

化工进展

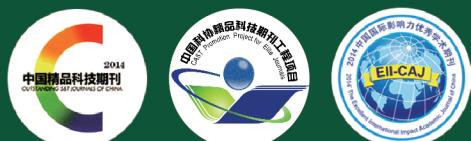
第三十六卷

第九期

中国化工学会刊

Journal of Chemical Industry and Engineering Society of China

ISSN 1000-6613 / CN 11-1954/TQ



EI收录期刊

2017
第36卷

9

化工进展

Chemical Industry and Engineering Progress



ISSN 1000-6613

09>
9 771000 66171



欢迎扫码关注
化工进展微信公众号

主办



中国化工学会
化学工业出版社



目 次

特约评述

- 聚烯烃类弹性体——现状与进展 李伯耿, 张明轩, 刘伟峰, 王文俊 (3135)
我国化石能源清洁利用前景展望 胡徐腾 (3145)

化工过程与装备

- 颗粒床过滤除尘技术研究进展 颜深, 孙国刚, 孙占朋, 韩笑, 黄雷, 赵斐 (3152)
油气输送管线水合物沉积研究进展 宋光春, 李玉星, 王武昌, 姜凯, 施政灼, 赵鹏飞 (3164)
新型循环流化床反应器研究进展 苏鲁书, 朱晴晴, 刘丙超, 李春义 (3177)
 $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$ 晶体流态化煅烧过程实验研究 王玲, 郑燕萍, 程榕, 杨阿三, 孙勤, 张许力 (3189)
基于图像分析的底吹搅拌反应器混合特性 肖清泰, 王仕博, 李鹏, 高勤, 徐建新, 王华 (3195)
管道表面润湿性对层流流动阻力的影响 敬加强, 齐红媛, 梁爱国, 史建英, 蒋华义, 张亦翔, 王玉龙, 孙娜娜 (3203)
不同有机物对氯化钠溶解度和介稳区的影响 卢诗谣, 赵颖颖, 袁俊生 (3210)
水冷螺旋输送机内颗粒的流动特性 张忠良, 刘永启, 郑斌, 李瑞阳, 郁鸿凌 (3217)
有机朗肯循环中的工质热源转折温度及其特征 李新国, 王伟, 翟哲, 南来福, 王竟逸 (3223)
火灾环境液化石油气卧罐动态可靠性分析 贾梅生, 陈国华 (3231)
异距贴壁风喷口布置方案的数值模拟 孟凡冉, 高畅, 金保昇, 张勇 (3237)
共沸精馏分离 2-甲基吡啶和水 杨颖, 范开功, 白鹏, 郭翔海 (3243)

能源加工与技术

- 生物炼制经济的发展思路和展望 孙明荣, 刘晓欣, 谢文华, 宗保宁, 鄂亮 (3250)
质子交换膜燃料电池冷启动研究进展 岳利可, 王世学, 李林军 (3257)
添加剂改性对催化裂化油浆静电分离的影响 郭爱军, 龚黎明, 赵娜, 陈坤, 刘贺, 王宗贤, 黄金菊, 孙梦, 袁俊聪 (3266)
神华煤直接液化残渣萃取组分改性石油沥青 宋真真, 孙鸣, 黄晔, 吕波, 苏小平, 钟姣姣, 赵香龙, 马晓迅 (3273)
蛭石复合添加剂对准东煤灰特性影响 高姗姗, 金晶, 刘敦禹, 王永贞, 姚宇翔, 寇学森 (3280)
不连沟煤热解半焦燃烧特性研究 薛新巧, 冯钰, 靳立军, 胡浩权 (3287)

工业催化

- 乙炔气相法合成乙酸乙烯催化剂的研究进展 郭秀玲, 陈光辉, 王伟文, 李建隆 (3293)
离子液体催化二氧化碳合成环状碳酸酯的研究进展 杨美, 钟向宏, 陈群 (3300)
 Ag/AgBr -硅藻土复合光催化剂的制备及其可见光光催化性能 龚久炎, 宋文东, 陈嘉琳, 李世杰, 蔡璐, 纪丽丽 (3309)
氮掺杂石墨烯负载八面体氧化亚铜复合材料的制备及其电催化性能 李月华, 张蓉, 姜孟秀, 王文洋 (3316)
离子液体催化转化 CO_2 合成碳酸丙烯酯 郭立颖, 邓莉莉, 胡卫东, 金先超, 殷龙珠 (3323)
碱处理 HZSM-5 催化纤维素热裂解制备芳烃 程浩, 周峰, 陈皓, 傅杰, 陈可泉, 乔凯, 欧阳平凯 (3329)

