

(HUANJING KEXUE)

ENVIRONMENTAL SCIENCE

第35卷 第1期

Vol.35 No.1

2014

中国科学院生态环境研究中心 主办

斜 学 出 版 社 出版



ENVIRONMENTAL SCIENCE

第35卷 第1期 2014年1月15日

目 次

	`
务4里77米州四北水冶区外间积及 FM _{2.5} 可决泰路的健康//	,
雾霾重污染期间北京居民对高浓度 PM _{2.5} 持续暴露的健康风险及其损害价值评估 谢元博,陈娟,李巍(1 长白山 PM _{2.5} 中水溶性离子季节变化特征研究 赵亚南,王跃思,温天雪,戴冠华(9 青岛大气颗粒物数浓度变化及对能见度的影响 柯馨姝,盛立芳,孔君,郝泽彤,屈文军(15)
青岛大气颗粒物数浓度变化及对能见度的影响 村馨姝,盛立芳,孔君,郝泽彤,屈文军(15)
重庆市大气二匹英污染水平及季节变化 张晓岭,卢益,朱明吉,蹇川,郭志顺,邓力,孙静,张芹,罗财红(22)
西南地区再生铝冶炼行业二哌英大气排放 卢益,张晓岭,郭志顺,蹇川,朱明吉,邓力,孙静,张芹(30)
西南地区新型干法水泥生产中的二噁英大气排放 张晓岭,卢益,蹇川,郭志顺,朱明吉,邓力,孙静,张芹(35)
- D. D D D D D D D	
模拟不同排放源排放颗粒及多环芳烃的粒径分布研究	í
川东北地区元素大气沉降通鼻及其季节变化	í
青庄市结山坡 2001。2010 年齡沉降亦化 — 全海祥 马苇苇 河烟)
杭州市办公场所至内空气中 PBDEs 的污染现状与特征 将欣慰,孙鑫,裴小强,金漫形,李云龙,沈字优(41 模拟不同排放源排放颗粒及多环芳烃的粒径分布研究 符海欢,田娜,商惠斌,张彬,叶素芬,陈晓秋,吴水平(46 川东北地区元素大气沉降通量及其季节变化 童晓宁,周厚云,游镇烽,汤静,刘厚均,黄颖,贺海波(53 重庆市铁山坪 2001~2010 年酸沉降变化 余德祥,马萧萧,谭炳全,赵大为,张冬保,段雷(60 汉江上游金水河流域氮湿沉降 王金杰,张克荣,吴川,张全发(66 麦秸及其烟尘中正构脂肪酸的组成 刘刚,李久海,吴丹,徐慧(73 兰州市室内大气降尘环境磁学特征及其随高度变化研究 吴铎,魏海涛,赵瑞瑞,张蕊,刘建宝(79 中亚热带针阔混交林土壤-大气界面释汞通量研究 马明,王定勇,申源源,孙荣国,黄礼昕(85 水稻秸秆生物炭对耕地土壤有机碳及其 CO ₂ 释放的影响 柯跃进,胡学玉,易卿,余忠(93 黄海和东海海域溶解铋地球化学分布特征 吴晓丹,宋金明,吴斌,李学刚(100 浑河上游(清原段)水环境中重金属时空分布及污染评价 马迎群,时瑶,秦延文,郑丙辉,赵艳民,张雷(108)
(X.仁工///) 建水闩机, 以须, 似. (M.) 以, 水, 大川, 木, 木, 大川, 木, 大, 大川, 木, 大川, 木, 大川, 木, 大,	/
友情及共阳至中上性构脂加酸的组取)
三州巾室内人气降尘外境幽学特征及其随高度变化研究 ————————————————————————————————————)
中业热带针阔泥交林土壤-大气界面释汞迪量研究)
水稻秸秆生物炭对耕地土壤有机碳及其 CO ₂ 释放的影响 柯跃进,胡学玉,易卿,余忠(93)
黄海和东海海域溶解铋地球化学分布特征 吴晓丹,宋金明,吴斌,李学刚(100)
浑河上游(清原段)水环境中重金属时空分布及污染评价 马迎群,时瑶,秦延文,郑丙辉,赵艳民,张雷(108)
POCIS 采样技术应用于九龙江流域水环境中雌激素的检测)
降雨条件下岩溶地下水微量元素变化特征及其环境意义 陈雪彬, 杨平恒, 蓝家程, 莫雪, 师阳(123)
福林河流域地表水水化学主喜子特征及控制因素·	/
- Managara Panagara	`
一	/
J 7 何小尔·西加烈杀虫风及军问刀·甲存证。)
水稻种植对中业热带红壤丘陵区小流域氮磷养分输出的影响 宋立芳,王毅,吴金水,李勇,李裕元,孟岑,李航,张满意(150 黄东海表层沉积物中磷的分布特征 宋国栋,刘素美,张国玲(157 河流沉积物中有机磷提取剂(NaOH-EDTA)提取比例与机制研究 张文强,单保庆,张洪,唐文忠(163 沉积物短期扰动下 BAPP 再生和转化机制 武晓飞,李大鹏,汪明(171 三峡库区典型农村型消落带沉积物风险评价与重金属来源解析 敖亮,雷波,王业春,周谐,张晟(179 太湖东部不同类型湖区疏浚后沉积物重金属污染及潜在生态风险评价	`
*************************************)
更乐海表层沉积初中磷的分布特征 · · · · · · · · · · · · · · · · · · ·)
河流沉积物中有机磷提取剂(NaOH-EDTA)提取比例与机制研究 ····································)
沉积物短期扰动下 BAPP 再生和转化机制 武晓飞,李大鹏,汪明(171)
三峡库区典型农村型消落带沉积物风险评价与重金属来源解析 敖亮,雷波,王业春,周谐,张晟(179)
太湖东部不同类型湖区疏浚后沉积物重金属污染及潜在生态风险评价	
)
滇池沉积物中主要污染物含量时间分异特征研究 王心宇,周丰,伊旋,郭怀成(194)
浓度层析荧光光谱局部匹配溢油鉴别技术)
光电 Fenton 技术处理污泥深度脱水液研究 · · · · · · · · · · · · · · · · · · ·	í
同步脱氧除磷颗粒污泥硝化反硝化特性试验研究	í
为好情拥名淡波流玩程大物的复数长期络字收守验研究	1
为公公全公司的证据从证上了的历史的任务中的一个专家的方面, 如)
太湖东部不问类型湖区城沒后讥帜物里金属污染及浴任生态风应评价)
水稻光合同化碳在土壤中的矿化和转化动态 ········ 谭立敏,彭佩钦,李科林,李宝珍,聂三安,葛体达,童成立,吴金水(233土地利用及退耕对喀斯特山区土壤活性有机碳的影响 ·········· 廖洪凯,李娟,龙健,张文娟,刘灵飞(240)
工地利用及逐种利格别特坦区工集活性有机恢的影响)
水稻土团聚体 Cu²+吸附过程中铝的溶出及土壤溶液 pH 变化 许海波,赵道远,秦超,李玉姣,董长勋(248)
Cr(Ⅵ)对两种黏土矿物在单一及复合溶液中Cu(Ⅱ)吸附的影响 ············· 刘娟娟,梁东丽,吴小龙,屈广周,钱勋(254)
· 海水时长对 2 种从枝蓿相 (AM) 直蓿侵氿 2 种湿肿植物的影响	/
他小时以AJ 5 什么仅图依(AM) 具图反来 2 件业地值初时影响 与 百 值,工府商,工 店 允(203)
太湖水质与水生生物健康的关联性初探 ··················周笑白,张宁红,张咏,牛志春,刘雷,于红霞(271))
太湖水质与水生生物健康的关联性初探 ····································)))
Cr(Ⅵ)对两种黏土矿物在单一及复合溶液中Cu(Ⅱ)吸附的影响)
- 基制药废水对发光细菌刍性毒性的评价研究 杜丽娜 杨帆 穆玉峰 全芸術 左剑恶 高俊发 全忻 滕丽君 汤薪琛(286))
- 基制药废水对发光细菌刍性毒性的评价研究 杜丽娜 杨帆 穆玉峰 全芸術 左剑恶 高俊发 全忻 滕丽君 汤薪琛(286))
- 基制药废水对发光细菌刍性毒性的评价研究 杜丽娜 杨帆 穆玉峰 全芸術 左剑恶 高俊发 全忻 滕丽君 汤薪琛(286))
某制药废水对发光细菌急性毒性的评价研究 ··· 杜丽娜, 杨帆, 穆玉峰, 余若祯, 左剑恶, 高俊发, 余忻, 滕丽君, 汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 ····································)
某制药废水对发光细菌急性毒性的评价研究 ··· 杜丽娜, 杨帆, 穆玉峰, 余若祯, 左剑恶, 高俊发, 余忻, 滕丽君, 汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 ····································)
某制药废水对发光细菌急性毒性的评价研究 ··· 杜丽娜, 杨帆, 穆玉峰, 余若祯, 左剑恶, 高俊发, 余忻, 滕丽君, 汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 ····································)
某制药废水对发光细菌急性毒性的评价研究 ··· 杜丽娜, 杨帆, 穆玉峰, 余若祯, 左剑恶, 高俊发, 余忻, 滕丽君, 汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 ····································)
某制药废水对发光细菌急性毒性的评价研究 ··· 杜丽娜, 杨帆, 穆玉峰, 余若祯, 左剑恶, 高俊发, 余忻, 滕丽君, 汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 ····································)
某制药废水对发光细菌急性毒性的评价研究 · · · 杜丽娜,杨帆,穆玉峰,余若祯,左剑恶,高俊发,余忻,滕丽君,汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 · · · · · · · · · · · · · · · · · · ·)))))))
某制药废水对发光细菌急性毒性的评价研究 · · · 杜丽娜,杨帆,穆玉峰,余若祯,左剑恶,高俊发,余忻,滕丽君,汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 · · · · · · · · · · · · · · · · · · ·)))))))
某制药废水对发光细菌急性毒性的评价研究 · · · 杜丽娜,杨帆,穆玉峰,余若祯,左剑恶,高俊发,余忻,滕丽君,汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 · · · · · · · · · · · · · · · · · · ·)))))))))
某制药废水对发光细菌急性毒性的评价研究 · · · 杜丽娜,杨帆,穆玉峰,余若祯,左剑恶,高俊发,余忻,滕丽君,汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 · · · · · · · · · · · · · · · · · · ·)))))))))
某制药废水对发光细菌急性毒性的评价研究 · · · 杜丽娜,杨帆,穆玉峰,余若祯,左剑恶,高俊发,余忻,滕丽君,汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 · · · · · · · · · · · · · · · · · · ·)))))))))))
某制药废水对发光细菌急性毒性的评价研究 · · · 杜丽娜,杨帆,穆玉峰,余若祯,左剑恶,高俊发,余忻,滕丽君,汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 · · · · · · · · · · · · · · · · · · ·	
某制药废水对发光细菌急性毒性的评价研究 · · · 杜丽娜,杨帆,穆玉峰,余若祯,左剑恶,高俊发,余忻,滕丽君,汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 · · · · · · · · · · · · · · · · · · ·	
某制药废水对发光细菌急性毒性的评价研究	
某制药废水对发光细菌急性毒性的评价研究 · · · 杜丽娜,杨帆,穆玉峰,余若祯,左剑恶,高俊发,余忻,滕丽君,汤薪瑶(286 异丙甲草胺与锌共存对斜生栅藻毒性手性差异影响 · · · · · · · · · · · · · · · · · · ·	

