

# 环境工程学报

HUANJING GONGCHENG XUEBAO

月刊 1980年创刊

2020年4月 第14卷 第4期

主管 中国科学院

主办 中国科学院生态环境研究中心

主编 刘俊新

编辑 《环境工程学报》编辑部

北京市海淀区双清路18号

邮政编码 100085

电话/传真 010-62941074

E-mail cjee@rcees.ac.cn

网址 www.cjee.ac.cn

出版 科学出版社

北京东黄城根北街16号

邮政编码 100717

印刷装订 北京科信印刷有限公司

国内发行

中国邮政集团公司北京市报刊发行局

广告发布登记

京海工商广登字20170090号

出版日期 每月26日

国际标准连续出版物号 ISSN 1673-9108

国内统一连续出版物号 CN 11-5591/X

国内外公开发行

国内邮发代号 82-448

国内定价 120.00元

订阅 全国各地邮局

科学出版社期刊发行处

电话 010-64017032, 64017539

## Chinese Journal of Environmental Engineering

Monthly Started in 1980

Vol.14 No.4 April 2020

Supervised by Chinese Academy of Sciences

Sponsored by Research Center for

Eco-Environmental Sciences, Chinese

Academy of Sciences

Editor-in-Chief LIU Junxin

Edited by The Editorial Board of Chinese

Journal of Environmental Engineering

Published by Science Press

16 Donghuangchenggen North Street

Beijing 100717, China

Printed by Beijing Kexin Printing Co.,Ltd.

Foreign Distributed by China National

Publishing Industry Trading Corporation

(CNPITC)

P.O.Box 782, Beijing 100011, China

# 目次

## 综述

- 853 应用硝酸盐控制排水管道中H<sub>2</sub>S气体释放的研究进展  
卢金锁,赵子聪,张志强,周亚鹏,柴守宁,管伟

## 水污染防治

- 864 CNT-PVDF复合中空纤维膜的制备及其电辅助抗膜污染性能  
杜磊,魏朔,全燮,陈硕,于洪涛
- 875 Mn-Fe-Ce/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>催化剂的制备及其在奶牛养殖废水处理中的  
臭氧催化氧化性能  
李家耀,宋卫锋,李秋华,余泽峰,冯嘉颖,杜璞欣
- 884 一步法低温合成二维CN<sub>x</sub>纳米材料及其对水中重金属离子的  
吸附性能  
张开胜,蔡兴国,孔令涛,刘锦淮
- 896 改性沸石对二级生化出水中氨氮的吸附特性  
仇铭坤,杨红薇,杜明阳,夏梦,豆俊峰
- 906 DSB+CPB复合改性膨润土对磷酸盐的吸附  
赵鹏,苏子龙,何剑伟,詹旭,黄俊波,孙连军
- 917 城市给水厂污泥对污水中磷的动态吸附  
崔競文,郑晓英,邱丽佳,时玉龙,王慰,李魁晓,屈冬冬
- 925 底物流加-间歇运行方式下氨氧化细菌富集培养的效果及  
影响因素分析  
姚仁达,苑泉,王凯军
- 935 煤热解废水典型工艺流程中芳香化合物的降解特性  
韩洪军,郑梦启,徐春燕,张正文
- 943 阳极COD对榨菜生产废水MDC产电、脱盐的影响及氨氮去除的  
微生物群落分析  
刘哲,张智,张林防,宋壮壮,吕爽,查正太,陈诗浩
- 955 不同氮源对猪粪废水厌氧发酵中氨抑制效果的影响  
张寓涵,潘云霞,贺亚清,刘思琪
- 963 单室无膜微生物电解池对厕所废水的脱氮处理  
刘畅,周小康,徐霞,董良飞
- 970 基于硫酸盐还原菌的气提内循环反应器处理酸性矿山废水  
祝传静,孙晶晶,黄建洪,李柳青,田森林,胡学伟
- 977 电絮凝对电厂循环冷却水中硬度的去除  
刘思琦,李一兵,曹迪,张娟娟,惠劭华,朱海洋,曹宏琨,李宽,  
李武林,冒冉,赵旭
- 984 煤化工高盐废水臭氧催化氧化脱除COD  
马栋,段锋
- 993 利用秸秆材料处理养殖废水过程中氮的转化与氨排放特征  
赵聪芳,陈坤,李希,夏梦华,刘铭羽,蒋磊,张满意,李裕元,  
吕殿青,吴金水