材料科学与技术

- 用于燃料电池的碱性阴离子交换膜研究进展 袁园, 沈春晖, 陈继钦, 任学超 (3336)
钠离子电池正极材料 $\text{Na}_{0.44}\text{MnO}_2$ 的研究进展 史文静, 燕永旺, 徐守冬, 陈良, 刘世斌, 张鼎 (3343)
锂硫电池用硫化锂正极复合材料的研究现状 李巧乐, 燕映霖, 杨蓉, 陈利萍, 任冰, 许云华 (3353)
多孔液体及其二氧化碳气体分离研究进展 李晓强, 丁玉栋, 廖强, 朱恂, 郭李恒, 王宏 (3362)
镁锂合金的腐蚀机理及表面防护方法研究进展 高晓辉, 李玉峰, 祝晶晶, 景晓燕 (3373)
水热法制备二氧化锰及在过氧化氢传感器中的应用 靳福娅, 余林, 蓝邦, 程高, 孙明, 郑小颖 (3380)
多功能智能型反射隔热涂料的制备与性能表征 徐得华, 靳虎, 徐雪青, 邱晓忠, 何新华, 符小艺 (3388)
溶胶-凝胶法低温制备 $\text{Ce}_{0.8}\text{Sm}_{0.2}\text{O}_{2-\alpha}$ 及其复合电解质的中温燃料电池性能 管清梅, 王洪涛 (3395)
一种新型堵水调剖用酚醛交联剂的研究 孙磊, 徐鸿志, 郝志伟, 张贵清, 夏烨, 刘小攀, 王宇宾 (3400)
 $\beta\text{-CD}/\text{Al}_2\text{O}_3/\text{ATP}$ 复合材料对乙腈/正丙醇的吸附分离性能的影响 王俊, 韶晖, 解丹燕, 冷一欣, 黄春香 (3407)
水基 NiFe_2O_4 磁流体在无磁场时的沉降稳定性 胡臻尚, 吴张永, 莫子勇, 蔡晓明, 魏镜弢 (3414)
电化学脱除 Pb^{2+} 印迹复合膜的制备及其性能 刘秀红, 王永洪, 刘成岑, 侯蒙杰, 李龙 (3422)

憎水性金属多氮唑骨架材料(MAF-6)对糠醛/水吸附分离性能的研究……高春苹,石琪,董晋湘(3429)

生物与医药化工

新型纳米棒药物载体的合成及性能研究进展……李薇,赵一凡,曹媛媛,胡平静,李祥子(3436)
基因敲除弱化产1,3-丙二醇*Klebsiella pneumoniae*荚膜多糖的合成

……刘情,王小婉,诸葛斌,陆信曜,宗红,方慧英,宋健(3447)

精细化工

特种氟碳表面活性剂的研究及应用进展……李永飞,王彦玲,王倩,李强,任金恒,王坤(3453)
固载化离子液体的制备及其在催化加氢反应中的应用研究进展……徐冰莹,马青青,金欣,于世涛(3465)

资源与环境化工

负载型酞菁用于水和空气中有机污染物的可见光催化降解研究进展……王傲,孙康,蒋剑春(3475)
废旧锂离子电池中钴、锂的回收研究进展……孟奇,张英杰,董鹏,梁风(3485)

微生物共代谢处理印染废水研究进展……张庆云,谢学辉,柳建设(3492)

固定化碳酸酐酶催化吸收模拟烟气中CO₂实验研究……李娟,张琳,孙莹,杨林军(3502)

非碳基吸附剂高温捕集氯化铅蒸气……夏文青,黄亚继,王昕晔,查健锐,杨钊,王健,徐力刚(3508)

基于硅基的垃圾焚烧飞灰中温热处理重金属稳固化实验

……孙立,吴新,刘道洁,李军辉,李诗,都艺伟(3514)

曝气及外加H₂O₂强化电芬顿法处理石化反渗透浓水

……吴月,孙宇维,王崇,张健,何沛然,李玉平,张忠国,曹宏斌(3523)

行业动态

2017年绿色化学挑战奖简介……杨懿,叶君,陈秋铭,熊健(3531)

产品信息(3501, 3507) • 征订启事(3446)

广告索引

封面:精馏技术国家工程研究中心(天津大学)

