

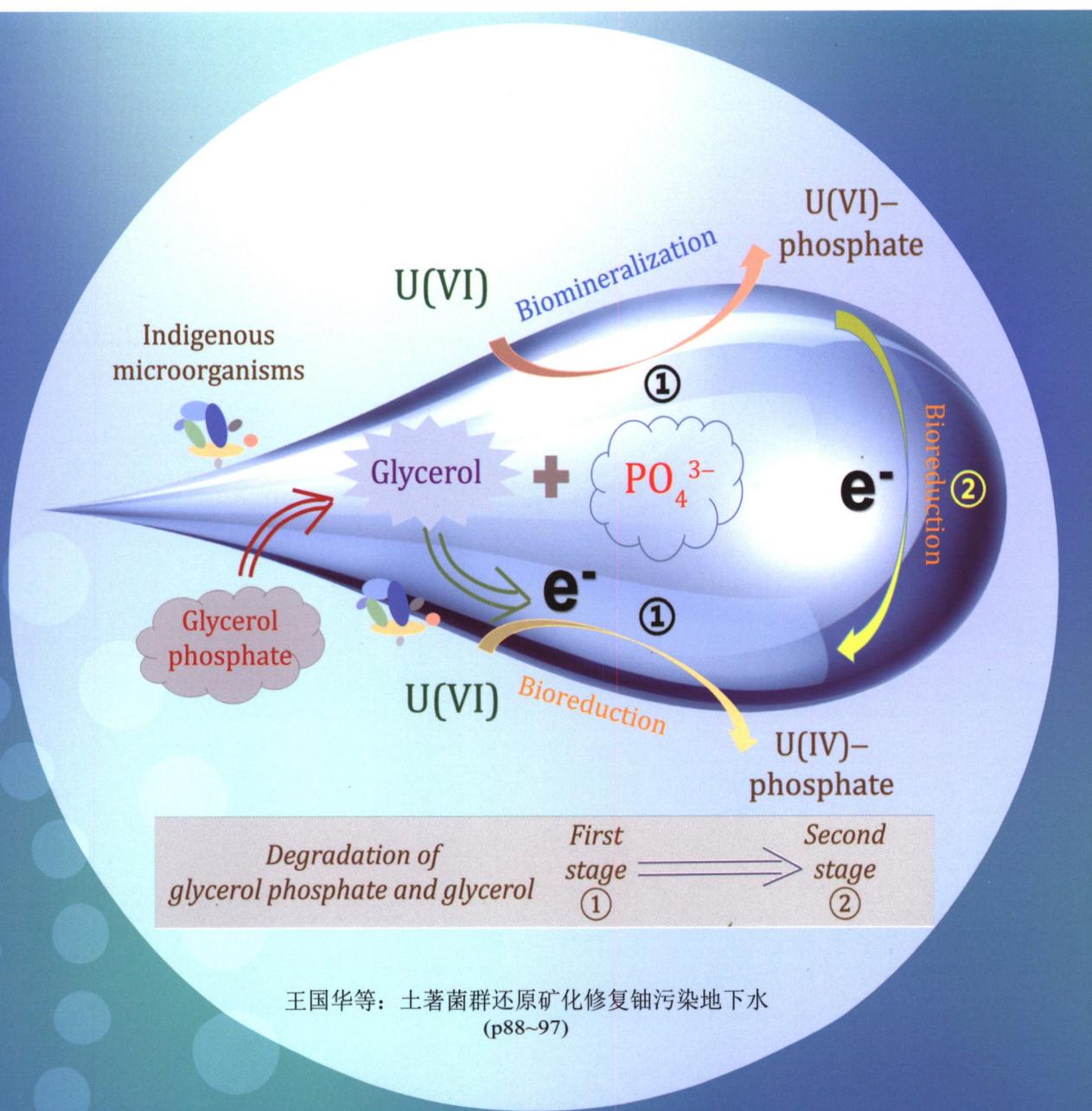
# 过程工程学报

1

2023.1 VOL.23

The Chinese Journal of Process Engineering

月刊



王国华等: 土著菌群还原矿化修复铀污染地下水  
 (p88~97)

# 过程工程学报

第23卷 第1期 2023年1月

(月刊)

