



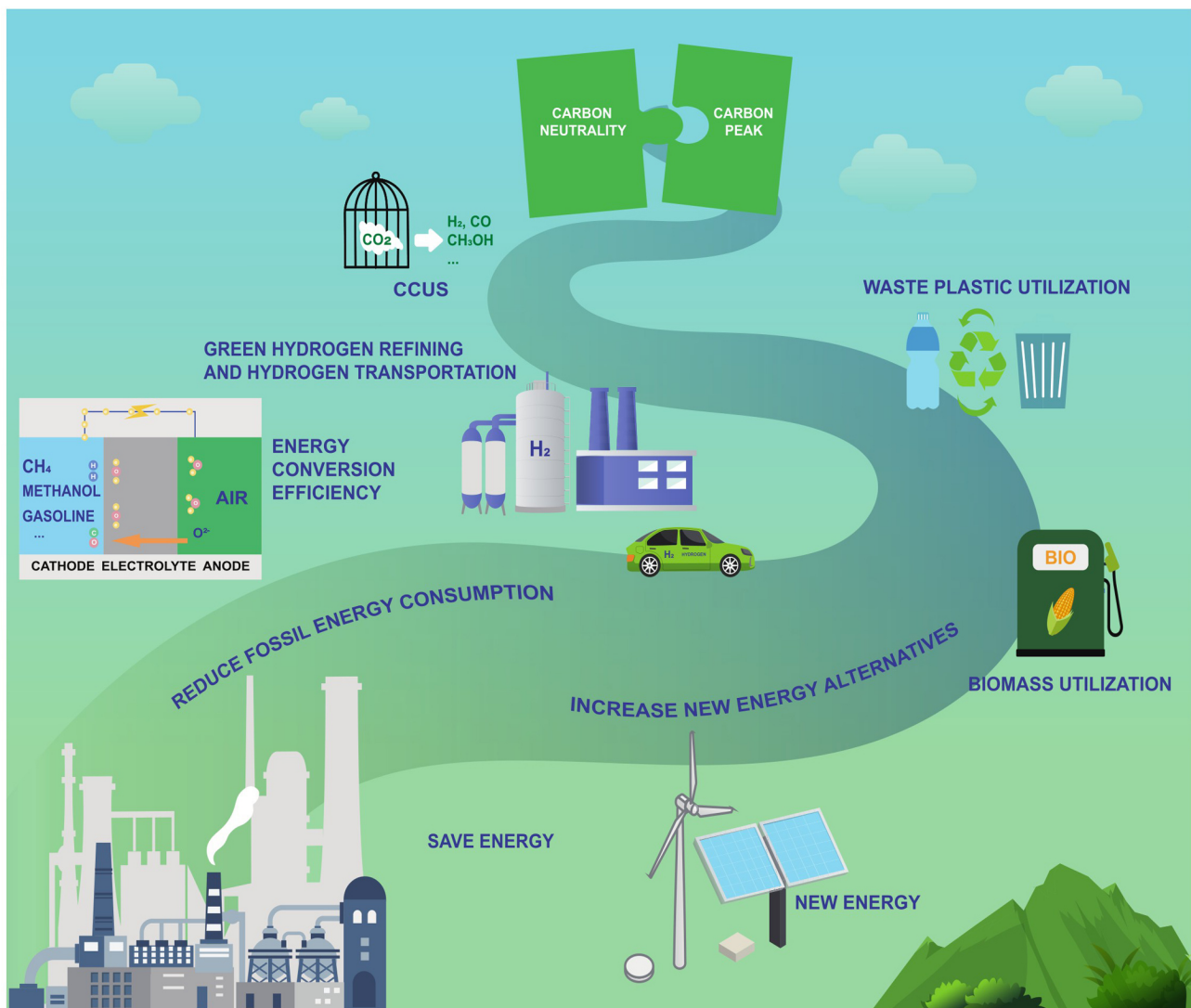
中文核心期刊 Ei核心期刊
本刊被Ei Compendex,CA,AJ,CBST,Scopus等
国际重要检索数据库收录

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

石油学报
(石油加工)

石油学报 (石油加工)

ACTA PETROLEI SINICA (PETROLEUM PROCESSING SECTION)



第四十卷

第一期

二〇二四年

主办：中国石油学会

承办：中石化石油化工科学研究院有限公司

2024

1
Vol.40

万方数据

石 油 学 报

(石油加工)

第 40 卷 第 1 期 2024 年 1 月

目 次

特约综述

中国炼化产业实现碳达峰与碳中和路径及支撑技术 * 魏志强, 曹建军, 孙丽丽, 曹湘洪(1)

催化材料和催化剂

Pt/Beta 催化剂上 Pt 金属中心/酸中心浓度比对加氢异构化性能的影响 郭 凯, 马爱增, 罗一斌, 王子健, 邢恩会, 李金芝, 李大东(12)

晶粒尺寸对 Zn/ZSM-5 沸石催化烯烃转化性能的影响 于梦楠, 潘 涛, 鞠雅娜, 张 然, 吴 培, 吴志杰(23)

碱处理改性 ZSM-5 分子筛孔结构对 VOCs 吸附性能的影响 牛 成, 赵 洋, 钱 程, 姜 悦, 姜 豪, 安 阳, 沈本贤, 孙 辉(37)

氨三乙酸配位辅助原位合成 Ni@B-HZSM-5 对苯和甲醇烷基化反应的影响 蔡 润, 代小平, 王 琦, 冯 博, 曹轶华, 霍 猛, 黄星亮(46)

丁烯叠合产物结构表征及对催化裂化生成丙烯的影响 李福超, 魏晓丽, 温朗友, 袁起民(58)

高硅 MCM-22 分子筛的合成与催化性能 童伟益, 刘 闯, 张俊玲, 侯 敏(65)

焙烧温度对 $\text{Pt-SO}_4^{2-}/\text{ZrO}_2\text{-Al}_2\text{O}_3$ 催化剂及其异丁烷异构化性能的影响 钟鑫鹏, 于中伟, 刘洪全, 陈永浩, 黄宇恺, 忻睦迪(75)

负载型 Fe-Ni 纳米合金的制备及其催化丁二烯选择性加氢性能 严永情, 王 朝, 刘思明, 连 天, 王伟豪, 金顺敬, 陈丽华, 苏宝连(83)