# 《环境工程学报》 第3届编辑委员会

## 指导委员会委员

曲久辉 郝吉明 张全兴  
任南琪 侯立安 张远航

主 编 刘俊新

副主编 王晓昌 贺 泓 崔福义  
李金惠 高宝玉 刘会娟  
王爱杰

## 编 委 (以姓氏笔画为序)

马 军 王凯军 王洪臣 王跃思  
仇荣亮 吕锡武 全 燮 刘双江  
刘勇弟 刘维屏 孙德智 李大鹏  
李玉友 李爱民 杨 敏 何 强  
何品晶 余 刚 宋存义 张付申  
张福锁 陈 卫 陈少华 陈光浩  
陈嘉平 季 民 金 波 周 琪  
单保庆 赵勇胜 郝晓地 俞汉青  
党 志 徐向阳 黄 勇 曾光明  
解跃峰

编委会秘书 张利田 金曙光

编辑部主任 张利田  
副 主 任 郑晓梅

学术编辑 靳 炜 金曙光

编校出版 郑晓梅 曲 娜

特邀编辑 王毅力 刘振刚  
豆小敏 杨晓芳  
王萌萌

本期组稿 郑晓梅

制 图 邵 鑫

封面设计 松迪设计

排 版 北京仁和汇智信息  
技术有限公司

- 1003 钙离子存在下胞外聚合物及其模拟溶液在膜污染中的差异  
陆薇儿,修光利
- 1013 基于污水厂尾水的人工湿地系统中水体氮的水流方向分布  
特征及污染评价  
李宏瑞,何旭,刘涛,刘红磊,许卓奇,文佳鑫,李艳英,陈子昂,  
马小东

## 大气污染防治

- 1022 铁修饰铝柱撑黏土催化剂(Fe/Al-PILC)的制备及其对  
C<sub>3</sub>H<sub>6</sub>-SCR活性的影响  
袁旻旻,钱文燕,邓文义,赵兵涛,苏亚欣
- 1033 单介质和双介质阻挡放电低温等离子体降解甲苯的比较  
于欣,党小庆,李世杰,黄准,郭惠,张金龙
- 1042 温湿电场对PM<sub>2.5</sub>及SO<sub>3</sub>的脱除性能  
黄怡民

## 固体废物处理与资源化

- 1052 剩余污泥在微氧条件下利用VFAs合成PHAs的工况优化  
谢一涵,方茜,刘煜,曾蕴仪,黄定武,黄紫龙
- 1059 暂存库填埋调质污泥的压缩与固结特性  
陈广,武亚军,林哲鑫
- 1067 污水处理厂脱水污泥中磷的形态及其溶出规律  
王方舟,刘雪瑜,肖书虎,颜秉斐,宋永会
- 1075 上海市试点小区湿垃圾源头减量前后垃圾处理处置全链  
条碳足迹分析  
詹咏,黄嘉良,罗伟,董滨,徐海斌,黄远东

## 环境生物技术

- 1084 苯酚降解菌生物转化吡啶及甲基吡啶的特性  
宋兆健,张立志,于聪,漆世英,包冬莉,吴炜泽,张旭旺
- 1092 嗜热栖热菌降解氟喹诺酮类抗生素  
潘兰佳,李杰,李春星,汪印
- 1103 嗜联苯红球菌B403对酚类污染物的降解特性及动力学分析  
谢晓航,叶萌,潘宏,许宋思恒,杨慧,柯榆杰,宋慧婷

