



中国化学会会刊 ISSN 1000-6613 CN 11-1954/TQ CODEN HUIJEK

化工进展

Chemical Industry and Engineering Progress

Vol.42 No.2
2023年2月

ATV 安特威 助您安心享受美好生活

高温、高压开关不卡涩
安特威软密封球阀，您安全的选择！

软密封球阀

- 彻底解决卡涩、泄漏难题；
- 弹性阀座设计，温度自适应、压力不敏感，轻松应对温度交变；
- 全系列API607防火认证，保障装置安全、稳定运行；
- 全流程、可视化智能制造，批量生产供货快、质量可靠；

广告

ISSN 1000-6613
9 771000 661232



主办 | CIESC 中国化学会
化学工业出版社有限公司



目 次

专栏：工业污泥/精馏釜残的热化学转化利用

(客座主编：吴玉龙；客座编辑：付少海，陈港，姚国栋，何林)

- 有机精馏釜残无害化处理与资源化转化研究进展与思考 杜金泽, 李源森, 蔡思超, 何林, 王成扬, 李鑫钢(559)
含铬污泥资源化方法研究进展 郭宇晨, 刘庆林, 蒋金洋, 宗永忠, 王金伟, 李臻, 吕树祥(575)
Cr(VI)去除用功能化纤维素纳米材料的结构设计研究进展 唐春霞, 李萌, 王玉奎, 宗永忠, 付少海(585)
低温水热耦合亚铁离子活化过硫酸盐提高剩余污泥的脱水性能 孙千千, 刘阵, 李瑞, 张溪, 杨明德, 吴玉龙(595)
水热处理对含油污泥热解特性及动力学影响 段一航, 高宁博, 全翠(603)
含油污泥多相复合调质降黏破乳分离过程 杨娟娟, 何林, 贺常晴, 李鑫钢, 隋红(614)
改性 Au-TiO₂光降解废水中诺氟沙星的影响 多佳, 姚国栋, 王英霖, 曾旭, 金滨滨(624)
Fe负载污泥生物炭催化热解聚丙烯及产物特性 胡兆岩, 张景新, 何义亮(631)
制革污泥蛋白质基生物质棉织物阻燃涂层的制备与阻燃性能 顾海洋, 王冬, 宗永忠, 付少海(641)

化工过程与装备

- 喷淋式烟气源热泵冷凝余热回收系统性能分析 张群力, 黄昊天, 张琳, 赵文强, 张秋月(650)
基于卷积神经网络的撞击流反应器浓度场混合特性 张建伟, 许蕊, 张忠闯, 董鑫, 冯颖(658)
基于新型微通道分离技术的甲醇制烯烃废水处理 黄起中, 刘冰, 马红鹏, 吕文杰(669)
尿素包合法分离费托轻质油中的正构烃 王哲, 余颖, 石永杰, 杨顺, 陈久洲, 崔希利, 邢华斌(677)
基于社区发现算法的复杂网络关键反应路线提取 陈土杰, 毕可鑫, 邱彤, 吉旭, 戴一阳(684)
亲水改性超薄平板热管传热性能 杨茂飞, 李金旺, 周刘伟(692)
高温密封润滑膜汽液固流动特性数值计算分析 侯婉, 陈江龙, 程谦, 陈英健, 卫泽鹏, 赵斌娟(699)

能源加工与技术

- 基于热-流-化耦合作用的单井增强地热系统性能分析 郭志鹏, 卜宪标, 李华山, 龚宇烈, 王令宝(711)
PV/T模块复合冷却模式性能对比测试与数值模拟分析 杜涛, 马进伟, 陈茜茜, 方浩, 陈秉章, 陈厚仁(722)

