



化工进展

Chemical Industry and Engineering Progress

Vol.39 No.12

2020年12月

ATV 安特威
助您安心享受美好生活

迭片式三偏心蝶阀

迭片厚度0.5~0.8mm，才是好蝶阀

- 双向密封、零泄漏
- 大于1000000次开关寿命
- 是频繁开关长寿命蝶阀的理想选择

助您安心享受美好生活

0.5~0.8mm迭片厚度

扫码获取更多产品案例

深冷蝶阀 全金属三偏心蝶阀 高温蝶阀

ISSN 1000-6613

9 771000 661201



主办 | 中国化工学会
 化学工业出版社有限公司



目次

专栏:化工过程强化

主编寄语	(4757)
微气泡耦合生物反应器的研究进展	李辉, 李干禄, 何峰, 许旭, 田威龙, 许晟, 陈可泉, 欧阳平凯(4758)
旋流分离过程强化新技术	付鹏波, 黄渊, 王剑刚, 范轶, 吕文杰, 黄聪, 邱阳, 袁威, 汪华林(4766)
“超重力+”法可控制备透明纳米分散体及应用	孙倩, 曾晓飞, 王丹, 王洁欣, 陈建峰(4779)
超重力强化臭氧高级氧化技术的研究进展	邵圣娟, 焦纬洲, 刘有智(4798)
膜分散技术及其强化反应过程的研究进展	陈日志, 姜红, 范益群, 高从培, 邢卫红(4812)
二维膜的精密构筑和结构调控策略综述	樊江, 汪唯, 蔡佳浩, 卢纵, 丁力, 魏嫣莹, 王海辉(4823)
中国炼油加氢催化过程强化技术进展	彭冲, 黄新露, 牛世坤, 方向晨, 汪华林(4837)
乙炔选择性加氢:催化剂结构敏感性分析及调控	李雨柔, 葛小虎, 曹约强, 段学志, 周兴贵, 袁渭康(4845)
光(电)催化氮气还原合成氨研究进展	任晓玲, 严孝清, 龚湘姣, 吴志强, 杨伯伦, 魏进家, 杨贵东(4856)
环氧化物亲核开环反应过程强化研究进展	刘玉梅, 安然, 陈圣新, 张锐锐, 刘瑞霞(4877)
低共熔溶剂用于萃取分离的研究进展	成洪业, 漆志文(4896)
微反应器耦合离子液体强化萃取过程的研究进展	张红, 余肇誉, 苏远海(4908)
面向二氧化碳捕集的过程强化技术进展	李函珂, 党成雄, 杨光星, 曹永海, 王红娟, 彭峰, 余皓(4919)
“背包式”反应精馏集成过程研究进展	陆佳伟, 孔倩, 汤吉海, 张竹修, 崔味芬, 陈献, 乔旭(4940)
油水强化分离技术	卢浩, 刘懿谦, 代品一, 潘志程, 李裕东, 武世汉, 杨强(4954)
气液液微分散萃取强化低浓度稀土离子富集回收	陈卓, 王运东, 徐建鸿(4963)
反应与溶析结晶过程强化及数值模拟研究进展	曲晏利, 姜跃佳, 程景才, 杨超(4970)

专栏:煤基甲醇制燃料和化学品新技术

主编寄语	(4983)
对二甲苯生产技术研究进展及发展趋势	于政锡, 徐庶亮, 张涛, 叶茂, 刘中民(4984)
聚甲氧基二甲醚合成工艺及产业化述评	耿雪丽, 孟莹, 从海峰, 李洪, 高鑫, 李鑫钢(4993)
煤基大宗化学品市场及产业发展趋势	陈嵩嵩, 张国帅, 霍锋, 张军平(5009)
聚甲氧基二甲醚合成反应动力学研究进展	曹晨, 秦晓飞, 张旭斌, 辛峰(5021)
甲醇制芳烃催化剂及相关工艺研究进展	代成义, 陈中顺, 杜康, 赵潇, 时一鸣, 陈星月, 刘丹, 马晓迅(5029)
进料组成对中部蒸汽压缩两段式精馏塔节能与经济效益的影响	陈颖, 从海峰, 何林, 李洪, 高鑫, 李鑫钢(5042)
模板剂对ZSM-5分子筛甲醛环化制三聚甲醛性能的影响	叶宇玲, 雷莺, 陈洪林, 张小明(5049)
甲醇甲苯烷基化流化床反应器的数值模拟	张玉黎, 徐庶亮, 叶茂(5057)