雾霾重污染期间北京居民对高浓度 PM_{2.5} 持续暴露的健康风险及其损害价值评估

谢元博,陈娟,李巍*

(北京师范大学环境学院,水环境模拟国家重点实验室,北京 100875)

摘要: 开展短期内高浓度空气污染造成的人体健康风险评价以及健康经济损失研究,对推进城市大气污染防控,保证人民群众的健康水平具有重要的科学价值和实际意义. 研究选择 2013 年 1 月发生的北京市雾霾重污染事件,采用泊松回归模型评价全市居民对 10~15 日高浓度 PM_{2.5}暴露的急性健康损害风险,并采用环境价值评估方法估算人群健康损害的经济损失. 结果表明,短期高浓度 PM_{2.5}污染对人群健康风险较高,约造成早逝 201 例,呼吸系统疾病住院1 056例,心血管疾病住院 545 例,儿科门诊7 094例,内科门诊16 881例,急性支气管炎10 132例,哮喘7 643例. 相关健康经济损失高达 4. 89 亿元(95% CI:2. 04~7. 49),其中早逝与急性支气管炎、哮喘三者占总损失的 90% 以上. 建议应针对不同人群不同健康终点的健康风险进行健康预警并开展及早医学干预,以降低类似空气重污染事件给居民健康带来的风险和损失.

关键词:北京居民; 高浓度暴露; PM, 5; 健康风险; 损害价值评估

中图分类号: X820.4 文献标识码: A 文章编号: 0250-3301(2014)01-0001-08

An Assessment of PM_{2.5} Related Health Risks and Impaired Values of Beijing Residents in a Consecutive High-Level Exposure During Heavy Haze Days

XIE Yuan-bo, CHEN Juan, LI Wei

(State Key Laboratory of Water Environment Simulation, School of Environment, Beijing Normal University, Beijing 100875, China) **Abstract**:It has important scientific value and practical significance for urban atmospheric air pollution control and people health protection to carry out health risk assessment as well as impaired value assessment of short-term high concentrations of air pollution. Using the Poisson regression model and environmental valuation method, this study estimated the health risks and impaired values of Beijing residents in a consecutive high-level PM_{2.5} exposure during the heavy haze pollution occurred from January 10th to 15th, 2013. The results show that, substantial health risks due to PM_{2.5} air pollution were occurred in six pollution days, including 201 cases of premature deaths, 1 056 and 545 cases of hospital admissions for respiratory and cardiovascular diseases, 7 094 and 16 881 cases of pediatric and internal outpatients each, 10 132 cases of acute bronchitis and 7 643 cases of asthma respectively. Correspondingly, approximate 489 (95% CI: 204-749) million RMB health-related economic loss was evaluated, of which more than 90% was attributable to premature deaths, acute bronchitis and asthma. It is recommended that health risks and economic losses can be reduced through early health warning and timely medical intervention for various groups of people with different health endpoints.

Key words: Beijing resident; high-level exposure; PM_{2.5}; health risk; impaired value assessment

伴随着快速工业化和城镇化,我国许多城市的环境空气质量都呈现出恶化趋势,环境空气重污染事件频发,影响范围越来越广,包括北京在内的我国多个城市都曾经出现在世界10大空气污染城市名单之中[1],对居民健康和社会经济的危害日趋显著.受不利天气和污染排放增加等多重因素的影响,包括北京在内涉及我国中东部130多万 km²的严重雾霾污染事件,更是引起了全社会对大气环境污染及其健康损害的空前关注.短期高浓度的空气污染对人体健康影响严重,20世纪著名的世界公害事件如比利时马斯河谷工业区4日内SO2污染事件,美国宾夕法尼亚州多诺拉镇1948年6日内SO2以及粉尘污染事件,40年代初美国洛杉矶光化学烟雾事件,1952年英国伦敦4日内烟雾事件[2]中,由

于大气污染物高浓度暴露水平,引起了不同程度的居民急性死亡、喉痛、咳嗽、呼吸困难等大气污染性疾病、并致使更多人患上支气管炎、冠心病、肺结核乃至癌症. 定量评估高浓度 PM_{2.5} 暴露下的居民健康风险并提出空气重污染事件的健康预警和应急措施意义重大.