无有机模板法制备 Cu-ZSM-5 催化剂及其选择性催化氧化苯乙烯 刘献锋, 张晨芳, 张 方, 张东平, 孔 岩(93)

资源循环利用

悬浮床加氢固体产物高值化制备超级电容器电极材料 岳艺群, 张丽华, 李 琢, 高瑞通, 陈照军, 杜 辉(103)

石油产品和化学助剂

预喷参数对乙醇/柴油双燃料发动机燃烧和排放特性的影响 陈庆涛, 刘军恒, 孙 平, 嵇 乾, 瞿 磊(115)

融合可解释机器学习的成品汽油调和配方质量预测评价与致因分析 李 炜, 郑明杰, 李亚洁, 梁成龙(126)

耐盐性 PAM-AMPS/ Fe_3O_4 纳米减阻剂流变性 秦文龙, 李 璐, 李国庆, 李晗晰, 秦国伟(137)

油酸甲酯基琥珀酸、单甲酯、双甲酯的合成及防锈性能 张 羿, 蔺建民, 夏 鑫, 李 妍(146)

聚(桐油-甲基丙烯酸甲酯)多功能润滑油添加剂的合成 丁丽芹, 张彦平, 刘思凡, 苏碧云, 梁生荣(155)

动力学与反应器

柴油/天然气/氢气三燃料化学动力学机理的构建 张 韦, 毛仕迪, 陈朝辉, 李泽宏, 庞晨晨, 张翔宇(163)

柴油加氢脱氮集总动力学模型及应用 黄 镇, 鞠雪艳, 丁 石, 聂 红, 习远兵(175)

旋风分离器环形空间顶灰环的流动特性 曹鸣谦, 陈建义, 樊晓琦, 崔 灏, 魏耀东(183)

级联式气-液旋流分离器流动特性数值研究 耿 坤, 孙治谦, 李 腾, 孙铭泽, 王振波(193)

动态热条件下原油罐储温过程主要影响因素分析 孙 巍, 刘玉多, 成庆林, 赵立新, 王志华(205)

分析表征与分离

原油中有机氯盐的分析与脱除 王振宇, 谷月刚, 于 丽, 张月琴, 曹凤仪, 王国峰, 李 云(221)

基于破乳诱导萃取和 ICP-MS/MS 分析渣油中的微量金属元素 朱乾华, 刘宏伟, 聂西度(229)

综述

炼化行业复杂性与碳排放之间的关系 李承卓, 马丹竹, 牛 皓, 刘广鑫, 石 磊(239)

合成气直接制芳烃含氧中间体路线研究进展 马 东, 孙来芝, 王治斌, 陈 雷, 杨双霞, 许美荣, 谢新革, 司洪宇, 赵保峰, 高明杰, 李天津, 华栋梁(248)

喷气燃料烃类组成与性质构效关系研究进展 蔡 璐, 舒亦桥, 陶志平, 赵 杰, 伏朝林(258)

聚 α -烯烃合成基础油分子结构与性能关系研究进展 何垒垒, 苏 朔, 龙 军(266)

* 封面文章

期刊基本参数: CN11-2129/TE * 1985 * b * A4 * 276 * zh+en * P * ¥20.00 * 1200 * 27 * 2024-01 本期责任编辑: 黄晓晖

ACTA PETROLEI SINICA

(PETROLEUM PROCESSING SECTION)

Vol. 40 No. 1 Jan. 2024

CONTENTS

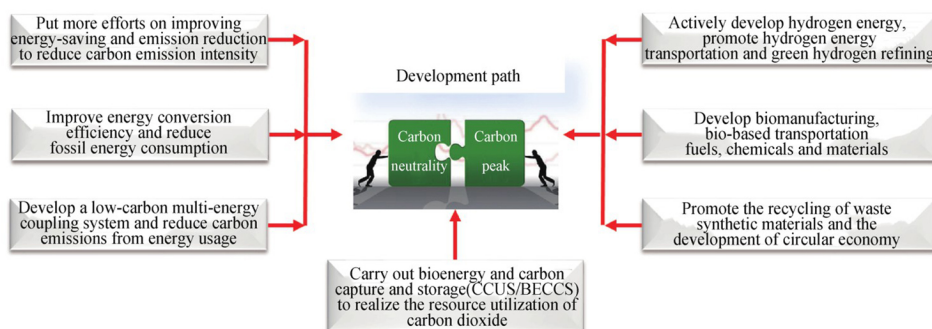
Special Review

Acta Petrolei Sinica (Petroleum Processing Section), 2024, 40(1): 0001-0011 doi: 10.3969/j.issn.1001-8719.2024.01.001

The Path and Supporting Technology of Carbon Peak and Carbon Neutrality in China's Refining and Chemical Industry

WEI Zhiqiang CAO Jianjun SUN Lili CAO Xianghong

The goal of achieving carbon peak and carbon neutrality ("dual carbon") and seven major paths are proposed, as well as the main supporting technologies that need to be developed and promoted. According to the research, the following suggestions are put forward; (1) to develop differentiated carbon reduction policies based on the development stage of China's refining and chemical industry; (2) to formulate supporting policies to promote low-carbon technology transformation in existing refining and chemical enterprises; (3) to encourage the refining and chemical industry to develop and utilize the agricultural and forestry waste and waste synthetic materials; (4) to support the research of the coupling of energy systems and small nuclear reactor in refining and chemical enterprises, formulate coupling regulations and standards and promote the construction of demonstration projects; (5) to support the refining and chemical industry to introduce advanced key technologies such as industrial fuel cells to accelerate the improvement of fossil energy conversion efficiency.