能源加工与技术

相变储热技术研究进展	李昭, 李宝让, 陈豪志, 文卜, 杜小泽(5066)
Pt/ZSM-35催化长链正构生物烷烃加氢裂化/异构化制航空煤油	刘宇, 谭涓, 刘靖, 王慧凤(5086)

工业催化

新型纳米颗粒/SiO ₂ 复合气凝胶制备及吸附催化应用进展	吕伯昇, 秦磊, 茹瑞, 徐泽海, 张国亮(5095)
低温深度脱除液相丙烯中微量CO的CuO(γ)/Cu _x Ce _{1-x} O ₂ 催化剂表征分析及性能实验	顾慧劼, 李磊, 叶丽萍, 黄河, 罗勇, 金政伟(5104)

不同掺杂剂对磷矿碳热还原反应的影响·····郑光亚, 曹任飞, 夏举佩, 梅毅, 陈正杰(5112)
Span-80/NiCl₂·6H₂O/甲醇/NaBH₄体系高效选择性催化还原 α -蒎烯·····李考学, 芦宝华, 王西龙, 杜军明, 苗雪凤(5119)

材料科学与技术

氧化石墨烯改性吸水树脂的制备及应用·····王向鹏, 郑云香, 宗丽娜, 张春晓, 吴伟(5125)
爆炸合成纳米粉体及其团聚控制研究进展·····曲艳东, 高凌霄, 章文姣, 刘伟(5136)
耐久型超疏水表面的研究进展·····鲍艳, 畅菁香(5148)
非相变固体蓄热材料的蓄放热特性·····尹少武, 韩嘉维, 石永乐, 童莉葛, 王立(5161)
具有三维聚酰胺脱盐网络结构的无纺布复合正渗透膜·····汤依莲, 李士洋, 孙志娟, 高从塔, 薛立新(5170)
辊式涂布法构建纸基牢固超疏水表面·····滕玉红, 陈蕴智, 石葆莹, 赵欣蕊, 高璐, 张佳伟, 王玉峰(5182)

生物与医药化工

木质素降解酶的酶活测试方法的评价与分析·····崔堂武, 袁波, 凌晨, 方彬任, 毛向阳, 费强(5189)
微氧EGSBBR产甲烷系统快速启动与微生物群落特性·····葛大令, 周鑫, RONEL Rudy Koubode, 阴泽阳, 张伟(5203)
低共熔溶剂和次氯酸钠组合预处理秸秆及在丁醇发酵中的应用·····李浩, 邢婉茹, 许国超, 倪晔(5211)

精细化工

水醇淀粉凝胶的形成及多孔淀粉的制备·····刘土松, 谢新玲, 秦祖赠, 张友全, 朱勇, 蓝艺灵(5219)
循环微反应系统内间甲基苯甲醚合成·····王德强, 王金婷, 王凯, 骆广生(5228)
基于分子模拟的新型油性降黏剂的制备及性能优化·····李熠宇, 吴琼, 徐鹏, 马爱青, 侯影飞(5234)

