



化工进展

Chemical Industry and Engineering Progress

Vol.42 No.3

2023年3月

化工进展

第四十二卷

第三期

二〇二三年三月

中国化工学会会刊 ISSN 1000-6613 CN 11-1954/TQ CODEN HUJIEK



中国石油石油化工研究院
PETROCHINA PETROCHEMICAL RESEARCH INSTITUTE

广告



主办 | 中国化工学会
 化学工业出版社有限公司



目次

特约评述

氢液化装置产业化与研究进展·····孙潇, 朱光涛, 裴爱国(1103)

化工过程与装备

高压氢气泄漏射流研究进展·····闫兴清, 戴行涛, 喻健良, 李岳, 韩冰, 胡军(1118)
蒸气压缩制冷/热泵系统中的气液分离技术·····吴恒, 李银龙, 晏刚, 熊通, 张浩, 陶骢(1129)
固-液/气-液多相耦合热控技术应用研究进展·····吴伟雄, 谢世伟, 马瑞鑫, 刘吉臻, 汪双凤, 饶中浩(1143)
油包水乳状液体系中水合物生长行为研究进展·····王唯, 张东旭, 李遵照, 王晓霖, 黄启玉(1155)
微乳液脉动热管应用于锂离子电池的散热性能·····高婷婷, 蒋振, 吴晓毅, 郝婷婷, 马学虎, 温荣福(1167)
升降热流条件下的脉动热管性能·····余俊声, 朱晔, 李乾坤, 徐士轩, 张昕阳, 汪城, 屈健(1178)
竖管渗流降膜蒸发式冷凝器传热特性分析·····谢迎春, 马洪亭, 徐畅, 马硕, 陈默, 刘军, 孙国强(1187)
基于全周期持续节能的换热网络滑动窗口分析与裕量缓释优化控制·····朱添宇, 孙琳, 任超, 罗雄麟(1195)
高速动压机械密封静环辅助O形圈密封和微动补偿性能分析·····黄柏洪, 李双喜, 闫欣欣, 古彦飞, 刘兴华, 宋子锋(1206)
燃料驱动无电热泵系统的节能模拟与运行经济性分析·····胡亚飞, 冯自平, 田佳焱, 黄冲, 宋文吉(1217)
不同波纹壁面微细通道沸腾曲线及沸腾起始点研究·····罗小平, 樊鹏, 周建阳, 王梦圆(1228)
废轮胎梯级热解中试装置开发与产物特性分析·····潘宇涵, 徐俊, 赵光杰, 林诚乾, 金亮, 薛志亮, 周永刚, 黄群星(1240)
弹载相变热沉传热仿真与优化·····邹银才, 李清国, 吴辉, 钟小兵, 陈咸志(1248)

能源加工与技术

全球可再生能源电转甲烷的应用·····张巍, 王锐, 缪平, 田戈(1257)
熔融金属法甲烷裂解制氢和碳材料研究进展·····何阳东, 常宏岗, 王丹, 陈昌介, 李雅欣(1270)
海上多孔介质通道内氢气换热与正仲氢转化的耦合特性·····孙崇正, 樊欣, 李玉星, 许洁, 韩辉, 刘亮(1281)
基于液氢和氨的氢运输链能效和碳排放分析·····刘洪茹, 林文胜(1291)
绝缘油浸没预热NCM811动力电池的热特性及放电参数改善
·····鲁南, 王海民, 王传伟, 胡学彬, 周建刚, 柳文琴, 赵峰, 孟国栋(1299)

工业催化

用于HC-SCR还原NO_x的Cu基分子筛催化剂研究进展·····宁淑英, 苏亚欣, 杨洪海, 温妮妮(1308)
柴油车用NH₃-SCR铜基分子筛催化剂孤立态Cu²⁺研究进展·····张晨光, 封硕, 邢玉焯, 沈伯雄, 苏立超(1321)
金属卟啉/碳纳米管仿生催化剂的制备及其在Baeyer-Villiger氧化反应中的催化机理·····陈韶云, 周贤太, 纪红兵(1332)
甲醇供氢体系铜锌双金属催化糠醛加氢转化·····萧焱鑫, 张军, 胡升, 单锐, 袁浩然, 陈勇(1341)
金属氧化物活化P/HZSM-5催化生物质热解气重整制备富烃生物油·····郑云武, 裴涛, 李冬华, 王继大, 李继容, 郑志锋(1353)