健康风险评估目前多采用危险度评价方法,通 过评价主要污染物每增高一个单位所产生的健康损 失,定量表征污染物浓度变化产生的人体健康效

收稿日期:2013-02-14;修订日期:2013-06-26

基金项目:中国清洁发展机制基金项目(1213075);中央高校基本科研业务费专项(105560GK)

作者简介:谢元博(1986~),男,博士,主要研究方向为大气污染防治、战略环境评价、生态价值评估,E-mail:former_007@

* 通讯联系人,E-mail:weili@bnu.edu.cn

应[3]. 其中,暴露反应关系链接了大气质量变化和 人群健康效应终点的变化,是定量评价大气污染健 康危害的关键. 国内外针对多种呼吸系统、心脑血 管系统疾病发病率、就诊人数与 PM10、SO, 和 NO, 等主要空气污染物之间的暴露反应关系开展了一系 列研究,初步获取了主要污染物暴露水平与老年人、 儿童等特定敏感人群患相关疾病的几率和死亡率之 间的相关关系[4~6]. 国内目前在上海、香港、武汉、 广州、西安和北京等地分别开展了PM₁₀, PM₂₅暴露 与城区居民健康影响的相关研究[7-9],但是,针对突 发性空气重污染事件的人群健康风险评价和健康预 警研究在国内外均属鲜见. 在人群健康风险评估基 础上,多以年作为时间尺度评价大气污染健康损害 的经济损失[10~12],其中包括对北京市 2000~2004 年期间以及2006年和2009年大气污染所开展的健 康损失经济价值评估[10~12]. 这些评估大多采用疾 病成本法(cost of illness, COI)、人力资本法、支付 意愿法(willingness to pay, WTP)等方法[13]. 国内 许多城市和地区包括兰州、重庆,天津、江苏、贵 州、上海、九江和南宁等均开展了针对大气污染的 人群健康支付意愿调查[14~17].

受能源消费和机动车数量快速增长的影响,北京市空气质量仍然较差,在世界卫生组织 2011 年公布的全球 91 个国家1 100个城市中空气质量排名第1 036位,全市严重污染日占到每年天数的 6% 且有增加的态势^[18],主要空气污染物 PM_{2.5}长期超标,灰霾问题日趋严重. 因此极有必要对短期的高浓度空气污染健康风险进行识别、评估与防控. 本研究以2013 年 1 月 10 ~ 15 日的严重雾霾污染事件为背景,选择北京市常住人口作为评估样本并利用主要污染物 PM_{2.5}逐日浓度数据,定量评估连续 6 日高浓度 PM_{2.5}暴露下的居民健康风险并对潜在的健康损害进行价值估算,以期为改进和完善针对空气重污染事件的健康预警和应急措施提供依据.

1 材料与方法

1.1 资料或数据来源

2013年1月10~15日,北京市23个大气环境监测站点的主要污染物均为细颗粒物,本文研究时间段内PM_{2.5}污染数据来源于北京市环境保护局每日公布23个大气环境监测站点空气质量数据.

考虑到数据年份的可获得性和统一性,本研究 人口及居民健康终点的发病、死亡率统一以 2011 年数据为准,其中以"北京市公共卫生信息中心"公 布的 2011 年底全市分区县常住人口作为暴露人群. 实际死亡率以及其他健康终端的基准发生率分别从《2011 年北京市卫生事业发展统计公报》、《2012 年中国卫生统计年鉴》和《北京市 2011 年度卫生与人群健康状况报告》中获得. 评估的参考浓度选取WHO 制定的健康浓度指导值, PM_{2.5} 日均浓度为 25μg·m⁻³.

1.2 评估方法

采用空气污染流行病学研究中应用较广的泊松回归模型,评价连续多日高浓度 $PM_{2.5}$ 暴露下的居民健康急性风险^[19],公式如下:

$$E = \exp[\beta(c - c_0)] E_0$$
 (1)

$$\Delta E = P(E - E_0) = P \left[1 - \frac{1}{\exp[\beta(c - c_0)]}\right] E$$
 (2)

式中, ΔE 为实际浓度与参考浓度下居民健康效应之差,即由于 $PM_{2.5}$ 浓度变化带来的居民健康效应变化量; P 为居民数量,万人; β 为暴露-反应关系系数; c 为实际暴露浓度; c_0 为参考浓度; E 为实际浓度下的居民健康效应, E_0 为参考浓度下的居民健康效应,两者常以发病或死亡表示.

定量评估大气污染引起的健康损失并进行货币 化估算是环境保护措施成本-效益分析的基础,对加 强政府的大气污染治理力度具有重要意义. 采用疾 病成本法(COI)估算对高浓度 PM_{2.5}暴露引发的各 种相关疾病所造成的经济价值损失,基本计算公 式为:

$$c_i = (c_{Pi} + GDP_P \times T_{Li}) \times I_i$$
 (3)
式中, c_i 为 PM_{2.5} 对健康终点 i 造成的疾病总成本, c_{Pi} 为健康终点 i 的单位病例的治疗成本,GDP_P 为北京 地区 国内生产总值的每日人均值 [元·(人·d) $^{-1}$], T_{Li} 为因健康终点 i 的疾病导致的误工时间, ΔI_i 为健康终点 i 因 PM_{2.5} 污染导致的健

康效应变化量. 1.3 数据处理

在公式(1)中,北京市常住人口2018.6万人,人口年总死亡率为5.9‰,其中心血管疾病死亡率为2.7459‰,呼吸系统疾病死亡率为0.6214‰.北京市医疗卫生机构总住院率为9.9475%,其中呼吸系统疾病住院占总住院率的12.86%,心血管疾病住院占总住院率的9.94%.因此,呼吸系统疾病住院率为1.279%,心血管疾病住院率为0.989%.针对PM_{2.5}与相关健康终点的暴露-反应系数,杨敏娟等^[7]和谢鹏等^[20]提出了适用于中国地区PM_{2.5}健康

效应评估的暴露-反应系数. 黄德生等^[21]基于流行病学综合研究成果总结了京津冀地区 $PM_{2.5}$ 引起的各健康终端的暴露-反应系数. 本研究综合以上研究成果,结合北京市实际情况,提取各健康终点基准发生率, $PM_{2.5}$ 污染暴露-健康反应关系系数(β 值)及其95%可信限(CI),详见表 1.

综合考虑国内流行病学研究现状及数据的可获

表 1 主要健康终点的 PM_{2.5}污染暴露-居民健康 反应系数和基准发生率¹⁾

Table 1 Concentration-response (CR) coefficients for mortality and morbidity and reference incidence rates of different

health terminals used in this study							
健康组	冬点	β值(95% 置信区间)/%	E 值/‰				
	总死亡	0.40(0.19,0.62)	0. 016 164 4				
早逝	呼吸系统疾病死亡率	1.43(0.85,2.01)	0. 001 702 5				
	心血管疾病死亡率	0.53(0.15,0.9)	0. 007 523 0				
住院	呼吸系统	1.09(0,2.21)	0. 035 041 1				
正的	心血管	0.68(0.43,0.93)	0. 027 090 4				
门诊诊问	儿科(0~14岁)	0.56(0.2,0.9)	0. 419 178 1				
门应应问	内科(15 岁以上)	0.49(0.27,0.7)	1. 126 164 4				

1) β 值为 $PM_{2.5}$ 浓度每增加 $10~\mu g \cdot m^{-3}$ 导致的人群发病率和死亡率增加的百分数(%); E 值是通过将年死亡率和发病率统计值折算成日均死亡率和发病率来获取

7.90(2.7,13)

2. 10(1.45,2.74) 0. 153 698 6

急性支气管

哮喘

患病

取性,本研究所选择的与可吸入颗粒物污染相关的 急性健康效应终点包括哮喘患病、急性支气管炎患 病、呼吸系统疾病、心血管系统疾病、内科及儿科 门诊. 其中呼吸系统疾病住院中不包括哮喘、急性 支气管炎患病,门诊诊问包括儿科与内科诊问,主要 估算不同年龄阶段人群访问次数.

健康终点的单位价值乘以 ΔE 就是该健康终点的人群归因经济损失,各健康终点的经济损失相加即为大气 $PM_{2.5}$ 污染的人群总归因经济损失. 考虑到健康的单位经济损失评估方法多样,且不同的评估方法最后结果不一,基于各健康终点经济损失基本数据的可获得性,本研究综合年鉴分析与相关研究成果进行估算,参考《中国卫生统计年鉴(2010)》的相关统计数据进行公式(3)计算,同时综合近年关于空气污染导致的居民健康损害(包括疾病和早逝)的经济价值评估和研究结果(表2)进行估算.

