

- 《中国学术期刊综合评价数据库》统计源刊
- 《中国期刊全文数据库》全文收录期刊
- 《中国核心期刊(遴选)数据库》全文收录期刊

- 美国《化学文摘》(CA)重点收录期刊
- 全国石油和化工行业优秀期刊
- 广东省、广州市优秀科技期刊

ISSN 1001-9677  
CN44-1228/TQ

# 广州化工

第 2 期  
2018年1月  
( 下半月 )  
第 46 卷

GUANGZHOU CHEMICAL INDUSTRY

广州化工研究设计院

广州市化工行业协会

广州市化学化工学会

## 广东珠江化工涂料有限公司



工业漆 防腐漆 家装漆

水性漆 墙面漆



地址：广东珠海高栏港石化区北五路  
传真：020-81035620 81035166  
万方数据

电话：( 珠海 ) 0760-6327138 ( 广州 ) 020-81033602 81033529  
邮编：510170



# 广州化工

## GUANGZHOU HUAGONG

《中国学术期刊综合评价数据库》统计源刊  
《中国核心期刊(遴选)数据库》全文收录期刊

《中国期刊全文数据库》全文收录期刊  
高、中级化工职称资格评审认定期刊

1973年创刊(半月刊)

第46卷第2期

2018年1月(下半月)

主 管:广州化工集团有限公司

主 办:广州化工研究设计院

广州市化工行业协会

协 办:广州市化学化工学会

编辑出版:《广州化工》编辑部

主 编:吴文莉

副 主 编:林珺颖

编 辑:刘倩婷、何启宏

广 告:茅仁旭

地 址:广州市白云区石井镇联和路2号

万力创新园D座

邮 码:510425

电 话:(020)36372165

邮 箱:gzhgbj@vip.126.com

网 址:http://www.gzhgbj.cn

印 刷:南方医科大学广州广卫印刷厂

发行范围:国内外公开发行

国外发行:中国出版对外贸易总公司

(北京782信箱)

国际标准刊号:ISSN1001-9677

国内统一刊号:CN44-1228/TQ

广告经营许可证:穗工商广字4401004002668号

出版物经营许可证:新出发粤刊总批字第226号

收款单位:广州化工研究设计院

开户银行:广州市工商银行石井支行

帐 号:3602025309000823574

国内定价:13.00元/期 全年295.00元(共24期)

### 第八届编委会成员名单

主 任:崔英德

副主任:叶家灿 白 莉

秘书长:张 统

委 员:(排名不分先后)

钱 宇 童叶翔 余 林 王乐夫 何榕友

杨育农 马小明 郑 成 麦堪成 彭 峰

赵建青 尹国强 刘自力 李大光 杨定乔

黄道平 李攻科 刘国光 陈国华 董新法

方岩雄 刘晓国 李雪辉 陈旭东 李锡安

梁基照 熊 亚 曾庆焕 罗国钦 余慧文

万方数据

# 目 次

## 专论与综述

熔融石英陶瓷的注凝成型工艺及影响其性能的因素 ..... 侯清麟,王迎霞,田 靓,侯熠徽(1)

车用橡胶件行业现状与用材趋势分析 ..... 张 瑾,徐树杰,侯 猛(3)

二氧化碳聚合物研究现状与展望 ..... 张跃春,苏 舒,黄 军,闵姚群,谢 飞,欧 洋(6)

页岩储层采出水污染及处理方式研究 ..... 陈秋林,贾振福,黄兴华,刘舒生,王春晓(9)

苯酚废水净化研究进展 ..... 黄崇瑶,彭 放,严旭晖,孙 涛,徐 畅,许 瑞,孙 超(12)

土壤中重金属样品的前处理研究现状 ..... 迟伟伟,徐 蕾(16)

超临界流体萃取技术及其应用 ..... 吴 芳,李雄山,陈乐斌(19)

芳烃生产技术研究 ..... 李小辉(21)

科学实验

烷烃生成焓的定量结构性质关系研究 ..... 秦玉翠,王彦昭,王 媛,刘焕焕,焦 龙(24)

超低轮廓压延铜箔表面处理生产工艺研究 ..... 陈 宾,王海军,张春阳(26)

氟代苯并[d][1,2,3]三氮唑基共聚物的合成与光伏性能研究 ..... 杨 夺,同军锋(28)