- PtSn/MgAl₂O₄-sheet 催化剂的制备及其PDH反应性能张孟旭, 王红琴, 李金, 安霓虹, 戴云生, 钱颖, 沈亚峰(1365)
- Cu-SAPO-44 分子筛的制备及其C₃H₆-SCR脱硝性能周峰, 张恒, 温妮妮, 王旭瑞, 徐璐, 李玮, 苏亚欣(1373)
- 有机固废合成气原位净化催化剂设计及反应器分析宋叶, 陈玉卓, 宋云彩, 冯杰(1383)

材料科学与技术

- 聚合物电解质在锌离子电池中的研究进展张艺璇, 胡伟, 刘梦瑶, 鞠敬鸽, 赵义侠, 康卫民(1397)
- 磷酸地质聚合物的制备及其性能研究进展高江雨, 张耀君, 贺攀阳, 刘礼才, 张枫桦(1411)
- 基于海水提铀的多孔芳香框架材料研究进展郭帅帅, 陈锦路, 金梁程龙, 陶醉, 陈小丽, 彭国文(1426)
- 二维纳米材料在渗透汽化脱盐膜中的应用陈仪, 郭耀励, 叶海星, 李宇璇, 牛青山(1437)
- 聚苯胺/碳纳米管气敏材料的研究进展薛博, 杨婷婷, 王雪峰(1448)
- 可生物降解泡沫材料的研究进展蔡举艳, 苏琼, 王彦斌, 王鸿灵, 梁俊奎, 王忠旭, 郭丽, 赵利斌(1457)
- 直接空气捕碳固体多孔材料的研究进展孔祥如, 张肖阳, 孙鹏翔, 崔琳, 董勇(1471)
- 纳米多孔CuMn基氧化物电极的制备及性能杜保宁, 赵珊, 刘向卿, 张毅, 肖雅茹, 张少飞, 李田田, 孙金峰(1484)
- 半导体光催化剂BiOCl异质结的构建及应用胥生元, 郝玮, 王杰, 高文生, 谢克锋(1493)
- Fe³⁺诱导聚多巴胺-聚乙烯亚胺电沉积制备单价选择性膜赵王瑞, 刘燕, 张伟, 邓会宁(1508)
- PEO改性PVDF/SMA膜结构和性能杨园园, 雷婷, 秦青青, 武晓, 李剑, 秦舒浩, 李嘉乐, 张兵兵, 任露露(1515)
- H₃PO₄活化核桃壳制备活性炭及在Cr(VI)吸附中的应用邢献军, 罗甜, 卜玉蒸, 马培勇(1527)
- 基于超交联聚合物前体的碳载钾基CO₂吸附剂制备和性能
.....陈崇明, 曾四鸣, 罗小娜, 宋国升, 韩忠阁, 郁金星, 孙楠楠(1540)
- 大温度梯度下含铝型硅酸铝纤维板的透液性能尚小标, 李广超, 肖利平, 白永珍, 肖人友, 李佳剑, 张志浩(1551)

精细化工

- 聚甲基丙烯酸酯类黏度指数改进剂的研究进展李光文, 华渠成, 黄作鑫, 达志坚(1562)