彩插9:天津市新天进科技开发有限公司

封二:北京泽华化学工程有限公司

彩插10:苏州顶裕节能设备有限公司

封三:北京世纪森朗实验仪器有限公司

彩插11:第九届中国(上海)国际石油化工技术
装备展览会

封四:中山大学惠州研究院

彩插12:北京三聚环保新材料股份有限公司

彩插1:北京泽华化学工程有限公司

内插1:浙江丰利粉碎设备有限公司

彩插2:青岛科大隆腾科技发展有限公司

内插2:广西碳酸钙产业化工程院

彩插3:石家庄波特无机膜分离设备有限公司

内插3:南通富莱克流体装备有限公司

彩插4:精馏技术国家工程研究中心

内插4:浙江大学控制科学与工程学院

彩插5:常州天大精馏工程有限公司

内插5:温州市中伟磁传密封设备厂

彩插6:北京中能环科技术发展有限公司

内插6:上海申银机械(集团)有限公司

彩插7:北京北化工程技术有限公司

彩插8:上海沪禹泵阀设备有限公司

责任编辑 奚志刚

英文顾问 蔡家琦,李保庆,龙秉文,王运东

主 管	中国科学技术协会	主 编	曹湘洪	国际标准刊号	ISSN 1000-6613
主 办	中国化工学会	编 辑 部 主任	黄丽娟	国内统一刊号	CN 11-1954/TQ
编 辑	化学工业出版社	广 告 负 责 人	胡晓丹	广 告 发 布 登 记 号	京东工商广登字20170106号
出 版	《化工进展》编辑部	编 辑 部 电 话	010-64519500/9501/9502	订 阅 处	全 国 各 地 邮 局
通 讯 地 址	化学工业出版社	广 告 部 电 话	010-64519466/9499	邮 发 代 号	82-311
邮 编	北京市东城区青年湖南街13号	印 刷	北京科信印刷有限公司	海 外 总 发 行	中国国 际图书贸易集团有限公司
E-mail	100011	开 户 银 行	中国工商银行北京和平里支行	国 外 发 行 代 码	M3231
网 址	hgjz@263.net	账 户 名 称	北京进展期刊社	定 价	85 元(国内)
	www.hgjz.com.cn	银 行 账 号	0200004219200176319		20 美元(国外)



Contents

Invited reviews

- State-of-the-art and research progress of polyolefin-based elastomer LI Bo-Geng, ZHANG Mingxuan, LIU Weifeng, WANG Wenjun (3135)
Outlook of clean utilization of fossil energy in China Hu Xuteng (3145)

Chemical processes and equipments

- Advances in research on granular bed filter for dust removal YAN Shen, SUN Guogang, SUN Zhanpeng, HAN Xiao, HUANG Lei, ZHAO Fei (3152)
A review on hydrate deposition in oil and gas transmission pipelines SONG Guangchun, LI Yuxing, WANG Wuchang, JIANG Kai, SHI Zhengzhuo, ZHAO Pengfei (3164)
Progress in the study of novel circulating fluidized bed reactors SU Lushu, ZHU Qingqing, LIU Bingchao, LI Chunyi (3177)
Experimental study on the fluidized calcinations of $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$ crystals WANG Ling, ZHENG Yanping, CHEN Rong, YANG Asan, SUN Qin, ZHANG Xuli (3189)
Study on mixing characteristics in bottom-blown stirred reactor using image analysis XIAO Qingtai, WANG Shibo, LI Peng, GAO Qin, XU Jianxin, WANG Hua (3195)
Experimental research on the effect of pipe surface wettability on flow resistance in laminar flow JING Jiaqiang, QI Hongyuan, LIANG Aiguo, SHI Jianying, JIANG Huayi, ZHANG Yixiang, WANG Yulong, SUN Nana (3203)
Study on effects of different organic compounds on solubility and metastable zone of sodium chloride LU Shiyao, ZHAO Yingying, YUAN Junsheng (3210)
Flow characteristics of particles in water-cooled screw conveyor ZHANG Zhongliang, LIU Yongqi, ZHENG Bin, LI Ruiyang, YU Hongling (3217)
Shift-temperature of heating fluid and its characteristics for working fluid in organic Rankine cycle LI Xinguo, WANG Wei, ZHAI Zhe, NAN Laifu, WANG Jingyi (3223)
Dynamic reliability of horizontal LPG tank exposed to fire JIA Meisheng, CHEN Guohua (3231)
Numerical simulation of near-wall air scheme combined with different jet position MENG Fanran, GAO Chang, JIN Baosheng, ZHANG Yong (3237)
Separation of the binary system with 2-methylpyridine and water by azeotropic distillation YANG Ying, FAN Kaigong, BAI Peng, GUO Xianghai (3243)