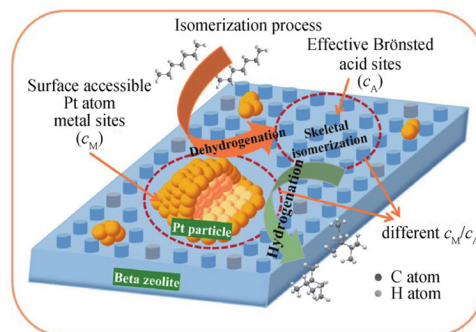
Catalytic Materials and Catalysts

Acta Petrolei Sinica (Petroleum Processing Section), 2024, 40(1): 0012-0022 doi: 10.3969/j.issn.1001-8719.2024.01.002

Influence of Pt Metal Center/Acid Center Concentration Ratio on Hydroisomerization Performance Over Pt/Beta Zeolite

GUO Kai MA Aizeng LUO Yibin WANG Zijian XING Enhui
LI Jinzhi LI Dadong

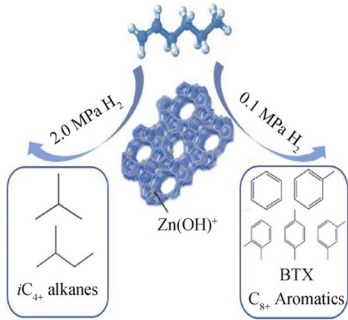
Various catalysts were prepared, including Beta zeolite loaded with different contents of Pt. The surface accessible Pt and effective acid amounts were tested to obtain surface accessible a series of metal/acid site concentration ratios (c_M/c_A). The *n*-heptane isomerization activity, isomer selectivity and yield are closely related to the c_M/c_A .



Effect of Zeolite Crystal Size on the Catalytic Performance of Zn/ZSM-5 Zeolite for Olefin Conversion

YU Mengnan PAN Tao JU Ya'na ZHANG Ran WU Pei
WU Zhijie

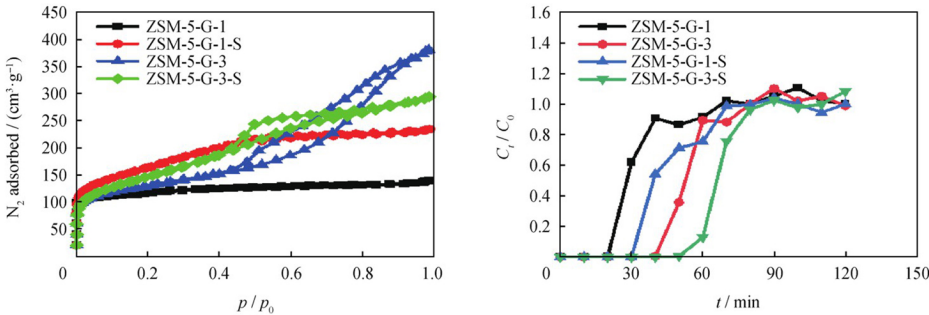
Zn/ZSM-5 zeolite with the smallest crystal size (100—200 nm) has the lowest B/L acid amount ratio at 0.15 and the highest fraction of medium-strong acid sites at 29.6%, which is conducive to the selective conversion of 1-hexene into *iso*-alkanes and aromatics at the hydrogen pressure of 2.0 MPa and 0.1 MPa, respectively.



Effect of Pore Structure of Alkali Modified ZSM-5 Zeolite on Its VOCs Adsorption Performance

NIU Cheng ZHAO Yang QIAN Cheng LOU Yue JIANG Hao AN Yang SHEN Benxian SUN Hui

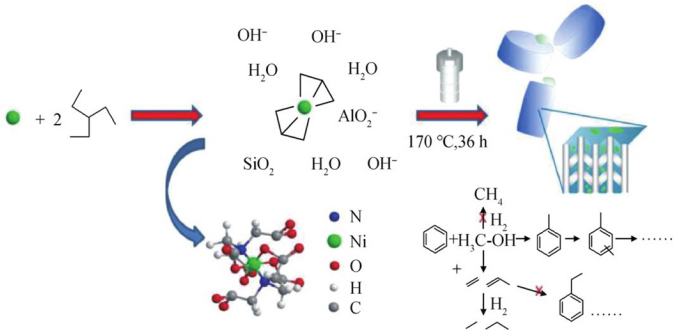
The ZSM-5 zeolite separately modified using NaOH and TPAH with the concentration of 0.2 mol/L exhibits largely increased adsorption sites and mesopore characteristics, which contributes to its improved adsorption performance for volatile organic compounds (VOCs).



Effect of In-Situ Synthesis of Ni@B-ZSM-5 by Nitrilotriacetic Acid Coordination Assistance on Alkylation of Benzene With Methanol

CAI Run DAI Xiaoping WANG Qi FENG Bo
CAO Yihua HUO Meng HUANG Xingliang

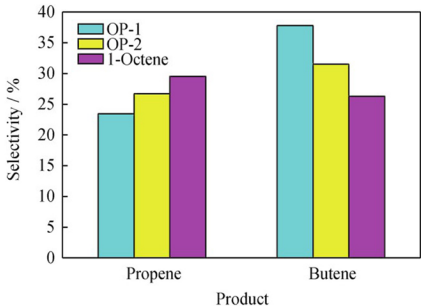
Na₃NTA was used as chelating agent for in-situ synthesis of Ni@B-ZSM-5 under alkaline conditions. The as-resulted catalyst exhibits uniform distribution of Ni and B, abundant weak acid and suitable hydrogenation capability in the alkylation of benzene and methanol, with the benzene conversion of 46.4%, total selectivity for toluene and xylene of 95.9%, and excellent stability.



Characterization of Molecular Structure of Butene Oligomerization Products and Its Effect on Catalytic Cracking to Produce Propene

LI Fuchao WEI Xiaoli WEN Langyou YUAN Qimin

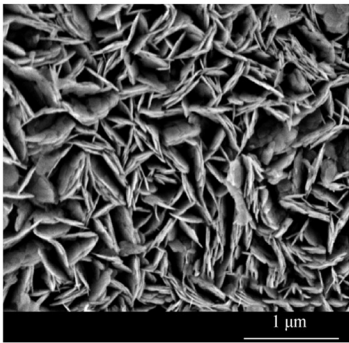
The effects of molecular structure of oligomerization products (denoted as OP-1 and OP-2) and 1-octene on β -scission modes and propene yield were studied. The results show that OP-1, which contains relatively high proportion of trimethylpentene, especially 2,4,4-trimethylpentene, cracks mainly by A-mode scission ($3^\circ \rightarrow 3^\circ$) to form *iso*-butene, while the less branched octene isomers, such as dimethylhexene, methylheptene and 1-octene, prefer to react via modes B₁ ($2^\circ \rightarrow 3^\circ$), B₂ ($3^\circ \rightarrow 2^\circ$), C ($2^\circ \rightarrow 2^\circ$) and D₂ ($2^\circ \rightarrow 1^\circ$) to increase the selectivity of propene.