工业催化

- 多孔材料催化丙酮缩甘油合成研究进展 金鑫, 李玉姗, 解青青, 王梦雨, 夏星帆, 杨朝合(731)
金属催化剂烧结机制及抗烧结策略 曹敏, 毛玉娇, 王倩倩, 李莎, 闫晓亮(744)
ZnSn(OH)₆基纳米材料在环境光催化中的应用 陈邦富, 欧阳平, 李宇涵, 段有雨, 董帆(756)
Cu改性对稀土尾矿催化剂 NH₃-SCR 脱硝的影响 侯丽敏, 许杰, 付善聪, 武文斐(765)
表面活性剂对制备 Ca 掺杂 β -In₂S₃微观结构的影响及其光催化降解甲基橙性能 姚稳, 张雨晨, 滕文馨, 黎江玲(774)
焦炉煤气常量含碳气氛对加氢脱硫催化剂活性、选择性和积炭的影响 李乃珍, 孙瑞洁, 秦志峰, 苗茂谦, 吴琼笑, 常丽萍, 孙鹏程, 曾剑, 刘毅(783)

Y型沸石在异丁醇齐聚反应中的催化性能陈昊, 张传浩, 于峰, 范彬彬, 李瑞丰(794)

材料科学与技术

- 沥青胶结料自愈合行为分子动力学模拟研究进展赵毅, 杨臻, 王佳, 李静雯, 郑煜(803)
路面裂缝用聚硅氧烷密封材料研究进展夏慧芸, 杨浩田, 卢昌杰, 宋莉芳, 牛艳辉(814)
玻璃纤维浸润剂的分析与表征技术进展章建忠, 许升, 樊家澍, 费振宇, 王堃, 黄建, 崔峰波, 冉文华(821)
复合固体干燥剂的研究进展韩郑良, 肖鑫(839)
相变微胶囊改性及其在光热转换中的应用郝旭波, 牛宝联, 郭昊天, 徐祥和, 张忠斌, 李应林(854)
碳纳米材料在PU纱线基柔性应变传感器中的应用胡锦健, 李龙, 董子靖(872)
碳材料在柔性超级电容器中的研究进展田甜, 雷西萍, 于婷, 樊凯, 宋晓琪, 朱航(884)
石蜡固-固相变材料的制备及性能赵西坡, 卞武勋, 冉宝清, 刘进超, 尹少鼎, 孙义明(897)
颗粒状NiO的制备及其电化学性能和CO₂吸附性能杨泛明, 贺国文(907)
脉冲电沉积PbO₂涂层在PEMFC不锈钢双极板上的应用于海强, 郭泉忠, 杜克勤, 汪川(917)
草酸钾-尿素协同活化法制备超大比表面积面粉基多孔炭及其电化学储能应用
.....卓祖优, 宋生南, 黄明培, 杨旋, 卢贝丽, 陈燕丹(925)
基于二硫键和氢键的自修复聚氨酯弹性体的制备、改性及其应用
.....席慧敏, 钱坤, 俞科静, 李杰, 张中威, 熊自明, 张耀良(934)

资源与环境化工

- 二氧化碳的还原及其利用研究进展张育新, 王灿, 舒文祥(944)
光催化系统灭活微生物气溶胶的研究进展程荣, 邓子祺, 夏锦程, 李江, 石磊, 郑祥(957)
基于废弃PET的高值化功能性多孔碳材料及其应用进展刘丹, 范云洁, 王慧敏, 严政, 李鹏飞, 李家成, 曹雪波(969)
市政污泥热化学处置中磷元素形态转变与回收利用研究进展王毅斌, 冯敬武, 谭厚章, 李良钰(985)
多环芳烃类液体有机氢载体储放氢技术研究进展周一鸣, 齐随涛, 周宇亮, 谭潇, 石利斌, 杨伯伦(1000)
基于导电材料强化抗生素胁迫厌氧消化的研究进展祝佳欣, 朱雯喆, 徐俊, 谢婧, 王文标, 谢丽(1008)
废塑料高附加值利用技术研究进展范思强, 彭绍忠, 彭冲, 胡永康(1020)
离子型有机多孔聚合物的制备及其烟气脱硫耦合脱碳性质陈姝晖, 伍岳, 张文祥, 王闪闪, 马和平(1028)
沼渣、飞灰和污泥生物炭制备建筑陶粒王玉, 余广炜, 林佳佳, 黎长江, 江汝清, 邢贞娇, 余铖(1039)
聚酯纤维微塑料胁迫下活性污泥系统性能及微生物群落的变化情况胡璇, 陈滢(1051)
城市固废炉排炉焚烧过程二噁英排放浓度数值仿真陈佳昆, 汤健, 夏恒, 乔俊飞(1061)
基于水凝胶界面光蒸发的压裂返排液脱盐降污处理张赫, 李小可, 熊颖, 文劲(1073)
以城市废弃污泥为种泥启动厌氧氨氧化工艺的可行性张涵, 张肖静, 马冰冰, 佴灿, 刘砾砾, 马永鹏, 宋亚丽(1080)
A²/O-BAF工艺短程硝化模式下反硝化除磷效能吴新波, 党鸿钟, 马娇, 严渊, 曾天续, 李维维, 张国珍, 陈永志(1089)