为评估不同健康终点的经济损失,本研究依据 北京地区人均 GDP 增长率和 2012 年人均可支配收 人将表 2 中不同研究年份的研究成果最终修正为 2012 年各健康终点经济成本,同时对不同健康终点 的经济成本进行纵向比较,取其中的高、中、低经 济成本作为本研究的基础数据(表 3)以便更全面的 评估.

表 2 相关研究中北京地区空气污染健康损害单位经济成本评估结果

0.1041096

Table 2 Unit cost of resident health damage due to air pollution in Beijing estimated by relevant studies

			artir adminage artis t	o dii poilditoii ii i	01,111.8 00011111111011111		
研究年份	早逝	急性支气管炎	哮喘	门诊	住院/	元·例 -1	文献
如光平切	/万元·例 ⁻¹	/元・例 ⁻¹	/元・例 ⁻¹	/元・例 -1	心血管疾病	呼吸系统疾病	文献
2004	112. 1	_	_	231.8	13 463. 3	6 648. 8	[10]
2006	100.0	_	_	300.0	10 400. 0	6 700. 0	[11,22]
2009	_	4 186. 8	_	322.0	15 (028. 9	[23]
2010	110.0	_	_	519.7	8 906. 5	6 088. 0	[24]
2010	168. 0	2 500. 1	1 840. 3	515.1	16 9	959. 1	[21]

表 3 北京地区 2012 年相关健康终点的单位损害经济成本

Table 3 Unit damage costs of related health terminals in Beijing area in year 2012

损害成本	早逝	急性支气管炎	哮喘	门诊	住院/フ	万元·例 ⁻¹
坝古风平	/万元•例-1	/万元·例 ⁻¹	/万元·例 ⁻¹	/万元·例 ⁻¹	心血管疾病	呼吸系统疾病
高	238. 80	0. 52	1.06	0.06	2. 87	1. 86
中	181. 40	0. 29	0. 64	0.05	1. 95	1. 42
低	126. 50	0. 27	0. 21	0.04	1.02	1. 06

2 结果与讨论

2.1 居民健康风险评价结果

全市主要地区 10~15 日 PM_{2.5} 日均浓度变化如图 1 所示. 可见在雾霾重污染期间.10 日和 11 日全

市 PM_{2.5}浓度逐渐增高,并在 12 日和 13 日到达峰值;尤其是在 12 日,东城区、西城区、朝阳区、丰台区、石景山区、大兴区、通州区的监测浓度均超过了最高标准限值 500 μg·m⁻³,最高值出现在 12 日的通州区(788 μg·m⁻³)和朝阳区(768 μg·m⁻³).

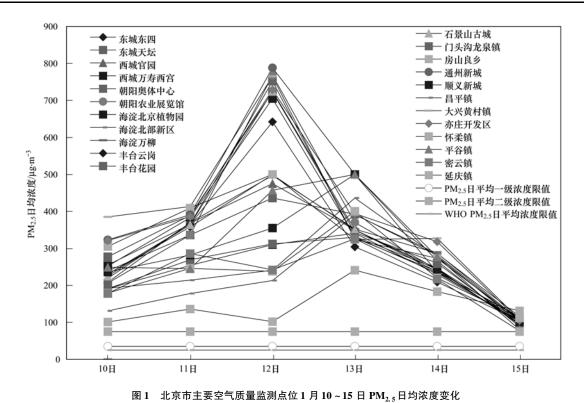


Fig. 1 Variations of daily averaged $PM_{2.5}$ concentrations at the main air quality monitoring stations in Beijing during the period from January $10^{\,th}$ to $15^{\,th}$, 2013

13 日,主城区 $PM_{2.5}$ 浓度有所下降,郊区如昌平(城市清洁对照点)、顺义、平谷、密云、怀柔和延庆等浓度有所上升;此后由于较强冷空气来临,到 14 日浓度出现明显下降,至 15 日部分地区降至二级标准限值(75 μ g·m⁻³)附近.在整个研究时段内, $PM_{2.5}$ 逐日平均浓度市区为 306.57 μ g·m⁻³,郊区为 283.89 μ g·m⁻³,分别为二级标准限值的 4.09 和 3.79 倍.

通过将研究时段内北京市主要城区常住人口数据、PM_{2.5}浓度、急性健康效应终点基线数据、暴露反应关系系数等代入评价模型,计算得到雾霾重污染期间全市居民针对 PM_{2.5}持续高浓度暴露的急性健康效应(表 4). 为了避免重复计算,评价过程中将不同健康终点的次日影响人数减去前一日受影响人数,作为逐日累积的健康受损人数.

计算结果显示,研究时段内 $PM_{2.5}$ 高水平暴露下北京市人群健康风险将显著增大,受危害总数约 43 553例(95% $CI:24766\sim57332$),占常住总人口的 2. 2‰. 其中,突发性死亡约 201 例(95% $CI:99\sim300$),呼吸系统疾病住院约为1 056例(95% $CI:0\sim1805$),心血管疾病住院约 545 例(95% $CI:360\sim715$),儿科门诊 7094 例(95% $CI:2700\sim10764$),内科门诊16 881例(95% $CI:9670\sim23260$),急性支

气管炎10 132例(95% CI:6 116~11 375), 哮喘 7643 例(95% CI:5 820~9 114).

2.2 健康损害价值评估结果

在人群健康风险评价基础上,结合表 3 中各健康终点的单位损害经济成本,计算得出研究时段内居民健康损失的经济价值,结果见表 5.

结果显示,研究时段内人群健康经济损失均值 约为 4. 89 亿元(95% $CI:2.04 \sim 7.49$),约占北京市 2012 年 GDP 的 0. 275‰ (0. 140‰ $\sim 0.395‰$). 其 中,对应高、中、低这 3 个评估标准,居民健康损害 经济价值分别为 6. 68 亿元(95% $CI:3.44 \sim 9.58$)、 4. 83 亿元(95% $CI:2.46 \sim 6.98$)和 3. 15 亿元(95% $CI:1.58 \sim 4.57$).

结合我国空气环境标准进行超标期间居民健康影响及相关经济损失分析. 重污染期间, PM_{2.5} 日均浓度在《环境空气质量标准》(GB 3095-2012)二级标准限值75 μg·m⁻³基础上每升高 10 μg·m⁻³,将会造成北京市常住居民早逝增加 8 例,呼吸系统住院增加 41 例,心血管住院增加 21 例,儿科门诊增加 277 例,内科门诊增加 659 例,急性支气管患病增加 396 例,哮喘患病增加 299 例,共增加健康受损人群 1 701 例. 相应增加健康经济损失约1 915. 0万元,其中早逝损失1 434. 0万元,呼吸系统住院损失 59. 7

表 4 雾霾重污染期间持续高浓度 $PM_{2.5}$ 暴露下北京市居民健康风险评估结果

Table 4	Estimated outcomes of resid	dent health risk in exposure o	f consecutive high-level PM _{2.5}	during the	period of heavy haze	pollution in Beijing