Synthesis and Catalytic Performance of High-Silicon MCM-22 Zeolite

TONG Weiyi LIU Chuang ZHANG Junling HOU Min

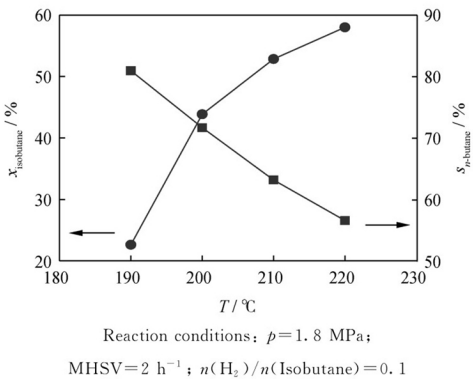
Hexamethylene imine (HMI) and *N,N,N*-trimethyl-1-ammonium adamantane (TMAdaOH) as composite organic structure directing agents can effectively improve the crystallinity and purity of high-silicon MCM-22, and promote the entry of more silicon atoms into the MWW framework. The MCM-22 zeolite (S80) synthesized from the feeding with a SiO₂/Al₂O₃ molar ratio of 80 boasts superior catalytic performance in heavy aromatics upgrading.



Influences of Calcination Temperature on Pt-SO₄²⁻/ZrO₂-Al₂O₃ Catalysts and Their Catalytic Performance for Isobutane Isomerization

ZHONG Xinpeng YU Zhongwei LIU Hongquan CHEN Yonghao HUANG Yukai XIN Mudi

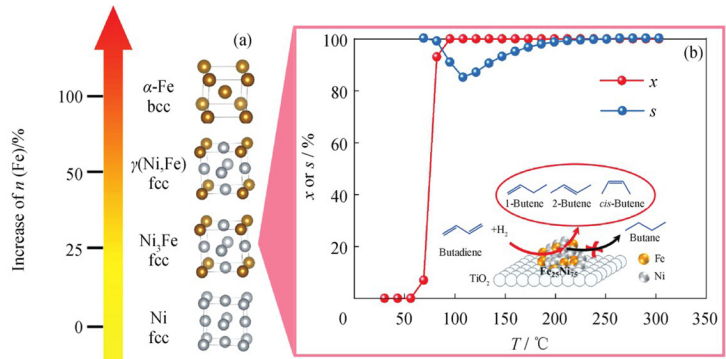
The catalytic performance of Pt-SO₄²⁻/ZrO₂-Al₂O₃ catalysts for isobutane isomerization at different calcination temperatures was studied. PSZA720 calcined at 720 °C has the best isobutane conversion and *n*-butane selectivity. At the reaction temperature of 200 °C, reaction pressure of 1.8 MPa, mass space velocity of 2.0 h⁻¹ for isobutane and hydrogen/isobutane molar ratio of 0.1, the isobutane conversion and *n*-butane selectivity on PSZA720 catalyst can reach 43.9% and 71.7%, respectively.



Synthesis and Catalytic Activity of Supported Fe-Ni Nano-Alloys for Butadiene Selective Hydrogenation

YAN Yongqing WANG Zhao LIU Siming
LIAN Tian WANG Weihao JIN Shunjing
CHEN Lihua SU Baolian

This work explores the metallic phase transformation in supported bimetal Fe-Ni by controlling Fe/Ni molar ratio for selective butadiene hydrogenation. Among them, Ni-rich Ni_3Fe phase ($\text{Fe}_{25}\text{Ni}_{75}/\text{TiO}_2\text{-R}$) shows excellent hydrogenation activity and butene selectivity due to the dilution of active Ni sites by inactive Fe atoms.

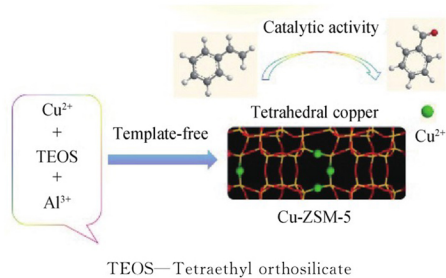


(a) Schematic illustration of Fe-Ni alloy structure vs. $n(\text{Fe})$;
(b) 1,3-Butadiene conversion (x) and butenes selectivity (s) vs. temperature (T)
Conditions: $m(\text{Catalyst})=100\text{ mg}$; $n(\text{Propylene})/n(1,3\text{-Butadiene})=100$; $t=4.5\text{ h}$

Preparation of Cu-ZSM-5 Zeolite Without Organic Template for the Selectively Catalytic Oxidation of Styrene

LIU Xianfeng ZHANG Chenfang ZHANG Fang
ZHANG Dongping KONG Yan

Tetrahedral Cu incorporated ZSM-5 (Cu-ZSM-5) was prepared by a low-cost and green method without any organic template or high temperature calcination, and performed high and stable catalytic activity for the oxidation of styrene to benzaldehyde owing to the tetrahedral coordination copper atom as catalytic active site. Without the need of any organic template or high temperature calcination, the preparation cost of Cu-ZSM-5 greatly decreases.

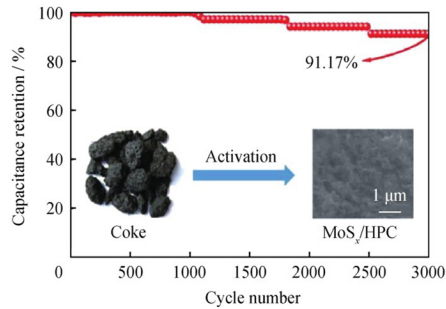


Resource Recycling

Upcycling of Solid Products From Slurry-Bed Hydrocracking Into Supercapacitor Electrode