观点

- 绿电制氢生产氨的新场景与实践孙晖, 孟祥海, 魏景海, 周红军, 徐春明(1098)

责任编辑：郑宇印

英文顾问：郭梅芳, 金仁村, 李保庆, 龙秉文, 王运东

Contents

Special column: Thermochemical conversion and resource utilization of industrial sludge and distillation residue

(Guest editor in chief: WU Yulong; Guest editor: FU Shaohai, CHEN Gang, YAO Guodong, HE Lin)	
Recent advances and considerations for the harmless treatment and conversion of organic distillation residue	.....DU Jinze, LI Yuansen, CAI Sichao, HE Lin, WANG Chengyang, LI Xingang (559)
Research progress on recycling methods of chromium-containing sludge	.....GUO Yuchen, LIU Qinglin, JIANG Jinyang, ZONG Yongzhong, WANG Jinwei, LI Zhen, LYU Shuxiang (575)
Progress in structural design of functionalized cellulose nanomaterials for Cr(IV) removal	.....TANG Chunxia, LI Meng, WANG Yuxi, ZONG Yongzhong, FU Shaohai (585)
Low temperature hydrothermal coupling of ferrous ion activated persulfate to improve the dewatering performance of waste activated sludge	.....SUN Qianqian, LIU Zhen, LI Rui, ZHANG Xi, YANG Mingde, WU Yulong (595)
Effect of hydrothermal treatment on pyrolysis characteristics and kinetics of oily sludge	.....DUAN Yihang, GAO Ningbo, QUAN Cui (603)
Treatment of oily sludge through multiphase compound conditioning and demulsification separation process	.....YANG Juanjuan, HE Lin, HE Changqing, LI Xingang, SUI Hong (614)
Effects on the photo-degradation of norfloxacin using modified Au-TiO ₂	.....DUO Jia, YAO Guodong, WANG Yingji, ZENG Xu, JIN Binbin (624)
Catalytic pyrolysis of polypropylene plastics and product properties with Fe-loaded sludge biochar	.....HU Zhaoyan, ZHANG Jingxin, HE Yiliang (631)
Preparation and property of tanning sludge based biomass flame retardant coating protein for cotton fabric	.....GU Haiyang, WANG Dong, ZONG Yongzhong, FU Shaohai (641)

Chemical processes and equipment

Analysis of condensation waste heat recovery system of spray flue gas source heat pump	.....ZHANG Qunli, HUANG Haotian, ZHANG Lin, ZHAO Wenqiang, ZHANG Qiuyue (650)
Mixing characteristics of concentration field in impingement flow reactor based on convolutional neural network	.....ZHANG Jianwei, XU Rui, ZHANG Zhongchuang, DONG Xin, FENG Ying (658)
Methanol to olefin wastewater treatment based on a novel microchannel separation technology	.....HUANG Qizhong, LIU Bing, MA Hongpeng, LYU Wenjie (669)
Separation of normal hydrocarbons from Fischer-Tropsch synthetic light oil by urea inclusion method	.....WANG Zhe, YU Ying, SHI Yongjie, YANG Shun, CHEN Jiuzhou, CUI Xili, XING Huabin (677)
Extraction of important reaction pathways for complex reaction network based on community detection algorithm	.....CHEN Tujie, BI Kexin, QIU Tong, JI Xu, DAI Yiyang (684)
Heat transfer performance of hydrophilic modified ultra-thin flat heat pipe	.....YANG Maofei, LI Jinwang, ZHOU Liuwei (692)
Numerical calculation and analysis of vapor-liquid-solid flow characteristics of high temperature sealing lubricating film	.....HOU Wan, CHEN Huilong, CHENG Qian, CHEN Yingjian, WEI Zepeng, ZHAO Binjuan (699)