Table 4 行政	人口基数				•	完/例	2.0	S/例	of heavy haze poll 患症	f/例
区域	/万人	总死亡	呼吸系统	心血管	呼吸系统	心血管	儿科	内科	急性支气管	哮喘
东城	91. 0	10 (5,14) ¹⁾	3 (2,4)	6 (2,9)	50 (0,85)	26 (17,34)	340 (130,514)	809 (465,1113)	469 (289,522)	362 (277,430)
西城	124. 0	13 (6,19)	4 (3,5)	8 (2,12)	67 (0,115)	35 (23,46)	454 (173,688)	1 081 (620,1 489)	631 (388,702)	486 (371,578)
朝阳	365. 8	38 (19,57)	12 (8,15)	23 (7,37)	201 (0,340)	104 (69,136)	1353 (517,2046)	3 221 (1 849 ,4 430)	1867 (1 149,2 078)	1441 (1 102,1 711)
海淀	340. 2	30 (14,44)	10 (6,13)	18 (5,29)	159 (0,279)	81 (53,107)	1048 (393,1608)	2 487 (1 413 ,3 452)	1673 (956,1 908)	1180 (884,1426)
丰台	217. 0	24 (12,35)	7 (5,9)	14 (4,22)	122 (0,206)	64 (42,83)	829 (318,1 250)	1 976 (1 137,2 712)	1111 (693,1 234)	872 (670,1032)
石景山	63. 4	7 (3,10)	2 (1,3)	4 (1,7)	36 (0,61)	19 (13,25)	247 (95,372)	589 (339,807)	327 (205,364)	258 (199,305)
门头沟	29. 4	2 (1,4)	1 (0,1)	1 (0,2)	13 (0,23)	6 (4,9)	83 (31,129)	197 (112,275)	143 (79,164)	96 (71,117)
房山	96. 7	10 (5,15)	3 (2,4)	6 (2,10)	54 (0,93)	28 (18,37)	365 (138,554)	867 (496,1 197)	509 (316,559)	395 (300,470)
通州	125. 0	16 (8,24)	5 (3,6)	10 (3,15)	82 (0,133)	43 (29,56)	566 (220,843)	1 353 (785,1842)	659 (444,714)	567 (444,660)
顺义	91. 5	9 (4,13)	(2,4)	5 (2,8)	46 (0,80)	24 (16,31)	307 (116,469)	729 (416,1 009)	461 (273,518)	339 (256,407)
昌平	173. 8	12 (6,19)	4 (3,6)	8 (2,12)	68 (0,122)	34 (22,46)	445 (166,687)	1 054 (596,1 469)	791 (423,936)	516 (382,630)
大兴	142. 9	18 (9,27)	6 (4,7)	11 (3,17)	92 (0,152)	48 (32,63)	633 (245,948)	1511 (873,2064)	769 (508,831)	646 (503,757)
怀柔	37. 1	3 (1,4)	1 (1,1)	2 (1,3)	16 (0,28)	8 (5,10)	101 (38,156)	240 (136,335)	177 (96,206)	117 (87,143)
平谷	41.8	4 (2,6)	1 (1,2)	3 (1,4)	$ \begin{array}{c} 22 \\ (0,38) \end{array} $	11 (7,15)	148 (56,225)	351 (201,485)	209 (128,233)	160 (122,191)
密云	47. 1	(2,5)	1 (1,2)	2 (1,3)	19 (0,34)	9 (6,13)	122 (45,189)	289 (163,403)	217 (117,253)	142 (105,174)
延庆	31. 9	2 (1,2)	(0,1)	1 (0,2)	8 (0,16)	4 (3,6)	54 (20,84)	126 (71,178)	119 (55,152)	66 (48,83)
全市	2018. 6	201 (99,300)	64 (42,82)	121 (37,193)	1 056 (0,1 805)	545 (360,715)	7 094 (2 700,10 764)	16 881 (9 670,23 260)	10 132 (6 116,11 375)	7 643 (5 820,9 114)

¹⁾ 表中括号内数值为根据 95% 可信限(CI) 预测所得,下同

表 5 PM_{2.5} 重度污染造成的北京居民健康价值损失

 $Table \ 5 \quad Estimated \ losses \ in \ economic \ value \ of \ residents' \ health \ damage \ due \ to \ severe \ PM_{2.5} \ pollution \ in \ Beijing$

/z-h	事	健康受损人数		健康损害经济价值(万元)		
健康终点		(人)	高	中	低	
死亡		201 (99, 300)	47 999 (23 641, 71 640)	36 455 (17 956 ,54 411)	25 427 (12 524, 37 950)	
住院	心血管	1 056 (0, 1 805)	3 031 (0, 5 180)	2 059 (0, 3 520)	1 077 (0, 1 841)	
12.176	呼吸系统	545 (360, 715)	1 014 (670, 1 330)	774 (511, 1015)	578 (382, 758)	
门诊	儿科	7 094 (2 700, 10 764)	426 (162, 646)	369 (140, 560)	28 (11, 43)	
1,10	内科	16 881 (9 670, 23 260)	1 013 (580, 1 396)	878 (503, 1 210)	68 (39, 93)	
	急性支气管炎	10 132 (6 116, 11 375)	5 269 (3 180, 5 915)	2 938 (1 774, 3 299)	2 736 (1 651, 3 071)	
	哮喘	7 643 (5 820, 9 114)	8 102 (6 169, 9 661)	4 892 (3 725, 5 833)	1 605 (1 222, 1 914)	
	合计		66 852 (34 403, 95 768)	48 365 (24 608, 69 847)	31 518 (15 828, 45 670)	

万元,心血管住院损失 41.5 万元,儿科门诊损失 13.9 万元,内科门诊损失 33.0 万元,急性支气管患 病损失 142.5 万元,哮喘患病损失 190.1 万元.

3 讨论

此次评估的重点是雾霾重污染期间典型污染物 PM_{2.5}对人群健康的影响与经济损失,未考虑其他污染物如 SO₂,NO_x,PM₁₀等对人群健康的影响.鉴于各种大气污染物可能对人体健康损害产生协同作用,因此,此次的评估结果有可能低估研究时段 PM_{2.5}污染导致的急性健康危害.对比北京市 2009年 PM_{2.5}年均低浓度连续 6 日暴露的健康风险评估结果(719 例)^[21],本次针对高浓度暴露的急性健康风险评价结果约为其 60 倍,说明此次雾霾重污染事件对居民健康损害的急性效应是十分严重的.

目前 PM_{2.5}对健康的影响机制尚不完全清晰,因此实际测算的健康终点可能不够全面. 尽管有研究提示肺功能降低、限制活动天数、不良生殖结局等也与 PM_{2.5}有关,但国内缺乏相关的流行病研究和基础健康资料,因此评估相应的健康损失存在较大的不确定性,依赖于流行病学的研究结果所得到的暴露-反应系数尚待更深入研究. 同时,本次暴露-反应关系的过程本身仍存在不确定因素,例如流行病学研究中对各种混杂因素(如天气、其他污染物、居民暴露模式等)的定义和控制过程中存在的差异会对暴露-反应系数的研究带来一定的困难^[25]. 本研究对国内不同地区的暴露-反应关系进行了综合分析并尽量选取了北京市相关研究结果,避免了采用单个研究结果可能导致的误差,也在一定程度上将不确定性控制在相对可靠的范围.

基于有限的流行病学研究得到的 PM_{2.5}暴露反应关系,难以全面而真实地反映我国城市人群在急性大气污染物暴露下健康反应现状,目前国内大气污染急性健康效应的流行病学研究在国内开展较为罕见,尚需国内同行开展更多的大气污染流行病学研究,特别是严格设计的多城市时间序列研究和病例交叉研究. 另外,本研究发现,PM_{2.5}高浓度暴露对人群急性支气管和哮喘的患病率影响较大,高浓度颗粒物暴露对儿童呼吸系统疾病如哮喘和支气管炎影响与内科门诊尤为严重. 据相关报道^[26],此次雾霾重污染期间北京市儿童医院门诊量最高峰曾达到9000多人次,呼吸道感染占到内科病患的50%以上;解放军总医院急诊科1月13日接诊的500多名患者中,大部分是呼吸道疾病患者.

当前有学者已提出分病因的暴露反应关系系数 通常大于不分病因的暴露反应关系系数 [27],但由于我国医疗机构在门诊、急诊登记时并未严格区分病种,以致内科门诊成为唯一可利用的门诊健康终点,因此,本研究有可能低估大气颗粒物污染对呼吸疾病引起的健康终点人数及其他健康终点人群.

在健康损害价值评估计算中,基于 WTP 法的评估方法能反映被测量人群的个人意愿和偏好,相对全面地反映由于疾病或过早死亡给个人带来的经济损失和痛苦等负效用. 人力资本法和 COI 法也被广泛应用于健康效应的经济学评价,但未能全面反映健康损害对人们造成的负效用和福利损失. 有可能低估疾病的经济学价值^[28]. 对此,研究在充分参考北京地区早逝与各种疾病成本的相关研究成果基础上,对潜在居民健康损失的经济成本分别进行高、中、低这 3 个层次的估值,这样可在一定程度上提高健康损害价值评估的可靠性. 本研究时段内北京市 PM_{2.5}高浓度污染所造成的健康经济损失高达4.89(95% CI: 2.04~7.49) 亿元. 早逝占的经济损失最大,其次是哮喘和急性支气管炎的发病,心血管疾病和呼吸系统疾病住院.