YUE Yiqun ZHANG Lihua LI Zhuo GAO Ruitong
CHEN Zhaojun DU Hui

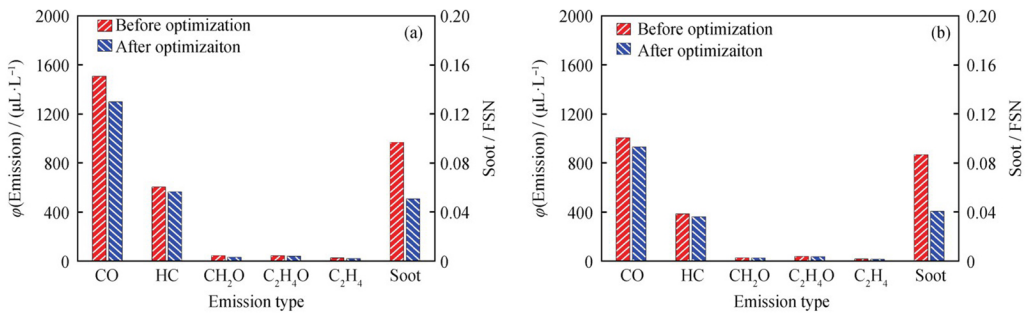
The solid products of residue slurry-phase hydrocracking were upcycled to fabricate the molybdenum sulfide/hierarchical porous carbon composite for a stable supercapacitor electrode. The specific capacitance of the optimized products is 176.1 F/g at the current density of 1 A/g, and the capacitance retention rate can reach 91.17% after 3000 cycles.



Effect of Pilot Injection Parameters on Combustion and Emission Characteristics of Ethanol/Diesel Dual-Fuel Engine

CHEN Qingtao LIU Junheng SUN Ping JI Qian QU Lei

The effects of pilot injection parameters on the combustion process and emission characteristics of ethanol/diesel dual-fuel engine were studied. The results show that the CO, Soot and HC emissions of the engine after optimization of diesel pilot injection parameters are lower than those of the engine under initial conditions, and the unregulated emissions are reduced. When brake mean effective pressure (BMEP) is 0.81 MPa and 1.05 MPa, formaldehyde emissions are reduced by 28.91% and 4.17%, acetaldehyde emissions are reduced by 7.62% and 6.61%, and ethylene emissions are reduced by 18.79% and 10.34%, respectively.



BMEP/MPa: (a) 0.81; (b) 1.05

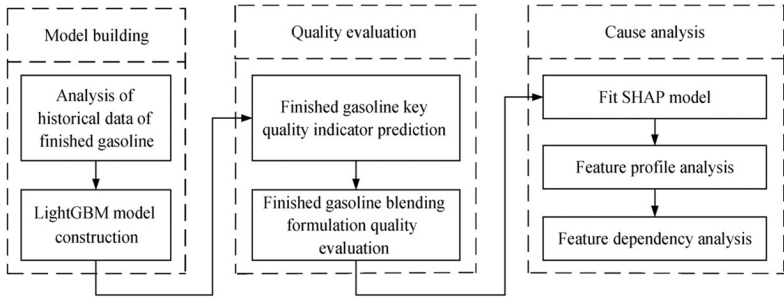
Conditions of before optimization: Pilot injection quantity=4.0 mg/cyc; Pilot injection timing=19° CA BTDC; Main injection timing=5° CA BTDC

Conditions of after optimization: Pilot injection quantity=3.0 mg/cyc; Pilot injection timing=19° CA BTDC; Main injection timing=11° CA BTDC

Predictive Evaluation and Cause Analysis of Finished Gasoline Blending Formulation Quality by Interpretable Machine Learning

LI Wei ZHENG Mingjie LI Yajie LIANG Chenglong

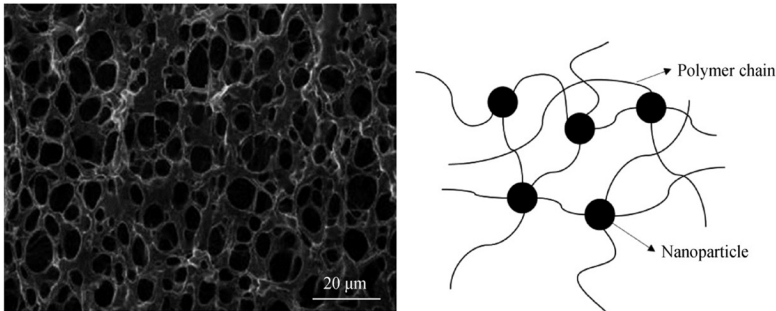
A predictive model for blending formula quality evaluation is proposed based on combining the LightGBM with SHAP interpretable machine learning. This model can meet the need of ex-ante evaluation and formula correction in the finished gasoline tank blending process, due to its methodology of quality prediction and cause analysis for blending formulas.



Rheological Properties of PAM-AMPS /Fe₃O₄ Nano Drag Reducing Agent With Salt Tolerance

QIN Wenlong LI Lu LI Guoqing LI Hanxi QIN Guowei

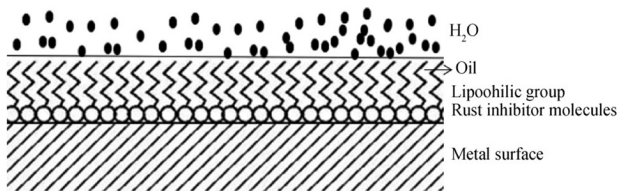
The salt-tolerant polymer grafted nanocomposite PAM-AMPS/Fe₃O₄ was synthesized by introducing the temperature and salt-tolerant groups of 2-acrylamide-2-methylpropane sulfonic acid (AMPS). The synthesized product has the drag reduction function of polymer and the enhanced temperature resistance and heat transfer function of nanoparticles. Moreover, the suitable concentration of drag reducer and the salinity range of brine were determined, providing an important reference for achieving high-efficiency drag reduction in brine environment.