Energy processes and technology

- Present economical development and prospective of biorefineries SUN Mingrong, LIU Xiaoxin, XIE Wenhua, ZONG Baoning, GAO Liang (3250)
Research progress of cold start of proton exchange membrane fuel cell YUE Like, WANG Shixue, LI Linjun (3257)
The influence of additive modification on electrostatic separation of FCC slurry oil GUO Aijun, GONG Liming, ZHAO Na, CHEN Kun, LIU He, WANG Zongxian, HUANG Jinju, SUN Meng, YUAN Juncong (3266)
Modified asphalt with the extract fractions of Shenhua direct coal liquefaction residue SONG Zhenzhen, SUN Ming, HUANG Ye, LÜ Bo, SU Xiaoping, ZHONG Jiaoqiao, ZHAO Xianglong, MA Xiaoxun (3273)
Effect of vermiculite composite additives on the anti-slagging behavior during combustion of Zhundong coal GAO Shanshan, JIN Jing, LIU Dunyu, WANG Yongzhen, YAO Yuxiang, KOU Xuesen (3280)
Combustion characteristics of pyrolysis char of Buliangou coal XUE Xingqiao, FENG Yu, JIN Lijun, HU Haoquan (3287)

Industrial catalysis

- Research progress of catalysts for synthesis of vinyl acetate from acetylene and acetic acid GUO Xiuling, CHEN Guanghui, WANG Weiwen, LI Jianlong (3293)
Recent progress of the synthesis of cyclic carbonates from CO_2 and epoxides catalyzed by ionic liquids YANG Mei, ZHONG Xianghong, CHEN Qun (3300)
Ag/AgBr-diatomaceous earth composite photocatalysts with superior photocatalytic performance under visible-light irradiation GONG Jiuyan, SONG Wendong, CHEN Jialin, LI Shijie, CAI Lu, JI Lili (3309)
Synthesis and electrocatalytic performance of nitrogen doped graphene loading octahedral cuprous oxide composite materials LI Yuehua, ZHANG Rong, JIANG Mengxiu, WANG Wenyang (3316)
Ionic liquids as catalysts for conversion of CO_2 to propylene carbonate GUO Liying, DENG Lili, HU Weidong, JIN Xianchao, YIN Longzhu (3323)
Preparation of aromatics from fast catalytic pyrolysis of cellulose over alkali-treated HZSM-5 CHENG Hao, ZHOU Feng, CHEN Hao, FU Jie, CHEN Kequan, QIAO Kai, OUYANG Pingkai (3329)

Material science and technology

- Research progress of alkaline anion exchange membranes ··· YUAN Yuan, SHEN Chunhui, CHEN Jiqin, REN Xuechao (3336)
Research progress of sodium manganate oxide $\text{Na}_{0.44}\text{MnO}_2$ as cathode for sodium-ion batteries ··· SHI Wenjing, YAN Yongwang, XU Shoudong, CHEN Liang, LIU Shibin, ZHANG Ding (3343)
Research status of lithium sulfide composites as cathode for lithium sulfur battery ··· LI Qiaole, YAN Yinglin, YANG Rong, CHEN Liping, REN Bing, XU Yunhua (3353)
Review on porous liquids and its application in carbon dioxide sequestration ··· LI Xiaoqiang, DING Yudong, LIAO Qiang, ZHU Xun, GUO Liheng, WANG Hong (3362)
Corrosion mechanism and surface protection method for magnesium-lithium alloy ··· GAO Xiaohui, LI Yufeng, ZHU Jingjing, JING Xiaoyan (3373)
Preparation of MnO_2 nanomaterials in hydrothermal method and applied in hydrogen peroxide sensing ··· JIN Fuya, YU Lin, LAN Bang, CHENG Gao, SUN Ming, ZHENG Xiaoying (3380)
Preparation and characterization of smart building paints with multiple functions ··· XU Dehua, JIN Hu, XU Xueqing, QIU Xiaozhong, HE Xinhua, FU Xiaoyi (3388)
 $\text{Ce}_{0.8}\text{Sm}_{0.2}\text{O}_{2-\alpha}$ ceramic prepared by sol-gel method at low temperature and its composite electrolyte in intermediate temperature fuel cells ··· GUAN Qingmei, WANG Hongtao (3395)
Study on a novel phenol-formaldehyde crosslinker for water shutoff and profile control ··· SUN Lei, XU Hongzhi, HAO Zhiwei, ZHANG Guiqing, XIA Ye, LIU Xiaopan, WANG Yubin (3400)
Study on the adsorption performance of β -CD/ Al_2O_3 /ATP composites for separation of acetonitrile and *n*-propanol ··· WANG Jun, SHAO Hui, XIE Danyan, LENG Yixin, HUANG Chunxiang (3407)
Sedimentation stability of water-based NiFe_2O_4 ferrofluid in the absence of magnetic field ··· HU Zhenshang, WU Zhangyong, MO Ziyong, CAI Xiaoming, WEI Jingtao (3414)
Preparation of electrochemical removal lead ion imprinted composite film and its performance ··· LIU Xiuhong, WANG Yonghong, LIU Chengcen, HOU Mengjie, LI Long (3422)
Study of the adsorptive separation performance of hydrophobic metal azolate framework (MAF-6) for furfural/water system ··· GAO Chunping, SHI Qi, DONG Jinxiang (3429)