## 工程创新与行业动态

- 1113 气田甲醇污水处理装置的运行优化  
吕雷,马天奇,张淑侠,李辉,董晨曦,王丹丹
- 1119 面向寒冷地区城镇污水处理厂提标改造的ASM模拟优化  
及其应用  
柳蒙蒙,陈梅雪,齐嵘,魏源送,杜海洲,胡彦明,张鑫
- 1129 CASS工艺园区污水处理厂提标改造为AAO+三级处理工  
艺后的运行效果对比分析  
吴飞,徐剑新,吕晨

## CONTENTS

- 853 **Research progress of H<sub>2</sub>S gas control by nitrate in the sewer**  
LU Jinsuo, ZHAO Zicong, ZHANG Zhiqiang, ZHOU Yapeng, CHAI Shouning, GUAN Wei
- 864 **Preparation of CNT-PVDF composite hollow fiber membrane and its anti-fouling performance with electro-assistance**  
DU Lei, WEI Shuo, QUAN Xie, CHEN Shuo, YU Hongtao
- 875 **Preparation of Mn-Fe-Ce/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalyst and its ozone catalytic oxidation performance in dairy farming wastewater treatment**  
LI Jiayao, SONG Weifeng, LI Qihua, YU Zefeng, FENG Jiaying, DU Puxin
- 884 **2-D CN<sub>x</sub> nanomaterials synthesis at low temperature by one-step method and its performance on heavy metal ions adsorption in water**  
ZHANG Kaisheng, CAI Xingguo, KONG Lingtao, LIU Jinhui
- 896 **Adsorption characteristics of ammonia nitrogen in secondary effluent on modified zeolite**  
ZHANG Mingkun, YANG Hongwei, DU Mingyang, XIA Meng, DOU Junfeng
- 906 **Adsorption of phosphate by DSB+CPB compositely modified bentonite**  
ZHAO Peng, SU Zilong, HE Jianwei, ZHAN Xu, HUANG Junbo, SUN Lianjun
- 917 **Dynamic adsorption of phosphorus in primary settling water by water treatment residuals in municipal water supply plant**  
CUI Jingwen, ZHENG Xiaoying, QIU Lijia, SHI Yulong, WANG Wei, LI Kuixiao, QU Dongdong
- 925 **Analysis on the effect of ammonia-oxidizing bacteria enrichment and its influence factors under the substrate continuous feeding in a sequencing batch reactor**  
YAO Renda, YUAN Quan, WANG Kaijun
- 935 **Aromatic compounds degradation characterization in a typical process of coal pyrolysis wastewater treatment**  
HAN Hongjun, ZHENG Mengqi, XU Chunyan, ZHANG Zhengwen
- 943 **Effect of anode COD on electricity generation and desalination of mustard production wastewater MDC and microbial community analysis under ammonia nitrogen removal**  
LIU Zhe, ZHANG Zhi, ZHANG Linfang, SONG Zhuangzhuang, LYU Shuang, ZHA ZhenGTai, CHEN Shihao
- 955 **Ammonia inhibition effect of different nitrogen sources in anaerobic fermentation of swine manure wastewater**  
ZHANG Yuhuan, PAN Yunxia, HE Yaqing, LIU Siqi
- 963 **Denitrification treatment of single-chamber membrane-free microbial electrolysis cell for toilet wastewater**  
LIU Chang, ZHOU Xiaokang, XU Xia, DONG Liangfei
- 970 **Treatment of acid mine drainage by a gas stripping internal circulation reactor with sulfate reducing bacteria**  
ZHU Chuanjing, SUN Jingjing, HUANG Jianhong, LI Liuqing, TIAN Senlin, HU Xuewei
- 977 **Removal of hardness from circulating cooling water of power plant by electrocoagulation**  
LIU Siqi, LI Yibing, CAO Di, ZHANG Juanjuan, HUI Shaohua, ZHU Haiyang, CAO Hongkun, LI Kuan, LI Wulin, MAO Ran, ZHAO Xu
- 984 **COD removal from high-salt wastewater in coal chemical industry by ozone catalytic oxidation**  
MA Dong, DUAN Feng