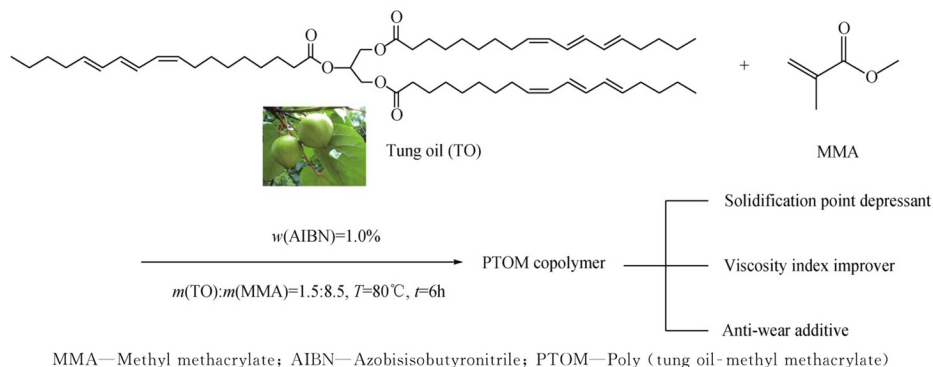
Synthesis and Anti-Rust Performance of Methyl Oleate Succinic Acid, Methyl Oleate Methyl Succinate and Methyl Oleate Dimethyl Succinate

ZHANG Yi LIN Jianmin XIA Xin LI Yan

The novel rust inhibitors methyl oleate succinic anhydride (ASA), methyl oleate succinic acid (MSA), methyl oleate monomethyl succinate (MMS), methyl oleate dimethyl succinate (MDS) are synthesized by methyl oleate and maleic anhydride. The polar groups in the rust inhibitor molecules can chemically adsorb on the metal surface and form an adsorption film, while the non-polar long carbon chain is dissolved in the oil to form an anti-rust film, thereby preventing the corrosive medium from coming into contact with the metal.



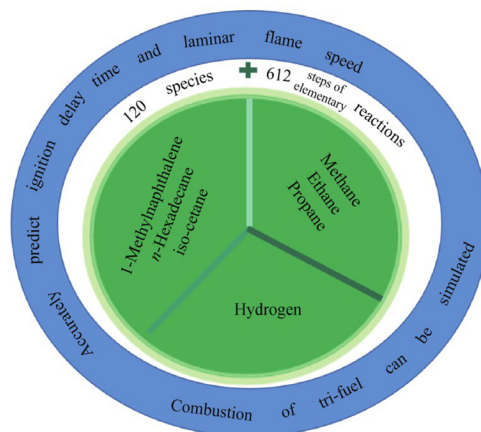
Poly (tung oil-methyl methacrylate) (PTOM) copolymer was synthesized using azodiisobutyronitrile (AIBN) as an initiator by Schlenk technique. The copolymer had a yield of 44.99% and weight average relative molecular mass of 28289 at the ratio of monomer $m(\text{TO}) : m(\text{MMA})$ of 1.5 : 8.5, the AIBN dosage of 1.0% (mass fraction) and 80 °C for 6 h. The synthesized copolymer can be used as a multifunctional lubricant additive with good solidification point depression ability, improved viscosity index and anti-wear performance.



Acta Petrolei Sinica (Petroleum Processing Section), 2024, 40(1): 0163-0174 doi: 10.3969/j.issn.1001-8719.2024.01.017

Construction of Chemical Kinetic Mechanism of Diesel/Natural Gas/Hydrogen Tri-Fuel

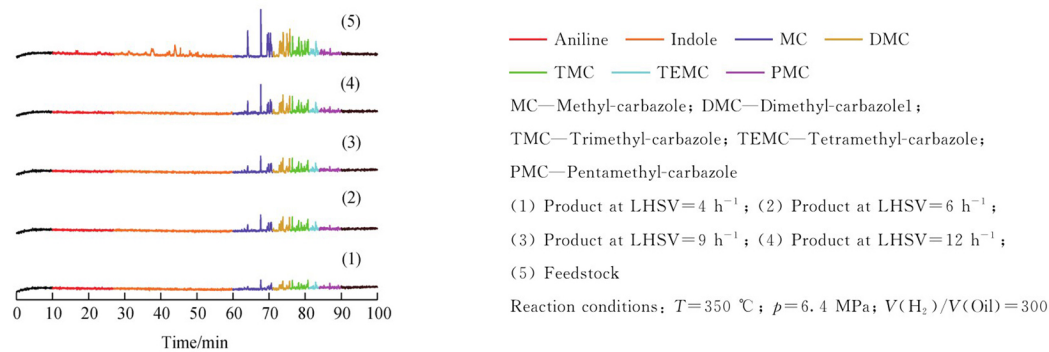
To investigate the combustion nature of diesel, natural gas, and hydrogen and enrich their combustion theories, a diesel/natural gas/hydrogen tri-fuel mechanism containing 120 species and 612 steps of elementary reactions was constructed. Then the mechanism was optimized using the ignition delay time sensitivity analysis, and the accuracy of the mechanism was verified by a large amount of experimental data.



Lumped Kinetic Model and Application of Diesel Hydrodenitrogenation

HUANG Zhen JU Xueyan DING Shi NIE Hong XI Yuanbing

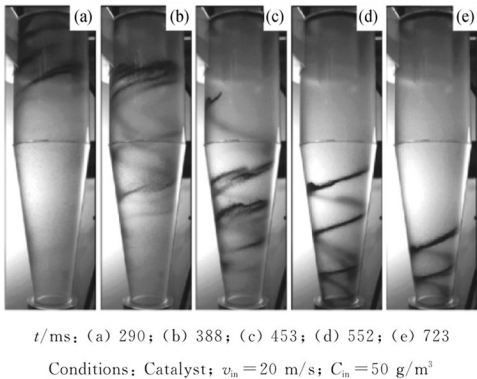
Identification and quantification of nitrogen compounds in the feedstocks and their hydrodenitrogenated products were conducted using GC-NCD and a five-lumped Langmuir-Hinshelwood kinetic model including the influence of hydrogen sulfide (H₂S), basic nitrogen (BN) and non-basic nitrogen (NBN) was established.