研究时段主城区空气污染程度要明显高于郊区,导致位于北京市中心的6个城区的急性死亡和患病人数占到健康受损害总人数的60.2%.其中,居民健康受损害人数最多的3个区依次分别是朝阳、海淀和丰台.经比较,通州、大兴、石景山和房山这4个区的健康风险较高,延庆、昌平、密云和怀柔这4个区的健康风险则明显低于其他区.因此,相对于北部地区,这次空气重污染事件对北京市南部地区居民健康影响较大.

4 建议

在空气重污染期间,即便高浓度的大气污染物暴露持续短短几日,也会导致大多数受影响居民出现不同程度的喉痛、咳嗽、呼吸困难等呼吸系统疾病症状,并可能诱使更多人罹患或加重急性支气管炎、心血管疾病、肺癌等,甚至可能导致敏感人群的急性死亡,由此造成严重的居民健康损害和经济损失.空气重污染将给相关疾病患者特别是低保家庭带来较大的财务压力.老人、小孩以及心肺疾病患者是 PM,5污染的敏感人群.

(1)在重污染期间应针对退休老人和学龄前儿 童因污染患病就医和心肺病患者因病情加重急诊就 医实行免费或补贴,这部分成本可通过设立重污染 日敏感人群应急医疗补助专项资金并纳入现行的应 急方案来解决.同时,也可为建立与空气污染相关 的居民健康调查统计体系以及开展相关课题研究提 供间接支持.

- (2)针对重污染期间对人群造成的严重健康经济损失,建议对于重污染天气要尽可能提前预报和预防,在重污染期间除继续加大污染物减排力度之外,还要在重污染日发生前3日或1周内就要采取各种措施大幅削减主要大气污染物的排放,以此预防或缓解不利天气条件下大气污染物的累积,尽可能降低影响居民健康的污染暴露水平,最大限度地减少受影响人群规模及发病人数.
- (3)机动车、燃煤、工业污染和扬尘是北京市大气污染的主要来源. 北京 2012 年末常住人口已经超过2 000万,到 2015 年常住人口将达到2 300万;机动车保有量目前已达 520 万辆,每年 50 亿人次乘坐公共交通出行;全市燃煤总量保持在2 300万 t,汽柴油消费总量达到 630 万 t;全市建筑施工面积仍高达 1.9 亿 m²,这些使得全市污染物排放总量持续居高不下. 因此可以基本肯定的是,如果还出现类似不利天气条件,极有可能再次发生空气重污染事件. 因此考虑到未来短期内无法实现全年特别是冬季污染物大幅度减排的情况下,应进一步完善针对空气重污染日的健康预警、应急医疗和健康防护措施,最大程度地降低由于空气污染造成的居民健康危害和损失.

5 结论

- (1)研究时段内北京市急性人群健康风险显著增大,常住居民中受影响病例约为43 553例(95% CI:24 766~57 332),即北京目前2 000多万常住人口中,每1 000人中就有 2~3 人的健康遭受急性损害. 其中,突发死亡 201 例,因突发呼吸系统和心血管疾病住院分别为1 056例和 545 例,儿科和内科门诊分别为7 094例和16 881例,急性支气管炎和哮喘发病分别为10 132例和7 643例.
- (2)研究时段内因高浓度 $PM_{2.5}$ 暴露导致的居民健康损害价值总计近 5 亿元,约占北京市 2012 年 GDP 的 0.275% (95% CI:0.140% ~ 0.395%). 早逝与急性支气管炎、哮喘是健康损失的主要来源,三者占总损失的 90% 以上.
- (3)高浓度 PM_{2.5}重污染期间可能导致内科门 诊量和急性支气管炎的患病人数激增,哮喘发病人 数和儿科门诊量也会有大幅增加,短期内会对全市

主要医疗机构造成较大压力.对此,建议加大社区 医疗单位的应急能力建设和事前准备,不仅可以降 低重污染期间全市主要医疗单位的门诊压力,而且 可加快对老人、儿童等需要协助就医的易感人群的 医疗处置,减少居民患病就医的交通出行量和距离, 进一步提高重污染期间医疗应急和健康防护的总体 效果.

参考文献:

- [1] 张庆丰, 罗伯特·克鲁特斯. 迈向环境可持续的未来——中华人民共和国国家环境分析[M]. 北京: 中国财政经济出版社, 2012.45-48.
- [2] 宫克. 世界八大公害事件与绿色 GDP[J]. 沈阳大学学报, 2005, 17(4): 3-6, 11.
- [3] Cohrssen J J, Covello V T. Risk analysis: a guide to principles and methods for analyzing health and environmental risks [M]. DIANE Publishing, 1999.
- [4] Gianicolo E A L, Bruni A, Mangia C, et al. Acute effects of urban and industrial pollution in a government-designated "Environmental risk area"; the case of Brindisi, Italy [J]. International Journal of Environmental Health Research, 2013, 23(1); 1-15.
- [5] Seaton A, Godden D, MacNee W, et al. Particulate air pollution and acute health effects [J]. The Lancet, 1995, 345 (8943): 176-178.
- [6] Pope C A, Dockery D W. Acute health effects of PM₁₀ pollution on symptomatic and asymptomatic children [J]. American Journal of Respiratory and Critical Care Medicine, 1992, 145 (5): 1123-1128.
- [7] 杨敏娟,潘小川.北京市大气污染与居民心脑血管疾病死亡的时间序列分析[J].环境与健康杂志,2008,25(4):294-
- [8] 谢鹏, 刘晓云, 刘兆荣, 等. 我国人群大气颗粒物污染暴露-反应关系的研究[J]. 中国环境科学, 2009, **29**(10): 1034-1040.
- [9] Huang W, Cao J J, Tao Y B, et al. Seasonal variation of chemical species associated with short-term mortality effects of PM_{2.5} in Xi'an, a Central City in China [J]. American Journal of Epidemiology, 2012, 175(6): 556-566.
- [10] Zhang M S, Song Y, Cai X H, et al. Economic assessment of the health effects related to particulate matter pollution in 111 Chinese cities by using economic burden of disease analysis [J]. Journal of Environmental Management, 2008, 88(4): 947-954.
- [11] 陈仁杰, 陈秉衡, 阚海东. 我国 113 个城市大气颗粒物污染的健康经济学评价[J]. 中国环境科学, 2010, **30**(3): 410-415.
- [12] Hou Q, An X Q, Wang Y, et al. An assessment of China's PM₁₀-related health economic losses in 2009 [J]. Science of the Total Environment, 2012, 435-436(1): 61-65.
- [13] 韩茜. 北京市大气污染物中可吸入颗粒物(PM₁₀)造成的健康损失研究——人力资本法实例研究[J]. 北方环境, 2011, **23**(11): 150-152.