资源与环境化工

- 碱性工业固废矿化封存二氧化碳研究进展王秋华, 吴嘉帅, 张卫凤(1572)
- 逆水煤气变换反应研究进展王晓月, 张伟敏, 姚正阳, 郭晓宏, 李聪明(1583)
- 厌氧消化系统酸化预警及调控技术研究进展孟晓山, 汤子健, 陈琳, 呼和涛力, 周政忠(1595)
- 氧化还原介体介导厌氧氨氧化生物脱氮的研究进展赵星程, 贾方旭, 蒋伟或, 陈佳熠, 刘晨雨, 姚宏(1606)
- CO₂捕集工艺中热再生气余热的PVDF/BN-OH平板复合膜回收特性尚玉, 肖满, 崔秋芳, 涂特, 晏水平(1618)
- 超声波与紫外线耦合脱气杀菌谢迎春, 王倩倩, 马永丽, 孙国强, 刘明言(1629)
- CaSO₄载氧体在煤气化化学链燃烧中的脱汞范昀培, 金晶, 刘敦禹, 王静杰, 刘秋祺, 许开龙(1638)
- 机械活化强化锌焙砂中锌的浸出陈绍勤, 胡玲, 雷天涯, 王蓉, 舒建成, 陈梦君(1649)
- 稀土Er(III)对短程硝化性能的影响及其抑制动力学特性李芸, 崔楠, 熊星星, 黄志远, 王东亮, 许丹, 李军, 李泽兵(1659)

责任编辑: 余雪娇

英文顾问: 郭梅芳, 金仁村, 李保庆, 龙秉文, 王运东



Contents

Invited review

Industrialization and research progress of hydrogen liquefierSUN Xiao, ZHU Guangtao, PEI Aiguo (1103)

Chemical processes and equipment

- Research progress of high-pressure hydrogen leakage and jet flow
.....YAN Xingqing, DAI Xingtao, YU Jianliang, LI Yue, HAN Bing, HU Jun (1118)
- Vapor-liquid separation technology in refrigeration/heat pump systems
.....WU Heng, LI Yinlong, YAN Gang, XIONG Tong, ZHANG Hao, TAO Kui (1129)
- Research progress of solid-liquid/gas-liquid multiphase coupling thermal control technology
.....WU Weixiong, XIE Shiwei, MA Ruixin, LIU Jizhen, WANG Shuangfeng, RAO Zhonghao (1143)
- Research progress on the growth behavior of hydrates in water-in-oil emulsion systems
.....WANG Wei, ZHANG Dongxu, LI Zunzhao, WANG Xiaolin, HUANG Qiyu (1155)
- Experimental investigation on lithium-ion battery heat dissipation performance of oscillating heat pipe with micro-nano emulsionGAO Tingting, JIANG Zhen, WU Xiaoyi, HAO Tingting, MA Xuehu, WEN Rongfu (1167)
- Performance of pulsating heat pipe with rising and declining heat flux
.....YU Junsheng, ZHU Ye, LI Qiankun, XU Shixuan, ZHANG Xinyang, WANG Cheng, QU Jian (1178)
- Analysis of heat transfer characteristics in vertical tube of seepage falling film evaporative condenser
.....XIE Yingchun, MA Hongting, XU Chang, MA Shuo, CHEN Mo, LIU Jun, SUN Guoqiang (1187)
- Sliding window analysis and slow-release margin optimal control for heat exchanger networks based on full cycle sustainable energy savingZHU Tianyu, SUN Lin, REN Chao, LUO Xionglin (1195)
- Performance analysis of stator secondary O-ring seal and compensation for micro-motion of high-speed dynamic pressure mechanical sealHUANG Baiqi, LI Shuangxi, YAN Xinxin, GU Yanfei, LIU Xinghua, SONG Zifeng (1206)
- Energy saving simulation and operation economic analysis of fuel driven non-electric heat pump systems
.....HU Yafei, FENG Ziping, TIAN Jiayao, HUANG Chong, SONG Wenji (1217)
- Boiling curve and onset of nucleate boiling of microchannels with corrugated walls
.....LUO Xiaoping, FAN Peng, ZHOU Jianyang, WANG Mengyuan (1228)
- Development of pilot-plant for the step pyrolysis of waste tires and analysis of product characteristics
.....PAN Yuhan, XU Jun, ZHAO Guangjie, LIN Chengqian, JIN Liang, XUE Zhiliang, ZHOU Yonggang, HUANG Qunxing (1240)
- Heat transfer simulation and optimization of missile borne phase change heat sink
.....ZOU Yincui, LI Qingguo, WU Hui, ZHONG Xiaobing, CHEN Xianzhi (1248)