含吡啶乙烯基的环金属钕配合物的合成及表征 ..... 谢超异,李名文,李襄宏(32)

新型吡啶烷基嘌呤苷脲及其衍生物的合成和晶体结构 ..... 易君明,陈明华,郑玉国(35)

1,3-二-N-乙基庆大霉素 C<sub>1a</sub>的制备及结构确证 ..... 殷晓伟(39)

二种固相合成艾塞那肽方法比较 ..... 张忠旗,王 慧,王万科,李 乾,苏晨灿,韩 广,杨小琳,赵金礼(42)

耐高温丙烯酸酰胺水凝胶的合成及其性能研究 ..... 官小琴,蒋 萃(45)

碱显影感光聚氨酯丙烯酸酯的合成及应用 .....	吴建,福田晋一郎,朱健(47)
高刚耐热聚丙烯树脂的制备 .....	王倩,张凤岐,李民,丁其维(50)
亚麻胶胶囊剂的崩解时限研究 .....	牛丽红(53)
热喷涂 ZnNi 合金涂层的耐腐蚀性能评价 .....	闵捷,刘芷怡(56)
聚氨酯泡沫塑料分离富集攀枝花钒钛磁铁矿尾矿中镓 .....	魏娟,王亚雄,张丽,郎春燕(59)
不同工艺条件对三聚磷酸钠的形貌影响 .....	郑旺,张亚娟(63)
粗碲化铜碱浸工艺实验研究 .....	钱俊杰,杨易,俞鹰,方支灵,潘荣选,申其新(66)
食品软包装塑料凹版印刷聚氨酯油墨的研制 .....	王学林,聂勇,岳长德,李国伟(69)
基于 Aspen Plus 的煤粉工业锅炉烟气再循环研究 .....	张媛,陈隆,肖翠微,王乃继(72)
正交实验优化纳米 ATO 浆料分散工艺 .....	荣金闯,王哲,黄菊(76)
Cyphos IL104 对氯化体系中铜萃取行为及机理研究 .....	李娅,任昀,朱翔,陈杨,胡久刚(78)
页岩气压裂返排液浓缩结晶实验研究 .....	李永胜,王远,温冬,肖泽仪(82)
城市污泥球团填料的实验研究 .....	雷玉办,彭贵贵,蔡敏,赵宏龙,韦响(85)
硝酸盐修饰 TiO <sub>2</sub> 纳米粉的制备及光催化降解亚甲基蓝 .....	华香,王红军,杨木明(88)
马齿苋中香豆素的提取研究 .....	陈建欣,孙林慧,李蓓(92)
煤沥青的热解特性分析 .....	戴永燕,张美玲,佟溥昊(94)

## 分析测试

高效液相色谱法测定曲匹布通的有关物质 .....	罗雨阳,朱跃芳,石文松,陈阳桔(99)
青天葵中鼠李秦素在不同溶剂的紫外-可见吸收光谱测定 .....	刘华东,甄丹丹,周燕园,丘琴,黄思诗,梁李广,黄敏琪,甄汉深(102)
液相色谱-串联质谱法测定食品中的 4 种添加剂 .....	钟茂生,陈舒奕,梁剑,朱品玲,叶洪,肖颖(104)
气相色谱法测定左氧氟沙星中的 N-甲基哌嗪 .....	牛明玉,张雅琴,朱琼,胡丽娜(107)
气相色谱测定工作场所空气中的甲基丙烯酸甲酯 .....	盛培培,陆龙飞(109)
测量仪器的期间核查及具体实例 .....	袁红梅,李海锋(112)

## 环境保护

不同功能采煤沉陷积水区单因子指数水质评价 .....	范廷玉,吴建宇,王顺,王月越,余乐,李璋琦,张金棚(114)
MTO 不停车检修污水汽提塔降低净化水 COD 措施 .....	姜海军(118)
利用树叶监测空气中污染物铅的探讨 .....	陆国耀(120)

## 生产技术

- 四氢呋喃生产工艺及研究 ..... 白建红,任小荣,石林,尹林虎,刘琦(122)
- 气相法白炭黑生产中不合格品的处理工艺研究 ..... 李政法,杨晓春,朱海(124)
- 40 t/h 锅炉正常运行过程中煤粉爆燃原因分析及解决措施 ..... 苏倩,杨磊,程千育,王江满(126)