- [14] 岳立,高新才,张钦智.西部城市大气污染支付意愿的实证分析——以兰州市为例[J]. 社科纵横,2010,25(9):15-18,39.
- [15] Wang H, Mullahy J. Willingness to pay for reducing fatal risk by improving air quality: a contingent valuation study in Chongqing, China [J]. Science of the Total Environment, 2006, 367(1): 50-57.
- [16] Wang H, He J. The Value of Statistical Life: A Contingent Investigation in China [EB/OL]. https://openknowledge. worldbank. org/handle/10986/3905, 2010-09-01.
- [17] Krupnick A, Hoffmann S, Qin P. The Willingness to Pay for Mortality Risk Reductions in China [A]. In: Fourth World Congress of Environmental Economists[C], Canada, 2010.
- [18] 李金香,邱启鸿,辛连忠,等.北京秋冬季空气严重污染的特征及成因分析[J].中国环境监测,2007,23(2):89-94.
- [19] Wang X P, Mauzerall D L. Evaluating impacts of air pollution in China on public health; implications for future air pollution and energy policies [J]. Atmospheric Environment, 2006, 40(9); 1706-1721.
- [20] 谢鹏, 刘晓云, 刘兆荣, 等. 珠江三角洲地区大气污染对人

- 群健康的影响[J]. 中国环境科学, 2010, 30(7): 997-1003.
- [21] 黄德生, 张世秋. 京津冀地区控制 PM_{2.5}污染的健康效益评估[J]. 中国环境科学, 2013, **33**(1): 166-174.
- [22] World Bank. Cost of pollution in China[R]. Washington D C, 2007.
- [23] 卫生部. 中国卫生统计年鉴[M]. 北京: 中国协和医科大学出版社, 2010.
- [24] He K, Lei Y, Pan X, *et al.* Co-benefits from energy policies in China [J]. Energy, 2010, **35**(11): 4265-4272.
- [25] 陈仁杰,陈秉衡,阚海东.上海市近地面臭氧污染的健康影响评价[J].中国环境科学,2010,30(5):603-608.
- [26] 曹滢, 陈元, 李莹, 等. 87 小时雾霾天气下的生活扫描[EB/OL]. http://news. xinhuanet. com/politics/2013-01/14/c_114356015. htm. 2013-01-14.
- [27] Aunan K, Pan X C. Exposure-response functions for health effects of ambient air pollution applicable for China-a metaanalysis [J]. Science of the Total Environment, 2004, 329(1): 3-16.
- [28] 陈晓兰. 大气颗粒物造成的健康损害价值评估[D]. 厦门: 厦门大学, 2008.

HUANJING KEXUE

Environmental Science (monthly)