Energy processes and technology

- Application research progress of renewable power-to-methaneZHANG Wei, WANG Rui, MIAO Ping, TIAN Ge (1257)
- Development of methane pyrolysis based on molten metal technology for coproduction of hydrogen and solid carbon productsHE Yangdong, CHANG Honggang, WANG Dan, CHEN Changjie, LI Yaxin (1270)
- Coupling characteristics of hydrogen heat transfer and normal-parahydrogen conversion in offshore porous media channelsSUN Chongzheng, FAN Xin, LI Yuxing, XU Jie, HAN Hui, LIU Liang (1281)
- Energy efficiency and carbon emission analysis of hydrogen transport chains based on liquid hydrogen and ammonia
.....LIU Hongru, LIN Wensheng (1291)
- Thermal characteristics and improved discharge parameters of NCM811 traction battery immersed preheated by insulating oil
.....LU Nan, WANG Haimin, WANG Chuanwei, HU Xuebin, ZHOU Jianguang, LIU Wenqin, ZHAO Feng, MENG Guodong (1299)

Industrial catalysis

- Research progress on supported Cu-based zeolite catalysts for the selective catalytic reduction of NO_x with hydrocarbons
.....NING Shuying, SU Yaxin, YANG Honghai, WEN Nini (1308)
- Research progress of isolated Cu²⁺ in copper based zeolite NH₃-SCR catalyst for diesel vehicles
.....ZHANG Chenguang, FENG Shuo, XING Yuye, SHEN Boxiong, SU Lichao (1321)
- Preparation of metalloporphyrin/carbon nanotube biomimetic catalysts and its catalytic mechanism in baeyer-villiger oxidationCHEN Shaoyun, ZHOU Xiantai, JI Hongbing (1332)
- Cu-Zn catalyzed hydrogenation of furfural with methanol as hydrogen donor
.....XIAO Yaixin, ZHANG Jun, HU Sheng, SHAN Rui, YUAN Haoran, CHEN Yong (1341)
- Production of hydrocarbon-rich bio-oil by catalytic biomass pyrolysis over metal oxide improved P/HZSM-5 catalyst
.....ZHENG Yunwu, PEI Tao, LI Donghua, WANG Jida, LI Jirong, ZHENG Zhifeng (1353)

- Preparation of PtSn/MgAl₂O₄-sheet catalyst and its PDH reaction performance**
ZHANG Mengxu, WANG Hongqin, LI Jin, AN Nihong, DAI Yunsheng, QIAN Yin, SHEN Yafeng (1365)
- Preparation and de-NO_x performance of C₂H₆-SCR over Cu-SAPO-44 catalyst**
ZHOU Hao, ZHANG Heng, WEN Nini, WANG Xurui, XU Lu, LI Wei, SU Yaxin (1373)
- Catalyst design and reactor analysis for *in-situ* purification of organic solid waste syngas**
SONG Ye, CHEN Yuzhuo, SONG Yuncai, FENG Jie (1383)