## 目 次

### 综 述

- 1 萤石资源开发利用现状与战略意义

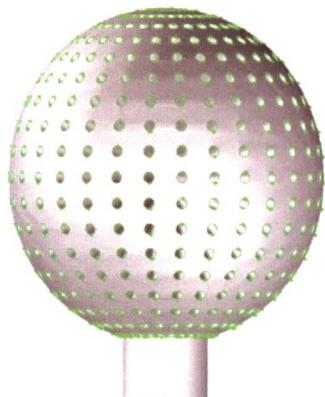
张丹仙,亢建华\*,黄红军,祝雯霞,王若林

- 15 气泡羽流气液两相流动特性的研究进展

董鑫,刘易诺,叶陈,张建伟,冯颖\*

- 25 煤岩学在炼焦配煤中的应用进展及优化配煤技术

王岩,杨承伟\*,袁东营,张宇宏,曲思建



### 研究论文

- 38 圆管内氧化石墨烯MPCM悬浮液对流传热实验研究

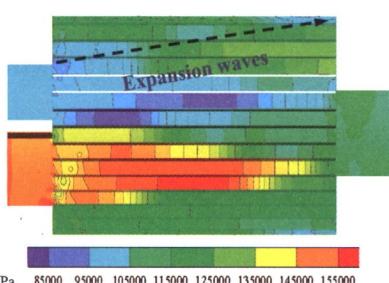
鲁进利,陈星雨,韩亚芳,孙彦红\*,尹子杰,吴丽

- 46 微藻柱状光生物反应器流动特性及结构的数值模拟优化

叶斌华,韩飞\*,石向星,焦永刚,赵青云,钟凯强

- 57 入口流速对间断微通道内流型演变及流量分配特性影响

袁鑫森,袁俊飞\*,王林,江河,曹艺飞



- 67 气波引射器压力端口设计及其对性能的影响

赵一鸣,刘明昊,李浩然,胡大鹏\*

- 78 光辅自耦合藻-菌颗粒污泥处理系统特性

程琪,何成达\*,张淼,薛禹

- 88 土著菌群还原矿化修复铀污染地下水

王国华,刘颖,王家莉,向金晶,刘迎九,赵发,刘金香\*

98 碱土金属醇类低共熔溶剂强化钒磷氧催化剂的制备及催化性能研究

王兴盛, 常智, 吴刘柱, 张满园, 张瑞锐\*, 刘瑞霞\*

107 氯化胆碱-乙二醇低共熔溶剂中高效电解回收废铅膏制备铅粉

黄皓铭, 汝娟坚\*, 华一新, 耿笑, 张文文, 程明强, 王道祥

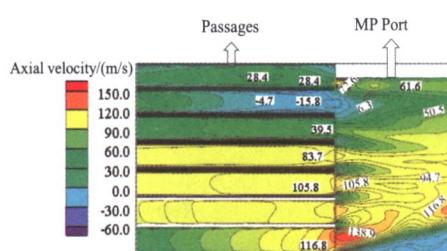
115 氟化铝生产副产物-硅渣酸化过程及其动力学

艾怡君, 李婷婷, 夏举佩\*

124  $\text{Na}_2\text{O}-\text{TiO}_2-\text{SiO}_2-\text{CaO}-\text{Al}_2\text{O}_3-\text{V}_2\text{O}_5-\text{MnO}-\text{MgO}-\text{FeO}$  渣系渣铁间硫分配比热