资源与环境化工

金属硫化物吸附剂脱除烟气汞研究进展·····黄瑞, 杨阳, 徐文青, 张冀翔, 朱廷钰(5243)
电动力学辅助植物修复重金属污染土壤的特征机制与机遇·····刘玥, 牛婷雨, 李天国, 蒋明, 熊俊芬, 李博, 湛方栋, 何永美(5252)
改性生物炭对土壤重金属污染修复研究进展·····黄安香, 杨定云, 杨守禄, 周显勇, 王忠伟, 刘竹, 张彦雄, 许杰(5266)
碳氮比对SBR系统硝化过程及EPS三维荧光光谱特性的影响
·····陈翠忠, 李俊峰, 蓝明菊, 额热艾汗, 谢可飞, 徐威龙, 刘雅茹, 孙洪伟(5275)
温度对生物净化滤柱中氨氮、铁、锰去除效果的影响·····能子礼超, 陈韵竹, 王雪梅, 柯丹, 彭代芳(5283)
混凝与光催化联用处理水体中的复合染料·····王元芳, 尹孟华, 钱佳丽, 耿启金, 杨金美, 陈刚(5290)
H₂O₂强化光催化处理苯胺化工废水的应用试验·····张华, 张子鹏, 张澜澜, 张晓飞, 刘泽阳(5299)
磷酸三丁酯络合萃取煤气化废水中的酚·····王吉坤, 李阳(5309)

信息交流

专访——诺贝尔化学奖获得者 Sharpless 教授(5316); 智能纳米环保新材料及检测技术国际联合研究中心简介(5319)

全年索引

《化工进展》2020年第39卷1~12期主要栏目分类索引·····(I)

——卷终——

责任编辑: 史来娣

英文顾问: 郭梅芳, 金仁村, 李保庆, 龙秉文, 王运东



Contents

Special column: Chemical process intensification

- Research progress of microbubble coupled bioreactor**
.....LI Hui, LI Ganlu, HE Feng, XU Xu, TIAN Weilong, XU Sheng, CHEN Kequan, OUYANG Pingkai (4758)
- Process intensification technology for hydrocyclone separation**FU Pengbo, HUANG Yuan, WANG Jiangang, FAN Yi, LYU Wenjie, HUANG Cong, QIU Yang, YUAN Wei, WANG Hualin (4766)
- Controllable preparation and applications of transparent nanodispersions by “high gravity plus” method**
.....SUN Qian, ZENG Xiaofei, WANG Dan, WANG Jiexin, CHEN Jianfeng (4779)
- Research progress of high gravity enhanced ozone-based advanced oxidation technology**
.....SHAO Shengjuan, JIAO Weizhou, LIU Youzhi (4798)
- Perspective on membrane dispersion technology and its enhanced reaction processes**
.....CHEN Rizhi, JIANG Hong, FAN Yiqun, GAO Congjie, XING Weihong (4812)
- A review of structural design and tuning methods of two-dimensional membranes**
.....FAN Jiang, WANG Wei, CAI Jiahao, LU Zong, DING Li, WEI Yanying, WANG Haihui (4823)
- Recent progress in process intensification of oil hydroprocessing in China**
.....PENG Chong, HUANG Xinlu, NIU Shikun, FANG Xiangchen, WANG Hualin (4837)
- Selective hydrogenation of acetylene: structure sensitivity of catalysts and precise regulation**
.....LI Yurou, GE Xiaohu, CAO Yueqiang, DUAN Xuezhi, ZHOU Xinggui, YUAN Weikang (4845)
- Overview on photo(electro)catalytic nitrogen fixation for ammonia synthesis**
.....REN Xiaoling, YAN Xiaoqing, GONG Xiangjiao, WU Zhiqiang, YANG Bolun, WEI Jinjia, YANG Guidong (4856)
- Process intensification in nucleophilic ring-opening reactions of epoxides**
.....LIU Yumei, AN Ran, CHEN Shengxin, ZHANG Ruirui, LIU Ruixia (4877)
- Research progress of deep eutectic solvent for extractive separation**CHENG Hongye, QI Zhiwen (4896)
- Research progress of extraction enhancement with the use of microreactors coupled with ionic liquids**
.....ZHANG Hong, YU Zhaoyu, SU Yuanhai (4908)
- Process intensification techniques towards carbon dioxide capture: a review**
.....LI Hanke, DANG Chengxiong, YANG Guangxing, CAO Yonghai, WANG Hongjuan, PENG Feng, YU Hao (4919)
- Review on investigation of side-reactor column configuration technology**
.....LU Jiawei, KONG Qian, TANG Jihai, ZHANG Zhuxiu, CUI Mifen, CHEN Xian, QIAO Xu (4940)
- Process intensification technologies for oil-water separation**
.....LU Hao, LIU Yiqian, DAI Pinyi, PAN Zhicheng, LI Yudong, WU Shihan, YANG Qiang (4954)
- Enrichment of rare earth elements by gas-liquid-liquid microdispersion extraction technology**
.....CHEN Zhuo, WANG Yundong, XU Jianhong (4963)
- Advances in process intensification and numerical simulation of reactive and antisolvent crystallizations**
.....QU Yanli, JIANG Yuejia, CHENG Jingcai, YANG Chao (4970)