## 教学园地

- 药学本科药物分析的课外科研实践探索 ..... 冯家懿,张圳,果卉,闻俊,周婷婷(128)
- 一个有机化学实验:萘酰亚胺化化合物的合成 ..... 白翠冰,熊文章,乔瑞,杨松,刘鹏德,魏影(131)
- 推荐一个大学有机化学实验——乙酸-3-氯-3-甲基丁酯的合成 ..... 曾永明,魏婷,何伟,程建文(133)
- 关于《物理化学》教学的几点认识 ..... 王媛(135)
- 基于微课的药物分析教学建设 ..... 杨洁,刘叔文(137)
- 《电化学工程》教学过程中的改革与实践 ..... 李巧霞,徐群杰(139)
- CDIO 理念下过程设备设计与课程设计的教改实践 ..... 刘天霞,白志浩,杜春,姜国平(141)
- 有机化学实验单元操作微课在实验教学中的应用 ..... 王慧彦,李志良,陶传洲,王建,程青芳(143)
- 无机化学课程教学改革探讨 ..... 郭平春,宋蒙蒙(145)
- 基于 OBE 教育理念的药物化学课程教学改革探索 ..... 陈楠,姚波,陈笈,朱鑫庆(148)
- “教育+互联网”背景下物理化学教学方法探究 ..... 陈海玲,姬鄂豫,朱元良,杨艳菊(151)
- 医学院校《食品工程原理》课程教学模式探讨 ..... 叶栩文,王杰,司友琳,陶兆林(154)
- 应用化学卓越工程师计划实践教学中的问题研究 ..... 全红平(157)
- 浅谈本科制药工程专业建设中的实验教学 ..... 江海霞(159)
- 工科化学教学中学生创新创业能力培养的探究 ..... 蒋英,邱治国,陈祥迎,朱燕舞(161)
- 工科本科毕业论文的问题与新工科背景下的建议 ..... 王家伟,王海峰,赵平源,唐道文(163)
- 物理化学课程教学的几点思考 ..... 王艳群(165)
- 学科竞赛和项目实验为载体的双创思维人才培养探索 ..... 刘鹏,顾晓滨,王雅静,陶隆凤(168)
- 6S 管理模式在高校实验室中的研究与应用 ..... 冯超华,刘永刚,朱岸东,郑启捷(170)

## 安全与管理

- 城市燃气管网安全管理质的提升 ..... 关建维(173)
- 石化企业基于定位工卡的人员安全管控系统研发 ..... 王绪鹏(176)
- 对资源性危险废物应尽快豁免部分管理环节 ..... 刘正强,唐铁龙,刘威尔(179)