力学模型

尹学杰, 陈德胜\*, 王丽娜, 赵宏欣,甄玉兰, 齐涛, 王猛



136 几种多孔电极材料镓电沉积性能的研究

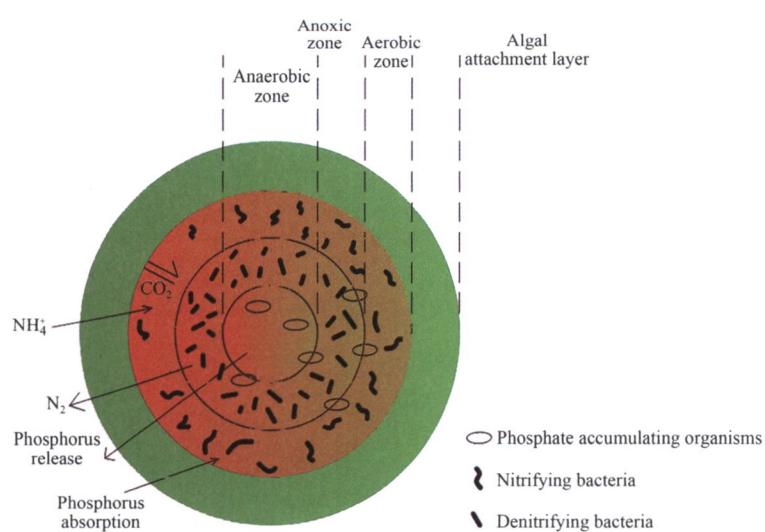
刘玲\*, 蔡楚楚, 董彬欣

144 丙烷脱氢反应气分离提纯丙烯和氢气过程严格模拟与能效评估

陆炫彤, 赵金, 邓春\*

154 基于微小槽道的冷媒直冷电池热管理系统性能研究与优化

王肖军, 张恒运\*, 黄兴华, 李康



# THE CHINESE JOURNAL OF PROCESS ENGINEERING

Volume 23

Number 1

Jan. 2023

## CONTENTS

### ● Review

- 1 **Exploitation and utilization of fluorite and its strategic significance**  
Danxian ZHANG, Jianhua KANG\*, Hongjun HUANG, Wenxia ZHU, Ruolin WANG
- 15 **Research progress on gas-liquid two-phase flow characteristics of bubble plume**  
Xin DONG, Yinuo LIU, Chen YE, Jianwei ZHANG, Ying FENG\*
- 25 **Application progress of coal petrology in coking coal blending and coal blending optimization technology**  
Yan WANG, Chengwei YANG\*, Dongying YUAN, Yuhong ZHANG, Sijian QU

### ● Research Paper

- 38 **Experimental research on heat transfer of microencapsulated phase change materials slurry containing GO in circular tube**  
Jinli LU, Xingyu CHEN, Yafang HAN, Yanhong SUN\*, Zijie YIN, Li WU
- 46 **Numerical simulation optimization of flow characteristics and structure of microalgae column photobioreactor**  
Binhu YE, Fei HAN\*, Xiangxing SHI, Yonggang JIAO, Qingyun ZHAO, Kaiqiang ZHONG
- 57 **Effect of inlet velocity on flow pattern evolution and flow distribution characteristics in discontinuous microchannels**  
Xinsen YUAN, Junfei YUAN\*, Lin WANG, He JIANG, Yifei CAO
- 67 **Design of gas wave ejector pressure ports and its impact on performance**  
Yiming ZHAO, Minghao LIU, Haoran LI, Dapeng HU\*
- 78 **Characteristics of light-assisted self-coupling algae-bacterial granular sludge treatment system**  
Qi CHENG, Chengda HE\*, Miao ZHANG, Yu XUE
- 88 **Bioreduction and biomimetic mineralization of indigenous bacteria for the remediation of uranium-contaminated groundwater**  
Guohua WANG, Ying LIU, Jiali WANG, Jinjing XIANG, Yingjiu LIU, Fa ZHAO, Jinxiang LIU\*
- 98 **Preparation of enhanced vanadium phosphorus oxide catalysts by alkaline earth metal-alcohols deep eutectic solvents**  
Xingsheng WANG, Zhi CHANG, Liuzhu WU, Manyuan ZHANG, Ruirui ZHANG\*, Ruixia LIU\*
- 107 **Recycling of scrap lead paste to prepare lead powder by high efficiency electrolysis in choline chloride-ethylene glycol deep eutectic solvent**  
Haoming HUANG, Juanjian RU\*, Yixin HUA, Xiao GENG, Wenwen ZHANG, Mingqiang CHENG, Daoxiang WANG
- 115 **Acidification process and kinetics of silicon slag from aluminum fluoride production**  
Yijun AI, Tingting LI, Jupei XIA\*
- 124 **Thermodynamic model for calculating sulfur distribution ratio between Na<sub>2</sub>O-TiO<sub>2</sub>-SiO<sub>2</sub>-CaO-Al<sub>2</sub>O<sub>3</sub>-V<sub>2</sub>O<sub>5</sub>-MnO-MgO-FeO slags and hot metal**  
Xuejie YIN, Desheng CHEN\*, Lina WANG, Hongxin ZHAO, Yulan ZHEN, Tao QI, Meng WANG

- 136 Study on the mechanism of enhanced Ga electrodeposition on three-dimensional porous electrodes**  
Ling LIU\*, Chuchu CAI, Binxin DONG
- 144 Rigorous modelling and energy performance evaluation for PDH reaction gas separation and hydrogen purification**  
Xuantong LU, Jin ZHAO, Chun DENG\*
- 154 Research and optimization on battery thermal management system with refrigerant cooling based on mini-channels**  
Xiaojun WANG, Hengyun ZHANG\*, Xinghua HUANG, Kang LI

# 过程工程学报

(月刊, 1976年创刊)

第23卷 第1期 2023年1月

版权所有

THE CHINESE JOURNAL OF PROCESS ENGINEERING

(Monthly, Founded in 1976)

Vol.23 No.1 Jan. 2023

©All Rights Reserved

地 址：北京市海淀区中关村北二街1号(100190)

电 话：010-62554658 邮 箱：[gce@ipe.ac.cn](mailto:gce@ipe.ac.cn)

网 址：<http://www.jproeng.com>

广告发布登记证号：京海工商广登字20170183号

中国标准刊号：  
ISSN 1009-606X  
CN 11-4541/TQ

国内邮发代号：80-297

国外发行代号：DK11006

国内定价：30.00元

ISSN 1009-606X