Materials science and technology

- Research progress of polymer electrolytes in zinc-ion batteries**
ZHANG Yixuan, HU Wei, LIU Mengyao, JU Jingge, ZHAO Yixia, KANG Weimin (1397)
- Recent progress on the fabrication and properties of phosphobase geopolymer**
GAO Jiangyu, ZHANG Yaojun, HE Panyang, LIU Licai, ZHANG Fengye (1411)
- Research progress of porous aromatic frameworks based on uranium extraction from seawater**
GUO Shuaishuai, CHEN Jinlu, JIN Liangchenglong, TAO Zui, CHEN Xiaoli, PENG Guowen (1426)
- Application of two-dimensional nanomaterials in pervaporation desalination membrane**
CHEN Yi, GUO Yaoli, YE Haixing, LI Yuxuan, NIU Q. Jason (1437)
- Research progress of polyaniline/carbon nanotube gas sensing materials** ...XUE Bo, YANG Tingting, WANG Xuefeng (1448)
- Research progress on biodegradable foaming materials**
CAI Juyan, SU Qiong, WANG Yanbin, WANG Hongling, LIANG Junxi, WANG Zhongxu, GUO Li, ZHAO Libin (1457)
- Research progress of solid porous materials for direct CO₂ capture from air**
KONG Xiangru, ZHANG Xiaoyang, SUN Pengxiang, CUI Lin, DONG Yong (1471)
- Preparation and properties of nano porous CuMn-based oxide electrodes**
DU Baoning, ZHAO Shan, LIU Xiangqing, ZHANG Yi, XIAO Yaru, ZHANG Shaofei, LI Tiantian, SUN Jinfeng (1484)
- Construction and application of BiOCl heterojunction as semiconductor photocatalyst**
XU Shengyuan, HAO Wei, WANG Jie, GAO Wensheng, XIE Kefeng (1493)
- Fe³⁺ ions induced rapid electrodeposition of polydopamine-polyethyleneimine for monovalent selective membrane fabrication**
ZHAO Wangrui, LIU Yan, ZHANG Wei, DENG Huining (1509)
- Structure and properties of PEO modified PVDF/SMA membrane**
YANG Yuanyuan, LEI Ting, QIN Qingqing, WU Xiao, LI Jian, QIN Shuhao, LI Jiale, ZHANG Bingbing, REN Lulu (1516)
- Preparation of biochar from walnut shells activated by H₃PO₄ and its application in Cr(VI) adsorption**
XING Xianjun, LUO Tian, BU Yuzheng, MA Peiyong (1528)
- Preparation and performance of carbon supported potassium-based CO₂ adsorbent derived from hyper-cross linked polymers** ...CHEN Chongming, ZENG Siming, LUO Xiaona, SONG Guosheng, HAN Zhongge, YU Jinxing, SUN Nannan (1541)
- Wave transmission performance of zirconium aluminum silicate fiberboard under large temperature gradient**
SHANG Xiaobiao, LI Guangchao, XIAO Liping, BAI Yongzhen, XIAO Renyou, LI Jiajian, ZHANG Zhihao (1552)

Fine chemicals

- Progress on polymethacrylate as viscosity index improvers for lube oil**
LI Guangwen, HUA Qucheng, HUANG Zuoxin, DA Zhijian (1563)

Resources and environmental engineering

- Research progress of alkaline industrial solid wastes mineralization for carbon dioxide sequestration**
WANG Qiuhua, WU Jiashuai, ZHANG Weifeng (1573)
- Research progress of reverse water gas shift reaction**
WANG Xiaoyue, ZHANG Weimin, YAO Zhengyang, GUO Xiaohong, LI Congming (1584)
- Research progress of the early warning and regulation techniques for excessive acidification in the anaerobic digestion system**MENG Xiaoshan, TANG Zijian, CHEN Lin, HUHE Taoli, ZHOU Zhengzhong (1596)
- Redox mediators-mediated anaerobic ammonium oxidation process for biological nitrogen removal: a review**
ZHAO Xingcheng, JIA Fangxu, JIANG Weiyu, CHEN Jiayi, LIU Chenyu, YAO Hong (1607)
- Recovery characteristics of PVDF/BN-OH flat composite membrane for waste heat of hot stripped gas in CO₂ capture process**SHANG Yu, XIAO Man, CUI Qiufang, TU Te, YAN Shuiping (1619)
- Ultrasonic and ultraviolet coupling degassing and sterilization**
XIE Yingchun, WANG Qianqian, MA Yongli, SUN Guoqiang, LIU Mingyan (1630)
- Mercury removal by CaSO₄ oxygen carrier during *in-situ* gasification and chemical-looping combustion of coal**
FAN Yunpei, JIN Jing, LIU Danyu, WANG Jingjie, LIU Qiuqi, XU Kailong (1639)
- Mechanical activation for zinc enhanced leaching from zinc calcine**
CHEN Shaoqin, HU Ling, LEI Tianya, WANG Rong, SHU Jiancheng, CHEN Mengjun (1650)
- Influence of rare earth element Er(III) on performance of short-cut nitrification and its inhibition kinetics**
LI Yun, CUI Nan, XIONG Xingxing, HUANG Zhiyuan, WANG Dongliang, XU Dan, LI Jun, LI Zebing (1660)

Executive Editor: YU Xuejiao

English Consultant: GUO Meifang, JIN Rencun, LI Baoqing, LONG Bingwen, WANG Yundong