Biochemical and pharmaceutical engineering

- Fabrication and properties of novel nanorods drug carriers ··· LI Wei, ZHAO Yifan, CAO Yuanyuan, HU Pingjing, LI Xiangzi (3436)
Reducing the capsular polysaccharide synthesis of *Klebsiella pneumoniae* in 1,3-propanediol fermentation by genes knocking-out ··· LIU Qing, WANG Xiaowan, ZHUGE Bin, LU Xinyao, ZONG Hong, FANG Huiying, SONG Jian (3447)

Fine chemicals

- Progresses in research and application of special fluorocarbon surfactant ··· LI Yongfei, WANG Yanling, WANG Qian, LI Qiang, REN Jinheng, WANG Kun (3453)
Progress in preparation of supported ionic liquids and its application in catalytic hydrogenation reactions ··· XU Bingying, MA Qingqing, JIN Xin, YU Shitao (3465)

Resource and environmental engineering

- Immobilized phthalocyanines for visible light photodegradation of organic pollutants in water and air ··· WANG Ao, SUN Kang, JIANG Jianchun (3475)
Recovery of Co and Li from spent lithium ion batteries ··· MENG Qi, ZHANG Yingjie, DONG Peng, LIANG Feng (3485)
Research overview of microbial co-metabolism on printing and dyeing wastewater treatment ··· ZHANG Qingyun, XIE Xuehui, LIU Jianshe (3492)
Experimental studies on catalytic absorption of CO_2 in simulated flue gas by immobilized carbonic anhydrase ··· LI Juan, ZHANG Lin, SUN Ying, YANG Linjun (3502)
Experimental study on high temperature adsorption of lead chloride by non-carbon adsorbents ··· XIA Wenqing, HUANG Yaji, WANG Xinye, ZHA Jianrui, YANG Zhao, WANG Jian, XU Ligang (3508)
Stabilization of heavy metals in municipal solid waste incineration fly ash using thermal treatment with silica-based material ··· SUN Li, WU Xin, LIU Daojie, LI Junhui, LI Shi, DU Yiwei (3514)
Enhanced treatment of petrochemical reverse osmosis concentrate by an electro-Fenton process with dosing H_2O_2 and aeration ··· WU Yue, SUN Yuwei, WANG Dong, ZHANG Jian, HE Peiran, LI Yuping, ZHANG Zhongguo, CAO Hongbin (3523)

Superintend: China Association for Science and Technology

Address: No. 13 Qingnianhu South Street,
Dongcheng District, Beijing, China

Email: hgjz@263.net
huagongjz@126.com

Sponsor: The Chemical Industry and Engineering Society of China; Chemical Industry Press

Post Code: 100011

http: //www.hgjz.com.cn

Editor: Editorial Department of Chemical Industry and Engineering Progress

Editor in Chief: CAO Xianghong

Price: \$ 20

Publisher: Chemical Industry Press

Managing Editor: HUANG Lijuan

ISSN: 1000-6613

Executive Editor: XI Zhigang

CN: 11-1954/TQ

Tel: (010) 64519466/9499/9500/9501/9502

CODEN: HUJIEK