Flow Characteristics of Top Ash Ring in Cyclone Separator

CAO Mingqian CHEN Jianyi FAN Xiaoqi CUI Hao WEI Yaodong

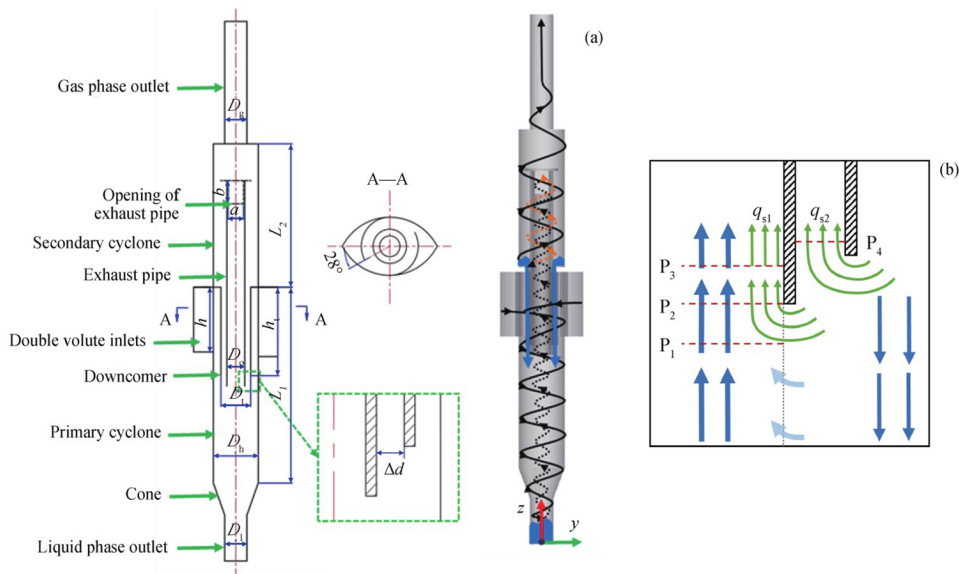
A high-speed camera was used to observe the top ash ring. It was found that the top ash ring fell off periodically. In combination with numerical simulation and theoretical analysis, the results show that the secondary vortices are the main reason for the formation and the falling-off of the top ash ring.



Numerical Study of the Flow Characteristics in a Cascade Gas-Liquid Cyclone Separator

GENG Kun SUN Zhiqian LI Teng SUN Mingze WANG Zhenbo

The new cascade gas-liquid cyclone separator with an additional secondary cyclone can effectively remove liquid droplets carried by the short-circuit flow. And the short-circuit flow can be accurately calculated from the change in upstream flow rate in the exhaust core pipe.

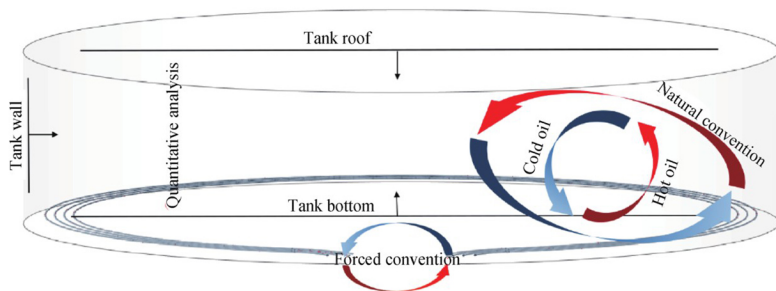


P_1, P_2, P_3, P_4 —Section; q_{s1} —Short-circuit flow escaping from the bottom of the exhaust pipe, m^3/h ;
 q_{s2} —Short-circuit flow escaping from the bottom of the downcomer, m^3/h ; a, b —Width and height of primary exhaust pipe opening, m ;
 D_g —Gas phase outlet diameter, m ; D_o —Cylinder diameter, m ; D_i —Liquid phase outlet diameter, m ; D_o —Exhaust pipe diameter, m ;
 D_i —Downcomer diameter, m ; h —Double volute inlets height, m ; h_i —Downcomer height, m ; L_1 —Primary cyclone length, m ;
 L_2 —Secondary cyclone length, m ; y, z —3D coordinate position, m ; Δd —Descending liquid gap width, m
(a) Structure diagram of cascade gas-liquid cyclone separator; (b) Short-circuit flow of cascade gas-liquid cyclone separator

Analysis of Main Factors Affecting the Temperature-Maintaining Process of Crude Oil Tank Storage Under Dynamic Thermal Conditions

SUN Wei LIU Yuduo CHENG Qinglin ZHAO Lixin WANG Zhihua

The influence of space structure and circumferential effect of heating coil on convective heat transfer in the tank is studied, and the mechanism between the boundary oil temperature of the tank and internal and external factors is quantitatively characterized.

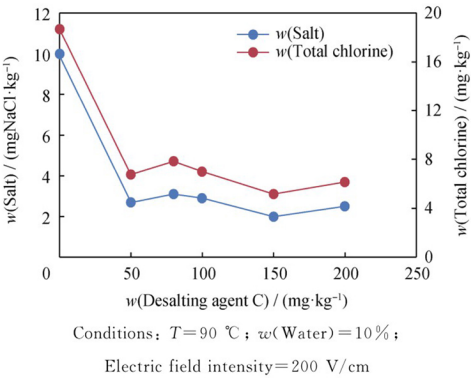


Acta Petrolei Sinica (Petroleum Processing Section), 2024, 40(1): 0221-0228 doi: 10.3969/j.issn.1001-8719.2024.01.022

Analysis and Removal of Organochlorine Salts in Crude Oil

WANG Zhenyu GU Yuegang YU Li ZHANG Yueqin
CAO Fengyi WANG Guofeng LI Yun

The main component of the chlorine-containing compound in diesel fraction is quinoline hydrochloride. The desalting agent C was prepared and desalting experiments were carried out on actual crude oil. The total chloride mass fraction and salt mass fraction of the desalted oil decreased.

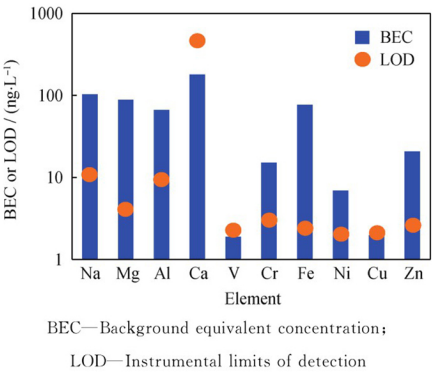


Acta Petrolei Sinica (Petroleum Processing Section), 2024, 40(1): 0229-0238 doi: 10.3969/j.issn.1001-8719.2024.01.023

Analysis of Trace Metal Elements in Residual Oils Through Extraction Induced by Emulsion Breaking and ICP-MS/MS

ZHU Qianhua LIU Hongwei NIE Xidu

The metal elements in oil phase were transferred to water phase through extraction induced by emulsion breaking of residue samples, and 10 metal elements were accurately determined by ICP-MS/MS. In the MS/MS mode, collision/reaction gases were used to eliminate spectral interference by on-mass method, which expands the precision detection ability of various metal elements in residual oil.



