG Xiuxia LIU Bingkun CHEN Jie

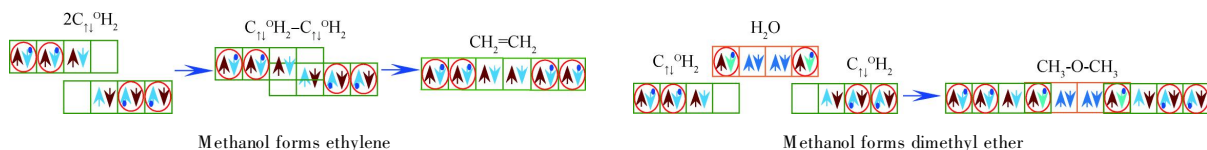
Iron-carbon composites were prepared by loading zero-valence iron on biochar, and the materials were used to treat petroleum-polluted soil. The results show that the addition of biochar obviously prevents zero-valence iron agglomeration. Moreover, it is found that the iron-carbon composite effectively remove petroleum pollutants from soil is because of both adsorption and reduction capacity.



Reaction Mechanism of Methanol to Ethylene and Dimethyl Ether

HE Zhenfu

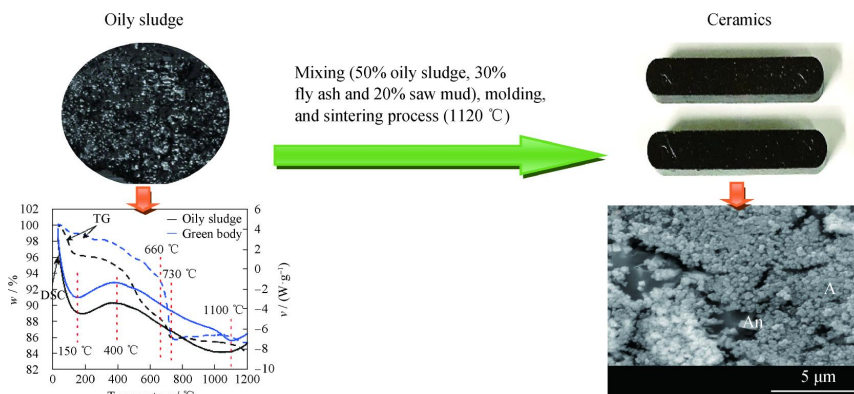
B-acid center provides H^+ to attack $C-O$ bond in the methanol molecular, and $C-O$ bond breaks to form CH_3^+ . The outer layer of carbon atom of CH_3^+ has an empty orbit. B-acid center after releasing H^+ loses its activity. The inactivated B-acid center obtains H^+ from CH_3^+ to form a new intermediate H-form C^+H_2 , which has a pair of lone pairs of electrons and an empty orbit.



Preparation and Mechanism of $SiO_2-Al_2O_3-CaO$ System Ceramics Using Oily Sludge as Main Raw Material

MA Yuan, LI Yu, XING Qinrui

After mixing (50% oily sludge, 30% fly ash and 20% saw mud), molding, and sintering process (1120 °C) for preparing ceramic, organic component of oily sludge volatilized and combusted during 300–800 °C. The ceramic was finally harmless with qualified properties.

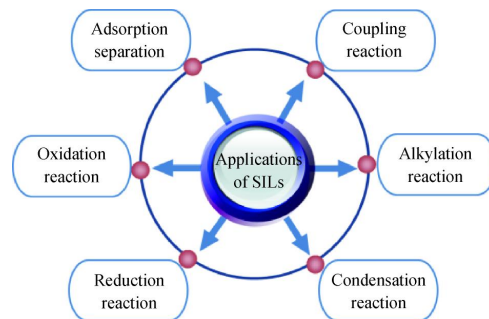


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Research Progress of Supported Ionic Liquids in Oxidative Desulfurization

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Supported ionic liquids (SILs) have a wide range of applications in adsorption separation, oxidation reactions and coupling reaction. Recently, SILs have also been applied in the purification of fuel. The research progress of different types of SILs in oxidative desulfurization is summarized, and the mechanism of oxidative desulfurization is discussed.

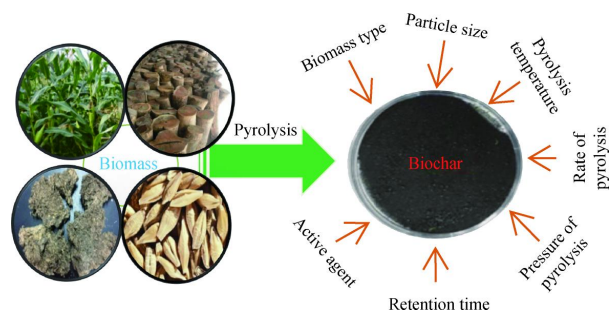


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Progress on Biochar Preparation Through Pyrolysis Process

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Biomass derived-carbon materials have been widely used in many areas such as water pollution control, catalysis, electrochemistry, soil remediation, etc. In this paper, different biochar preparation methods were summarized. Different factors which can impact physicochemical properties of biochar obtained by pyrolysis process were studied.



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