# CONTENTS

Gelcasting Process of Fused Silica Ceramics and Factors Influencing Its Performance .....	1
..... <i>HOU Qing-lin, WANG Ying-xia, TIAN Liang, HOU Yi-hui</i> (1)	
Current Situation of Automotive Rubber Parts and Trend of Application Materials .....	3
..... <i>ZHANG Jin, XU Shu-jie, HOU Meng</i> (3)	
Development Situation and Market Prospect of Carbon Dioxide Polymer .....	6
..... <i>ZHANG Yue-chun, SU Shu, HUANG Jun, MIN Yao-qun, XIE Fei, OU Yang</i> (6)	
Study on Produced-water Contamination and Its Comprehensive Treatment in Shale Reservoir .....	9
..... <i>CHEN Qiu-lin, JIA Zhen-fu, HUANG Xing-hua, LIU Shu-sheng, WANG Chun-xiao</i> (9)	
Research Progress on Purification of Phenol Wastewater .....	12
..... <i>HUANG Chong-yao, PENG Fang, YAN Xu-hui, SUN Tao, XU Chang, XU Rui, SUN Chao</i> (12)	
Present Study on Heavy Metal Samples in Soil .....	16
..... <i>CHI Wei-wei, XU Lei</i> (16)	
Application of Supercritical Fluid Extraction .....	19
..... <i>WU Fang, LI Xiong-shan, CHEN Le-bin</i> (19)	
Study on Production Technology of Aromatic Hydrocarbon .....	21
..... <i>LI Xiao-hui</i> (21)	
Study on Quantitative Structural Properties of Enthalpy of Formation of Alkanes .....	24
..... <i>QIN Yu-cui, WANG Yan-zhao, WANG Yuan, LIU Huan-huan, JIAO Long</i> (24)	
Study on Production Process of Surface Treatment of Ultra Low Profile Rolled Copper Foil .....	26
..... <i>CHEN Bin, WANG Hai-jun, ZHANG Chun-yang</i> (26)	
Study on Synthesis and Photovoltaic Properties of Fluorobenzo[ <i>d</i> ][1,2,3] triazole-based Copolymer .....	28
..... <i>YANG Duo, TONG Jun-feng</i> (28)	
Synthesis and Characterization of A Cyclometalated Ruthenium Complex Containing Pyridylethenyl Group .....	32
..... <i>XIE Chao-yi, LI Ming-wen, LI Xiang-hong</i> (32)	
Synthesis and Crystal Structures of A Novel Pyrazolidinyl Substituted Purine Glycoluril and Its Derivative .....	35
..... <i>YI Jun-ming, CHEN Ming-hua, ZHENG Yu-guo</i> (35)	
Preparation and Structure Elucidation of 1,3-di-N-ethylgentamicin C <sub>1a</sub> .....	39
..... <i>YIN Xiao-wei</i> (39)	
Comparison of Two Solid Phase Synthesis Methods of Exenatide .....	42
..... <i>ZHANG Zhong-qi, WANG Hui, WANG Wan-ke, LI Qian, SU Chen-can, HAN Guang, YANG Xiao-lin, ZHAO Jin-li</i> (42)	
Synthesis and Properties of High Temperature Resistant Acrylamide Hydrogel .....	45
..... <i>GUAN Xiao-qin, JIANG Cui</i> (45)	
Synthesis and Application of Alkali Developable Photosensitive Polyurethane Acrylate .....	47
..... <i>WU Jian, FUKUDA Shinichiroh, ZHU Jian</i> (47)	
Preparation of PP with High Rigidity and High Heat Resistance .....	50
..... <i>WANG Qian, ZHANG Feng-qi, LI Min, DING Qi-wei</i> (50)	
Disintegration Time Limit Study on Flax Gum Capsule .....	53
..... <i>NIU Li-hong</i> (53)	
Evaluation of Corrosion Resistance for ZnNi Alloy Coatings .....	56
..... <i>MIN Jie, LIU Zhi-yi</i> (56)	
Enrichment and Separation of Gallium in Vanadium Titanium Magnetite Tailings from Panzhihua Using Polyurethane Foam .....	59
..... <i>WEI Juan, WANG Ya-xiong, ZHANG Li, LANG Chun-yan</i> (59)	
Effect of Different Process Conditions on Morphology of Sodium Tripolyphosphate .....	63
..... <i>ZHENG Wang, ZHANG Ya-juan</i> (63)	
Experimental Study on Alkaline Leaching Process of Crude Copper Telluride .....	66
..... <i>QIAN Jun-jie, YANG Yi, YU Ying, FANG Zhi-ling, PAN Rong-xuan, SHEN Qi-xin</i> (66)	
Development of Plastic Intaglio Printing Polyurethane Ink for Soft Packaging of Food .....	69
..... <i>WANG Xue-lin, NIE Yong, YUE Chang-de, LI Guo-wei</i> (69)	
NO <sub>x</sub> Reduction Study on Pulverized Coal Industrial Boiler Flue Gas Recirculation Based on Aspen Plus .....	72
..... <i>万方数据 ZHANG Yuan, CHEN Long, XIAO Cui-wei, WANG Nai-ji</i> (72)	