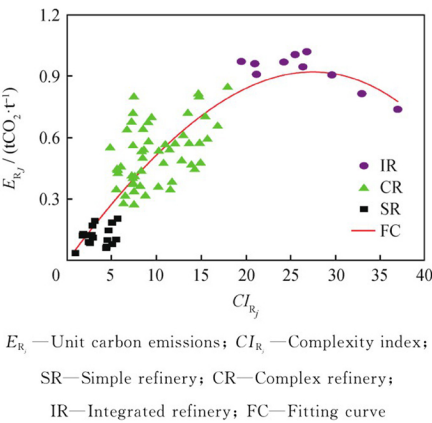
Reviews

Acta Petrolei Sinica (Petroleum Processing Section), 2024, 40(1): 0239-0247 doi: 10.3969/j.issn.1001-8719.2024.01.024

Relationship Between Complexity and Carbon Emissions in Refining and Chemical Industry

LI Chengzhuo MA Danzhu NIU Hao LIU Guangxin SHI Lei

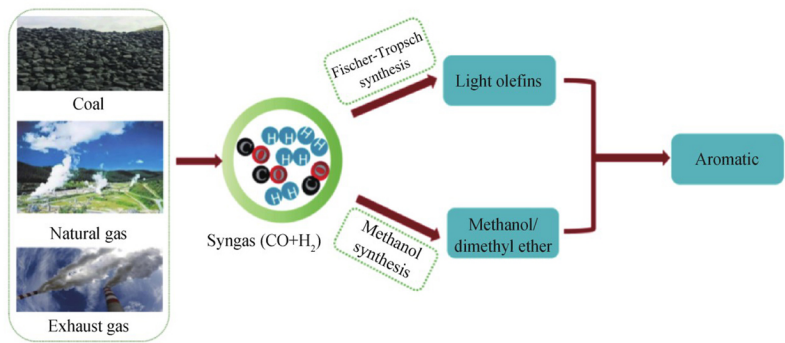
The relationship between complexity and unit carbon emissions of the refining and chemical industry was explored using the topology structure model of process unit in the refining and chemical industry; the Nelson complexity index was further introduced to obtain the optimal function relationship between them.



Research Progress on the Direct Synthesis of Aromatics From Syngas by Oxygen-Containing Intermediates

MA Dong SUN Laizhi WANG Zhibin CHEN Lei YANG Shuangxia XU Meirong XIE Xinping SI Hongyu
ZHAO Baofeng GAO Mingjie LI Tianjin HUA Dongliang

There are many influencing factors and reaction mechanisms for the direct synthesis of aromatics from syngas by oxygen-containing intermediates, and further research can lead to high yields of aromatic hydrocarbons and other products.



Research Progress on Structure-Activity Relationship Between Hydrocarbon Compositions and Physicochemical Properties of Jet Fuel

CAI Lu SHU Yiqiao TAO Zhiping ZHAO Jie FU Zhaolin

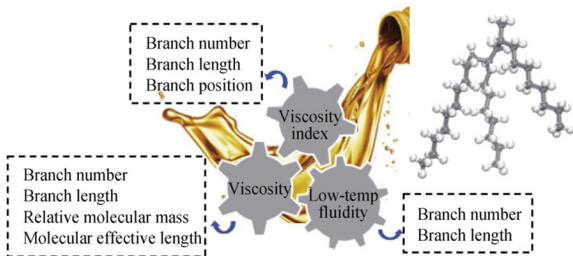
The relationship between the hydrocarbon compositions and physicochemical properties of fuel has always been a research focus. Through the molecular level research and characterization of jet fuel, the main hydrocarbon compositions of jet fuel are obtained to further build the qualitative and quantitative relevance with physical and chemical properties.



Research Progress on the Relationship Between Molecular Structure and Properties of Poly- α -olefins Synthetic Base Oil

HE Leilei SU Shuo LONG Jun

The relationship between the molecular structure and properties of poly- α -olefin synthetic base oils was summarized. Properties involve viscosity, viscosity index, and low-temperature fluidity. The structural parameters that affects the three properties were sorted out.



石油学报(石油加工)
SHIYOU XUEBAO (SHIYOU JIAGONG)
主 编 汪燮卿
双 月 刊
(1985 年 3 月创刊)
第 40 卷 第 1 期 2024 年 1 月 10 日

ACTA PETROLEI SINICA
(PETROLEUM PROCESSING SECTION)
Editor in Chief Wang Xieqing
Bimonthly
(Started in March 1985)
Vol. 40 No. 1 Jan. 10, 2024

主 管: 中国科学技术协会
主 办: 中国石油学会
编辑、出版:《石油学报(石油加工)》编辑部
地址:北京市海淀区学院路 18 号
邮编:100083
电话:010-62310752, 010-82368282
网址:www.syxbsyhg.com
E-mail:syxb8282.ripp@sinopec.com,
syxb8282@163.com

副 主 编: 胡晓春
印 刷: 北京科信印刷有限公司
发 行:
国 内: 北京市报刊发行局
国 外: 中国国际图书贸易总公司
(中国国际书店)
北京市 399 信箱

国内订阅处: 全国各地邮局
报刊登记证: (BJ)第 1404 号

Responsible Institution: China Association for Science and Technology
Sponsored by: China Petroleum Society
Edited and Published by: Editorial Office of Acta Petrolei Sinica
(Petroleum Processing Section)
Add: No. 18 Xueyuan Road, Haidian District, Beijing 100083, China
Tel: +86-010-62310752, +86-010-82368282
http://www.syxbsyhg.com
E-mail:syxb8282.ripp@sinopec.com,
syxb8282@163.com

Deputy Editor in Chief: Hu Xiaochun
Printed by: Beijing Kexin Printing Co., Ltd.
Distributed by:
Domestic: The Bureau of Periodical Distribution, Post
Office of Beijing
Abroad: China International Book Trading Corporation
(Guoji Shudian), P. O. Box 399, Beijing
(Code No. BM845)

Subscribed by: Local Post Offices in China
Periodical Registration: (BJ) No. 1404

ISSN 1001-8719
CN 11-2129/TE

国内邮发代号: 82-332
国外发行代号: BM845

定价: 20.00 元/期
120.00 元/年

ISSN 1001-8719