Energy processes and technology

Numerical simulation of heat extraction in single-well enhanced geothermal system based on thermal-hydraulic-chemical coupling model	.....GUO Zhipeng, BU Xianbiao, LI Huashan, GONG Yulie, WANG Lingbao (711)
Comparison test and numerical simulation analysis of PV/T module composite cooling mode	.....DU Tao, MA Jinwei, CHEN Qianqian, FANG Hao, CHEN Bingzhang, CHEN Houren (722)

Industrial catalysis

Progress on solketal synthesis catalyzed by porous materials	.....JIN Xin, LI Yushan, XIE Qingqing, WANG Mengyu, XIA Xingfan, YANG Chaohe (731)
Sintering mechanism and sintering-resistant strategies for metal-based catalyst	.....CAO Min, MAO Yujiao, WANG Qianqian, LI Sha, YAN Xiaoliang (744)
Application of ZnSn(OH) ₆ -based nanomaterials in environmental photocatalysis	.....CHEN Bangfu, OUYANG Ping, LI Yuhan, DUAN Youyu, DONG Fan (756)
Effect of Cu modification on NH ₃ -SCR denitrification of rare earth tailings catalyst	.....HOU Limin, XU Jie, FU Shancong, WU Wenfei (765)
Effect of surfactant on the preparation of Ca-doped β -In ₂ S ₃ microstructure and its performance in photocatalytic degradation of methyl orange	.....YAO Wen, ZHANG Yuchen, TENG Wenxin, LI Jiangling (774)
Effects of constant carbon atmosphere on the activity, selectivity and coking of catalysts in hydrodesulfurization of coke oven gas	.....LI Naizhen, SUN Ruijie, QIN Zhifeng, MIAO Maoqian, WU Qiongxiao, CHANG Liping, SUN Pengcheng, ZENG Jian, LIU Yi (783)

- Catalytic performance of zeolite Y in oligomerization of isobutyl alcohol** CHEN Hao, ZHANG Chuanhao, YU Feng, FAN Binbin, LI Ruifeng (794)

Materials science and technology

- Research progress on molecular dynamics simulation of self-healing behavior of asphalt binder** ZHAO Yi, YANG Zhen, WANG Jia, LI Jingwen, ZHENG Yu (803)
- Research progress of pavement crack silicone sealing materials** XIA Huiyun, YANG Haotian, LU Changjie, SONG Lifang, NIU Yanhui (814)
- Progress in characterization and analysis of glass fiber sizing** ZHANG Jianzhong, XU Sheng, FAN Jiashu, FEI Zhenyu, WANG Kun, HUANG Jian, CUI Fengbo, RAN Wenhua (821)
- Research progress of composite solid desiccant** HAN Zhengliang, XIAO Xin (839)
- Modification of microencapsulated phase change material and its utilization in photothermal conversion** HAO Xubo, NIU Baolian, GUO Haotian, XU Xianghe, ZHANG Zhongbin, LI Yinglin (854)
- Application of carbon nanomaterials in PU yarn-based flexible strain sensors** HU Jinjian, LI Long, DONG Zijing (872)
- Research progress in carbon materials for flexible supercapacitors** TIAN Tian, LEI Xiping, YU Ting, FAN Kai, SONG Xiaoqi, ZHU Hang (884)
- Preparation and properties of paraffin solid-solid phase change materials** ZHAO Xipo, BIAN Wuxun, RAN Baoiqng, LIU Jinchao, YIN Shaoding, SUN Yiming (897)
- Preparation of granular NiO for the electrochemical performance and CO₂ adsorption performance** YANG Fanming, HE Guowen (907)
- Application of pulse electrodeposition PbO₂ coating on stainless steel bipolar plate of PEMFC** YU Haiqiang, GUO Quanzhong, DU Keqin, WANG Chuan (917)
- Preparation of wheat flour-based hierarchical porous carbon with ultra large specific surface area by synergistic activation of potassium oxalate-urea and its electrochemical energy storage performance** ZHUO Zuyou, SONG Shengnan, HUANG Mingjie, YANG Xuan, LU Beili, CHEN Yandan (925)
- Preparation, modification and application of self-healing polyurethane elastomers based on disulfide and hydrogen bonds** XI Huimin, QIAN Kun, YU Kejing, LI Jie, ZHANG Zhongwei, XIONG Ziming, ZHANG Yaoliang (934)