Special column: Novel technologies for methanol to aromatics and DMMn

- Research progress and development trend in para-xylene production technology**
.....YU Zhengxi, XU Shuliang, ZHANG Tao, YE Mao, LIU Zhongmin (4984)
- Review on the synthesis process and industrialization of polyoxymethylene dimethyl ethers**
.....GENG Xueli, MENG Ying, CONG Haifeng, LI Hong, GAO Xin, LI Xingang (4993)
- Market and technology development trends of coal-based bulk chemicals**
.....CHEN Songsong, ZHANG Guoshuai, HUO Feng, ZHANG Junping (5009)
- Advances of formation kinetics of polymethoxy dimethyl ether**.....CAO Chen, QIN Xiaofei, ZHANG Xubin, XIN Feng (5021)
- Research progress of catalysts and related technologies for methanol to aromatics**
.....DAI Chengyi, CHEN Zhongshun, DU Kang, ZHAO Xiao, SHI Yiming, CHEN Xingyue, LIU Dan, MA Xiaoxun (5029)
- Influence of feed compositions on energy-saving and economic benefit of the novel middle vapor recompression distillation column**.....CHEN Hao, CONG Haifeng, HE Lin, LI Hong, GAO Xin, LI Xingang (5042)
- Effect of templates in ZSM-5 zeolite on the reaction performance of formaldehyde cyclotrimerization to trioxane**
.....YE Yuling, LEI Qian, CHEN Honglin, ZHANG Xiaoming (5049)
- A numerical investigation on alkylation of toluene with methanol in fluidized bed reactor**.....ZHANG Yuli, XU Shuliang, YE Mao (5057)

Energy processes and technology

- State of the art review on phase change thermal energy storage technology**
.....LI Zhao, LI Baorang, CHEN Haozhi, WEN Bo, DU Xiaoze (5066)
- Production of bio-jet fuel by hydrocracking and hydroisomerization of long-chain normal bio-paraffins over Pt/ZSM-35 catalysts**LIU Yu, TAN Juan, LIU Jing, WANG Hui Feng (5086)

Industrial catalysis

- Progress on the preparation of nanomaterials-SiO₂ aerogel composites and their applications in adsorption and catalysisLYU Bosheng, QIN Lei, RU Rui, XU Zehai, ZHANG Guoliang (5095)
- Characterization of CuO(y)/Cu_xCe_{1-x}O₆ mixed-oxide catalysts and their performance in deep removal of trace amount of CO in liquid-phase propyleneGU Huijie, LI Lei, YE Liping, HUANG He, LUO Yong, JIN Zhengwei (5104)
- Effect of different dopants on the carbothermal reduction of phosphate rockZHENG Guangya, CAO Renfei, XIA Jupei, MEI Yi, CHEN Zhengjie (5112)
- Efficient and highly selective reduction of α -pinene by Span-80/NiCl₂·6H₂O/methanol/NaBH₄LI Kaixue, LU Baohua, WANG Xilong, DU Junming, MIAO Xuefeng (5119)