- 993 **Characteristics of nitrogen transformation and ammonia emission in swine wastewater treatment with straw materials**  
ZHAO Congfang, CHEN Kun, LI Xi, XIA Menghua, LIU Mingyu, JIANG Lei, ZHANG Manyi, LI Yuyuan, LYU Dianqing, WU Jinshui
- 1003 **Differences of extracellular polymeric substances (EPS) and model solution with regard to membrane fouling in the presence of Ca<sup>2+</sup>**  
LU Weier, XIU Guangli
- 1013 **Nitrogen distribution characteristics and pollution assessment in water along the water flow direction in a constructed wetland system treating the tailwater from wastewater treatment plants**  
LI Hongrui, HE Xu, LIU Tao, LIU Honglei, XU Zhuoqi, WEN Jiabin, LI Yanying, CHEN Ziang, MA Xiaodong
- 1022 **Influence of preparation process on C<sub>3</sub>H<sub>6</sub>-SCR activity over aluminum pillared clays modified with iron catalyst (Fe-Al-PILC)**  
YUAN Minhao, QIAN Wenyan, DENG Wenyi, ZHAO Bingtao, SU Yaxin
- 1033 **Comparison of single and double dielectric barrier discharge non-thermal plasma for toluene removal**  
YU Xin, DANG Xiaoping, LI Shijie, HUANG Zhun, GUO Hui, ZHANG Jinlong
- 1042 **Removal performance of PM<sub>2.5</sub> and SO<sub>3</sub> by temperature and wet electric field**  
HUANG Yimin
- 1052 **Working conditions optimization of PHAs synthesis by excess activated sludge fed with VFAs under micro-aerobic conditions**  
XIE Yihan, FANG Qian, LIU Yu, ZENG Yunyi, HUANG Dingwu, HUANG Zilong
- 1059 **Compression and consolidation characteristics of chemical conditioned sludge stored in the temporary library**  
CHEN Guang, WU Yajun, LIN Zhexin
- 1067 **Species and release of phosphorus from dewatered sludge in sewage treatment plants**  
WANG Fangzhou, LIU Xueyu, XIAO Shuhu, YAN Bingfei, SONG Yonghui
- 1075 **Full chain carbon footprint analysis of garbage disposal process before and after food waste in-situ reduction treatment in Shanghai pilot communities**  
ZHAN Yong, HUANG Jialiang, LUO Wei, DONG Bin, XU Haibin, HUANG Yangdong
- 1084 **Characteristics of indole and methylindoles biotransformation by phenol degrading bacteria**  
SONG Zhaojian, ZHANG Lizhi, YU Cong, QI Shiyang, BAO Dongli, WU Weize, ZHANG Xuwang
- 1092 **Biodegradation of fluoroquinolones by *Thermus thermophilus***  
PAN Lanjia, LI Jie, LI Chunxing, WANG Yin
- 1103 **Degradation characteristics and kinetic analysis of phenolic pollutants by *Rhodococcus biphenylivorans* B403**  
XIE Xiaohang, YE Meng, PAN Hong, XU Songsiheng, YANG Hui, KE Yujie, SONG Huiting
- 1113 **Operation optimization of methanol wastewater treatment equipment in gas field**  
LYU Lei, MA Tianqi, ZHANG Shuxia, LI Hui, DONG Chenxi, WANG Dandan
- 1119 **ASM simulation optimization and practical application on upgrading of urban sewage treatment plant in cold region**  
LIU Mengmeng, CHEN Meixue, QI Rong, WEI Yuansong, DU Haizhou, HU Yanming, ZHANG Xin
- 1129 **Contrastive analysis of operation effect of the park sewage treatment plant with the upgraded and reconstructed AAO-tertiary treatment process from CASS process**  
WU Fei, XU Jianxin, LYU Chen