Resources and environmental engineering

- Research progress of carbon dioxide reduction and utilization** ZHANG Yuxin, WANG Can, SHU Wenxiang (944)
- Research progress on photocatalysis systems for inactivation of microbial aerosol** CHENG Rong, DENG Ziqi, XIA Jincheng, LI Jiang, SHI Lei, ZHENG Xiang (957)
- High value-added functional porous carbon materials from waste PET and their applications** LIU Dan, FAN Yunjie, WANG Huimin, YAN Zheng, LI Pengfei, LI Jiacheng, CAO Xuebo (969)
- Research progress on phosphorus speciation transformation and recovery during thermal chemical conversion of municipal sewage sludge** WANG Yibin, FENG Jingwu, TAN Houzhang, LI Liangyu (985)
- Research progress in the hydrogenation and dehydrogenation technology of polycyclic aromatic hydrocarbon liquid organic hydrogen carriers** ZHOU Yiming, QI Suitao, ZHOU Yuliang, TAN Xiao, SHI Libin, YANG Bolun (1000)
- Enhancement of anaerobic digestion under antibiotics stress via conductive materials application: A review** ZHU Jiaxin, ZHU Wenzhe, XU Jun, XIE Jing, WANG Wenbiao, XIE Li (1008)
- Research progress in high value-added utilization technology of waste plastics** FAN Siqiang, PENG Shaozhong, PENG Chong, HU Yongkang (1020)
- Preparation of ionic organic porous polymer and its coupled desulfurization and decarbonization properties in flue gas** CHEN Shuhui, WU Yue, ZHANG Wenxiang, WANG Shanshan, MA Heping (1028)
- Preparation of building ceramsite from food waste digestate residues, incineration fly ash and sludge biochar** WANG Yu, YU Guangwei, LIN Jiajia, LI Changjiang, JIANG Ruqing, XING Zhenjiao, YU Cheng (1039)
- Effects of exposure of polyester fiber microplastics on activated sludge system performance and microbial community structure** HU Xuan, CHEN Ying (1051)
- Numerical simulation of dioxin emission concentration in grate furnace incineration processes for municipal solid waste** CHEN Jiakun, TANG Jian, XIA Heng, QIAO Junfei (1061)
- Desalination and pollution treatment of fracturing flow-back fluid based on interfacial solar evaporation of hydrogel** ZHANG He, LI Xiaoke, XIONG Ying, WEN Jin (1073)
- Feasibility of starting anammox process with municipal waste sludge as seed sludge** ZHANG Han, ZHANG Xiaojing, MA Bingbing, NAI Can, LIU Shuoshuo, MA Yongpeng, SONG Yali (1080)
- Effect of denitrifying phosphorus removal under short-cut nitrification mode with A^{2/O-BAF process}** WU Xinbo, DANG Hongzhong, MA Jiao, YAN Yuan, ZENG Tianxu, LI Weiwei, ZHANG Guozhen, CHEN Yongzhi (1089)

Perspective

- New scene for ammonia synthesis by green hydrogen** SUN Hui, MENG Xianghai, WEI Jinghai, ZHOU Hongjun, XU Chunming (1098)

Executive Editor: ZHENG Yuyin

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