Materials science and technology

- Progress in graphene oxide modified superabsorbent and its applicationWANG Xiangpeng, ZHENG Yunxiang, ZONG Lina, ZHANG Chunxiao, WU Wei (5125)
- Progress in nanoparticles prepared by detonation method and their agglomeration controlQU Yandong, GAO Lingxia, ZHANG Wenjiao, LIU Wei (5136)
- Research progress of durable superhydrophobic surfaceBAO Yan, CHANG Jingxiang (5148)
- Heat charge and discharge characteristics of non-phase change solid heat storage materialsYIN Shaowu, HAN Jiawei, SHI Yongle, TONG Lige, WANG Li (5161)
- Non-woven composite forward osmosis membrane with three-dimensional polyamide desalination network structureTANG Yilian, LI Shiyang, SUN Zhijuan, GAO Congjie, XUE Lixin (5170)
- Fabrication of robust superhydrophobic surface on paper substrate by roller coatingTENG Yuhong, CHEN Yunzhi, SHI Baoying, ZHAO Xinrui, GAO Lu, ZHANG Jiawei, WANG Yufeng (5182)

Biochemical and pharmaceutical engineering

- Evaluation and analysis of activity assays of ligninolytic enzymesCUI Tangwu, YUAN Bo, LING Chen, FANG Binren, MAO Xiangyang, FEI Qiang (5189)
- Rapid start-up and microbial community characteristics of a micro-aerobic methane-producing EGSBBR systemGE Daling, ZHOU Xin, RONEL Rudy Koubode, YIN Zeyang, ZHANG Wei (5203)
- Combinatorial pretreatment of straw with DES and sodium hypochlorite and its application in butanol fermentationLI Hao, XING Wanru, XU Guochao, NI Ye (5211)

Fine chemicals

- Formation of water alcohol starch gels for preparation of porous starchLIU Tusong, XIE Xinling, QIN Zuzeng, ZHANG Youquan, ZHU Yong, LAN Yiling (5219)
- Synthesis of *m*-methylanisole in a cycled microreactor systemWANG Deqiang, WANG Jintong, WANG Kai, LUO Guangsheng (5228)
- Preparation and performance optimization of a new viscosity-reducing agent for crude oil based on molecular simulationLI Yiyu, WU Qiong, XU Peng, MA Aiqing, HOU Yingfei (5234)

Resources and environmental engineering

- Research progress of metal sulfide adsorbents for removing mercury in flue gasHUANG Rui, YANG Yang, XU Wenqing, ZHANG Jixiang, ZHU Tingyu (5243)
- Characteristics and opportunities of electrokinetic-assisted phytoremediation of heavy metal contaminated soilLIU Yue, NIU Tingyu, LI Tianguo, JIANG Ming, XIONG Junfen, LI Bo, ZHAN Fangdong, HE Yongmei (5252)
- Advance in remediation of heavy metal pollution in soil by modified biocharHUANG Anxiang, YANG Dingyun, YANG Shoulu, ZHOU Xianyong, WANG Zhongwei, LIU Zhu, ZHANG Yanxiang, XU Jie (5266)
- Effect of C/N ratio on the performance of nitrification and three-dimensional fluorescence excitation-emission matrix (EEM) spectroscopy characterization of extracellular polymeric substances from sequencing batch reactorsCHEN Cuizhong, LI Junfeng, LAN Mingju, EREAIHAN, XIE Kefei, XU Weilong, LIU Yaru, SUN Hongwei (5275)
- Influence of temperature on removal efficiency of ammonia, iron and manganese in biological purification biofilterNENGZI Lichao, CHEN Yunzhu, WANG Xuemei, KE Dan, PENG Daifang (5283)
- Color removal of composite dye by coagulation-photocatalysisWANG Yuanfang, YIN Menghua, QIAN Jiali, GENG Qijin, YANG Jinmei, CHEN Gang (5290)
- In situ* test of aniline wastewater degradation by photocatalytic treatment combined with H₂O₂ZHANG Hua, ZHANG Zipeng, ZHANG Lanlan, ZHANG Xiaofei, LIU Yiyi (5299)
- Complex extraction of phenol from coal gasification wastewater with tributyl phosphateWANG Jikun, LI Yang (5309)

———— The end of Vol. 39 ————

Executive Editor: SHI Laidi

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