Study on Dispersion Process of Nano ATO Slurry by Orthogonal Experiments .....	<i>RONG Jin-chuang, WANG Zhe, HUANG Ju</i> (76)
Study on Extraction Behaviors and Microscopic Mechanisms of Copper in Chloride Solution by Cyphos IL104 .....	<i>LI Ya, REN Yun, ZHU Xiang, CHEN Yang, HU Jiu-gang</i> (78)
Experimental Study on Concentrated Crystallization of Shale Gas Fracturing Flow Back Fluid .....	<i>LI Yong-sheng, WANG Yuan, WEN Dong, XIAO Ze-yi</i> (82)
Experimental Study on Preparation of Aggregate by Pelleting Municipal Sludge .....	<i>LEI Yu-ban, PENG Gui-gui, CAI Min, ZHAO Hong-long, WEI Xiang</i> (85)
Preparation of Tetralin Ion Modified TiO <sub>2</sub> Nanomaterials and Photocatalytic Degradation of Dyes .....	<i>HUA Xiang, WANG Hong-jun, YANG Shu-ming</i> (88)
Study on Extraction of Coumarin in <i>Portulaca oleracea</i> .....	<i>CHEN Jian-xin, SUN Lin-hui, LI Bei</i> (92)
Analysis of Pyrolysis Characteristic of Coal Tar Pitches .....	<i>DAI Yong-yan, ZHANG Mei-ling, TONG Pu-hao</i> (94)
Determination of Related Substances in Trepibutone by HPLC .....	<i>LUO Yu-yang, ZHU Yue-fang, SHI Wen-song, CHEN Yang-ju</i> (99)
Ultraviolet Visible Absorption Spectrum Determination of Rhamnazin in <i>Nervilia oadii</i> (Hance) Schltr. in Different Solvents .....	<i>LIU Hua-dong, ZHEN Dan-dan, ZHOU Yan-yuan, QIU Qin, HUANG Si-shi, LIANG Li-guang, HUANG Min-qi, ZHEN Han-shen</i> (102)
Determination of 4 Kinds of Additives in Food by Liquid Chromatography-tandem Mass Spectrometry .....	<i>ZHONG Mao-sheng, CHEN Shu-yi, LIANG Jian, ZHU Pin-ling, YE Hong, XIAO Ying</i> (104)
Determination of N-methyl Piperazine in Levofloxacin Tablets by GC .....	<i>NIU Ming-yu, ZHANG Ya-qin, ZHU Qiong, HU Li-na</i> (107)
Gas Chromatographic Determination of MMA in Workplace Air .....	<i>SHENG Pei-pe, LU Long-fei</i> (109)
Method and Example of Intermediate Verification of Measuring Instrument .....	<i>YUAN Hong-mei, LI Hai-feng</i> (112)
Water Quality Evaluation of Single Factor Index for Water Subsidence Area with Different Functions in Coal Mining .....	<i>FAN Ting-yu, WU Jian-yu, WANG Shun, WANG Yue-yue, YU Le, LI Zhang-qi, ZHANG Jin-peng</i> (114)
Measures to Reduce Purified Water COD by No Parking Maintenance of Sewage Stripper .....	<i>JIANG Hai-jun</i> (118)
Study on Monitoring Lead in Air by Using Leaves .....	<i>LU Guo-yao</i> (120)
Production Process and Research of Tetrahydrofuran .....	<i>BAI Jian-hong, REN Xiao-rong, SHI Lin, YIN Lin-hu, LIU Qi</i> (122)
Study on Processing Technology of Unqualified Products in Fumed Silica Production .....	<i>LI Zheng-fa, YANG Xiao-chun, ZHU Hai</i> (124)
Cause Analysis and Solution on Deflagration of Pulverized Coal During Normal Operation of 40 t/h Boiler .....	<i>SU Qian, YANG Lei, CHENG Qian-yu, WANG Jiang-man</i> (126)
Exploration of Extracurricular Scientific Research on Pharmaceutical Analysis among Undergraduates .....	<i>FENG Jia-yi, ZHANG Zhen, GUO Hui, WEN Jun, ZHOU Ting-ting</i> (128)
A University Organic Chemistry Experiment: Synthesis of N-butyl-4,5-dihydrazine-1,8-naphthalimide .....	<i>BAI Cui-bing, XIONG Wen-zhang, QIAO Rui, YANG Song, LIU Peng-de, WEI Ying</i> (131)
Recommending A University Organic Chemistry Experiment —Synthesis of 3-chloro-3-methyl Butyl Acetate .....	<i>ZENG Yong-ming, WEI Ting, HE Wei, CHENG Jian-wen</i> (133)
Some Understandings on Physical Chemistry Teaching .....	<i>WANG Yuan</i> (135)
Construciton of Micro-course in Pharmaceutical Analysis Teaching .....	<i>YANG Jie, LIU Shu-wen</i> (137)
Reform and Practice on Teaching Process of Electrochemical Engineering .....	<i>LI Qiao-xia, XU Qun-jie</i> (139)

Teaching Reform and Practice on Process Equipment Design and Course Design Based on CDIO Concept ..... *LIU Tian-xia, BAI Zhi-hao, DU Chun, JIANG Guo-ping*(141)

Application of Organic Chemistry Experiment Unit Operation Micro-course in Experimental Teaching ..... *WANG Hui-yan, LI Zhi-liang, TAO Chuan-zhou, WANG Jian, CHENG Qing-fang*(143)

Exploration on Teaching Reform of Inorganic Chemistry ..... *GUO Ping-chun, SONG Meng-meng*(145)

Exploration on Teaching Reform of Medicinal Chemistry Course Based on OBE Educational Philosophy ..... *CHEN Nan, YAO Bo, CHEN Ji, ZHU Li-qing*(148)

Study on Teaching Method of Physical Chemistry under Background of "Education+Internet" ..... *CHEN Hai-ling, JI E-yu, ZHU Yuan-liang, YANG Yan-ju*(151)

Exploration on Teaching Model of Principle of Food Engineering for Food Quality and Safety Major in Medical College ..... *YE Xu-wen, WANG Jie, SI You-lin, TAO Zhao-lin*(154)

Study on Problems in Practical Teaching of Outstanding Engineers of Applied Chemistry ..... *QUAN Hong-ping*(157)

Discussion on Experimental Teaching in Construction of Undergraduate Pharmaceutical Engineering Specialty ..... *JIANG Hai-xia*(159)

Exploration of Cultivating Students' Innovative Ability in Engineering Chemistry Teaching ..... *JIANG Ying, QIU Zhi-guo, CHEN Xiang-ying, ZHU Yan-wu*(161)

Problems in Graduation Thesis of Engineering Undergraduate and Suggestions in New Engineering Background ..... *WANG Jia-wei, WANG Hai-feng, ZHAO Ping-yuan, TANG Dao-wen*(163)

Reflections on Physical Chemistry Course Teaching ..... *WANG Yan-qun*(165)

Cultivation of Innovative Entrepreneurship Driven by Subject Competition and Project Experiment Practice ..... *LIU Peng, GU Xiao-bin, WANG Ya-jing, TAO Long-feng*(168)

Research and Application of 6S Management Mode in University Laboratory ..... *FENG Chao-hua, LIU Yong-gang, ZHU An-dong, ZHENG Qi-jie*(170)

Quality Improvement of Safety Management of City Gas Pipeline Network ..... *GUAN Jian-wei*(173)

Research and Development of the Personnel Security Control System Based on Location Work Card ..... *WANG Xu-peng*(176)

Management Aspects of Resources Hazardous Waste Should Be Exempted as Soon as Possible ..... *LIU Zheng-qiang, TANG Tie-long, LIU Wei-er*(179)

万方数据

**GUANGZHOU CHEMICAL INDUSTRY**

**Open Publishing**

**Established in 1973( Semimonthly)**

**Vol. 46 No. 2**

**Jan. 2018**

**Managed by:**

Guangzhou Chemical Industrial Group Co., Ltd.

**Sponsored by:**

Guangzhou Research & Design Institute of Chemical Industry  
Guangzhou Society of Chemistry and Chemical Engineering

**Assisted by:**

Guangzhou Chemical Industry Association

**Edited by:**

Editorial Office of "GUANGZHOU CHEMICAL INDUSTRY"

**Chief Editor:** WU Wen-li

**Vice Chief Editor:** LIN Jun-ying

**Editor:** LIU Qian-ting, HE Qi-hong

**Advertisement Department:** MAO Ren-xu

**Address:** Building D, Vanlead Innovation Park, No. 2  
Lianhe Road, Shijing Town, Baiyun District,  
Guangzhou, P. R. China

**Postcode:** 510425

**Tel:** (020) 36372165

**E-mail:** gzhgbjb@vip.126.com

**Website:** <http://www.gzhgbjb.cn>

**Printed by:**

Guangzhou Guangwei Printing Plant of Southern  
Medical University

**Overseas Distributed by:**

China National Publishing Industry Trading Corporation

**Journal Code:** ISSN 1001-9677  
CN 44-1228/TQ

**Adverxising Business License No. :**4401004002668