Vol. 35 No. 1 Jan. 15, 2014

CONTENTS

As Assenced Partins of Water-Schale less in Play, and Changhai Mentation as a Generative Right and Exposure Design (IRS) James, W. W. West, W. W. Tamwer, et al. [1]. Second Variation of Water-Schale less in Play, and Changhai Mentation and Design of Water Schale less in Play, and Changhai Mentation [1]. A proceedings of the State of Manager of Changing (IRS) and In Second Variation [2]. A proceeding of Water Schale less in Play, and Changing (IRS) and In Second Variation [2]. A proceeding of Water Schale less in Play, and and Changing (IRS) and In Second Variation [2]. A proceeding of Water Schale less in Play, and and a proceeding of Water Schale less in Play, and a proceeding of Water In Variation of PURIO's from Markon Proceeding Comment Klim with Polescolary in the Schale less in Play, Nava (IRS), Wite-ling, ILS (IRS), Nava (IRS)	CONTENTS	
Samed Water-Saleh Lee in PN, 4 al Changlad Mentain ZIAO Yaram, WANG Yara, WA	An Assessment of PM _{2.5} Related Health Risks and Impaired Values of Beijing Residents in a Consecutive High-Level Exposure	During Heavy Haze Days
Variation of Almospheric Pariade Number Concentrations in Uniphos and Its Impact on visibility Concentration of ARDVIN in the Attemphore of College (17) and 18 Secondary Variation Characterization of ARDVIN in the Managebore of College (17) and 18 Secondary Variation Managebore Existion of APDVIN from Newton Processing General Secondary Variation ARDVIN in the ARDVIN in Secondary Variation Mealings (18) and the Secondary Variation of APDVIN in Managebore Existion of APDVIN in Managebore Existion of APDVIN in Managebore (18) and the Secondary Variation of		······ XIE Yuan-bo, CHEN Juan, LI Wei (1)
Concentration of PAIDPS in the Aumophor of Cheeping (five and In Secural Variation — 1211, PAID Kan-ling, GO 500) Annumbration of AUDPS from Security (with March 1914) Annumbration of AUDPS from March 1914 Protection of Patricks and Patricks (1914) Annumbration of AUDPS from March 1914 Protection for Patricks (1914) Annumbration of AUDPS from March 1914 Protection of Patricks and Patricks (1914) Annumbration of AUDPS from March 1914 Protection of Patricks and Patricks (1914) Annumbration of Audps from March 1914 Protection of Patricks and Patricks (1914) Annumbration of Audps from March 1914 Protection of Patricks (1914) Annumbration of Audps from March 1914 Protection of Patricks (1914) Annumbration of Audps from March 1914 Protection of March 1914		
Amespheze Ensision of PUDD-15 non Scoulary Alminium Menlangs Industry in the Sauthorst Aven, Clima (1802). Amespheze Ensision of PUDD-15 non Mode to Processing General Less with Perlanding in the Sauthorst Aven, Clima (1802). Published State and Characteristics of PUDD-15 in Industry and (1802). Published State and Characteristics of PUDD-15 in Industry and the England State and Characteristics of Published State and Published State in Industry and Control of Published State and Published State in Published State and Published State and Characteristics of Published Published Published Published Published Published Pub		
Amongheire Finishion of PURDET, from Modern Der Processing Control Kiln with Percentage in the Sauthuros Area, Giana TARAN Kinolog, III Y., JIAN Clause, et al. (§ 5)		
Pollution State and Characteristics of Pillick in Indoor. An of Hangdane Experience of Proceedings of Pillick in Indoor. An of Hangdane Experience Processing Place and Susseal Variations of Elevents in Northean of Schaum, Control China TON Naso-ning, 2010. How-year, 701. Cheerings, et al. (5) Minopheric Poposition Places and Susseal Variations of Elevents in Northean of Schaum, Control China TON Naso-ning, 2010. How-year, 701. Cheerings, et al. (5) We Inspection of Managheric Nations of the Indoor Waterhood in the Upper Hunjiang River WAM Jin-jee, 2414-NE Secong, WI Cham, et al. (7) We Inspection of Annual Processing Places and Company of the Common Composition of Academics Vision and Its States and Composition of Places (Hangdane) and Olg. Scheleus in Arabic Sail Experience of Hangdane Composition of Disorded Recent in the Video Sca and East China Sca. W. H. Wang, M. Wang, S. Will Yung, et al. (9) Conclusional Distribution of Disorded Recent in the Video Sca and East China Sca. W. W. Nicoland, S. Will Yung, et al. (10) Temporal-special Distribution of Disorded Recent in the Video Sca and East China Sca. W. W. Nicoland, S. Will Yung, et al. (10) Temporal-special Distribution and Disorder Scane in the Cycle Recent Scane and Composition of Disorder Composition of Disorder Recent in the Video Sca and East China Sca. MA Yingsaya, SHI Yun, (NI Yunwan, et al. (10) Temporal-special Distribution and Disorder Scane in the Cycle Recent Unpaired Composition of Tomogenic Composition of Nicoland Scane and Composition of Composition of Disorder Composition of Composition of Composition of Disorder Composition of Disorde		
See Destruition of Particle and Polycyclic Anomaic Hydrocarbos in Particle Emission from Smalated Emission Sources TON No. Sealing, 2010 Hospan, vol. 146, 167, 167, 167, 167, 167, 167, 167, 16		
Amougher's Poposition Phones and Secondal Variations of Elements in Northeast of Schums, Lentul China TUNK Xusoning, 2010, Han-yan, VOL Chercheng, et al. 55 Transl in Acid Disposition of Techniquing Conging During 2011/2019 YLD Position of Manage Posit		
Frend in Ariol Deposition at Tiechungira, Congage Baring 2001–2010 — "YU Dessings, MA Xian-vino, TAN Kinegungan, et al. (6) Chemical Compositions of n-Mikanois. Acada in Whata Stars and In Simale "URC Age, and the Congage Congression of the Congage C		
Wet Deposition of Austrage facility and Management for Eupstell Watersheet in the Upper Hugings River		
Central Compositions of a-Mannie Archis in Ward Store and Its Smake		
Magnete Properties of Indoor Destalla at Different Heights in Lardon Western Flance from Confete Consulted Forces Floric Cardon and CO, Release in Anabe Scil — M. Ming, W. M. Chingo, W. M. Stong, W. M. Chingo, W. M. M. Ming, W. M. Chingo, W. M. M. Marcoll, N. W. Landon, S. W. Land		
Mercuny Phones from Confice-Roundlerd Footsoche Heid in Central Subtropical Foots Zone Max Max, WANG Ding-yong, SHEN Yaun-yuan, ed. (83) Reported five Stams Birchart on Organic Carbon and CD, Release in Anable Scil Coecelemical Distribution of Dissolved Bissenth in the Yellow Sea and East Clinia Sca Temporal-spital Distribution and Pollution Assessment of Heavy Metals in the Upper Reaches of Hambe River (Qinguan Section), Northest Clinia Max Ving-quan, SHI Yao, Qin Yuawwan, ed. (108) Determination of Estopoguic Componels in Water of Jislong River Using Polar Organic Chemical Integrative Sumpler Max Ving-quan, SHI Yao, Qin Yuawwan, ed. (108) Determination of Estopoguic Componels in Water of Jislong River Using Polar Organic Chemical Integrative Sumpler Max Ving-quan, SHI Yao, Qin Yuawwan, ed. (108) Determination of Estopoguic Componels in Water of Jislong River Using Polar Organic Chemical Integrative Sumpler Max Ving-quan, SHI Yao, Qin Yuawwan, ed. (108) May Varintion Chametricis and Environmental Sumfacial Cardion in Kard Gomenhart var Cliffs (Max Such in Yako Niko Phane), LI Yoogay, ed. (117) Major Integrative Standard Statistics of Standard Standard Cardion Integrative Sumpler Taxo Cardion Standard Standard Standard Standard Standard Cardion Integrative Standard		
Impacts of Rice Stane Richart and Organic Carlou and O.J., Release in Analysis Sal — W. Winso-dan, 2008; Jines-ming, W. Dien, et al. (190). Temporal-spittal Bistillution of Bosolved Bismuth in the Yellow Sea and East China Sea — W. Winso-dan, 2008; Jines-ming, W. Dien, et al. (100). Temporal-spittal Bistillution and Pullifon Assessment of Heavy, Metals in the Upper Reaches of Hunbe Rivor (Qingxum Section), Northeast China — M. A. Yiney-m., 2014; M. Vines-m., et al. (110). Determination of Estrogenic Companies in Water of Jinkong Rivor Using Polar Organic Chemical Integrative Sampler — ZHANG Liepong, WAN (Norboug, 11 Norsyu, v. al. (117). Variation Characteristics and Environmental Significant of Trace Elements Under Rainfull Cardision in Kara Genorabater — CHEN Xue-Sin, YANG Ping-long, LAN Jine-dong, et al. (113). Porms and Spatial Distribution Characteristics of Nitrogen in Ziya River Raini Hilly Red Soil Earth Region of Central Saltropies — SUNG Li-Ling, WANG Vi, VI, Unleadin, et al. (151). Impact of River Agriculture on Nitrogen and Phosphorus in Kinete Schiences of the Viele Soc and the East China Sea — SUNG Li-Ling, WANG VI, VI, Unleadin, et al. (151). Characteristics and Department of Ropo-brown in Kinete Schiences of the Viele Soc and the East China Sea — SUNG Li-Ling, WANG VI, VI, Unleadin, et al. (152). Characteristics and Department of Ropo-Brown in Schience Schiences of River Schiences of the Viele Soc and the East China Sea — SUNG Wang-Jong, JUL Scene, JUL Schoen, et al. (163). Regression and Tumodermation of the North-EUTA Extracts for Solution Science Schiences (WIE) of the Tumodermation of Ropo-Porn is Superbook Solid Under South-tense Schiences Department Department Schiences — WU Xiao-Gin, JUL Scote, and (164). See Schiences in March Lie Schiences of River Schiences of the Horsy Metals Source Analysis of Organic Posphorus Removal by General Estatuation Sciences — All Ling, J. Elbo, Wang Schiences, and July Schiences and Department of Soluty Schiences and Department Schiences and Department Schi		
Geochemical Destribution of Desired Sistenth in the Vellow Sea and East Clinus Se. Temporal-spatial Distribution and Pollution Assessment of Heavy Metals in the Upper Reaches of Humbe River (Qingsum Section), Nontreast Clinus MA Ying-qua, SHI Yao, QiN Yan-wen, et al. (183) Determination of Estospenic Compounds in Water of Judings River Using Polar Organic Chemical Integrative Sample MA Ying-qua, SHI Yao, QiN Yan-wen, et al. (183) Major Incomenstry of Surface Water in the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water in the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water in the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water in the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water in the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water in the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water in the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water in the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water In the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water In the Xilin River Basin and the Possible Controls Take Chemistry of Surface Water In the Xilin River Basin Andrews Surface Analysis of Organic Possphorus in River Schiments Material Take Case Surface Possible Chemistry of Surface Possible Chemistry Surface Possphorus in River Schiments EllaNOW West-quing, SHAN Bas-quing, ZHANG Rose Integration and Timedermation of BAIP in Suspended Solids Under Short-term Sediment Designer Possphorus in River Sediments EllaNOW West-quing, SHAN Bas-quing, ZHANG Rose Integrate Revolution of Bail Pain Suspended Solids Under Short-term Sediment Designer Possphorus in River Sediments EllaNow West-quing, SHAN Bas-quing, ZHANG Rose Integrate Revolution and Timedermation of BAIP in Suspended Solids Under Short-term Sediment Designer Revolution and Timedermation of BAIP in S		
Temporal-spatial Distritation and Pollution Assessment of Heavy Metals in the Lipper Reaches of Humbe River (Jugopuan Section), Northeant China MA Ying, equa, SHI Yao, QHN Yan-owen, et al. (108) Determination of Entrogenic Compounds in Water of Jialong River Using Polar Organic Chemical Integrative Sampler ZHANG Use-Jon, YANO Ping-beng, JAM Jis-cheng, et al. (123) Major loo Comesty's Oxfunce Water in the Kilm River Riss and the Possible Controls TANO New-Jon, YANO Ping-beng, JAM Jis-cheng, et al. (123) Forms and Spatial Distribution Characteristics of Ninogen in Zya River Riss Talk Oxv., SHAN Bas-rijne, ZHANG Wev-rijnag, et al. (131) Forms and Spatial Distribution Characteristics of Ninogen in Zya River Riss Talk Oxv., SHAN Bas-rijne, ZHANG Wev-rijnag, et al. (143) Study on Distribution of Pinsphoras in Surface Soliments of the Yellow Sea and the East China Sea SONG Gas-Solong, JU St-new, ZHANG Goo-ling (157) Characteristics and Optimization of the North-EDIT Extracts for Solution 372-NMR Analysis of Organic Pinsphoras in River Soliments ZHANG Wev-rijnag, SHAN Bas-rijne, ZHANG Houg, et al. (163) Regeneration and Tinasformation of BAPP in Suspended Solids Under Stort-term Sediment Disturbance ZHANG Wev-rijnag, SHANG Bas-rijne, ZHANG Houg, et al. (163) Regeneration and Tinasformation of BAPP in Suspended Solids Under Stort-term Sediment Disturbance ZHANG Wev-rijnag, SHANG Bas-rijne, ZHANG Houg, et al. (163) Regeneration and Tinasformation of BAPP in Suspended Solids Under Stort-term Sediment Disturbance ZHANG Wev-rijnag, SHANG Bas-rijne, ZHANG Houg, et al. (163) Regeneration and Tinasformation of BAPP in Suspended Solids Under Stort-term Sediment Disturbance ZHANG Wev-rijnag, SHANG Bas-rijne, ZHANG Houg, et al. (163) Study on the Stages of Major Sediments in Diameli Lake SHANG Men-rijne, GU Xiao-bing, et al. (202) Study on the Stages of Major Sediments in Diameli Lake WANG Xian-Lip Lip Bay, Water Sediment Sediment Sediment Solids Solids Solids Solids Solids Solids Solids Solids Solids Sol		
MA Ying-quin. SHI Yao, QNY Yan-wen, et al. (108) Determination of Estrogenic Compounds in Water of Judong River Using Polar Organic Commical Integrative Sampler ZHANG Li-peng, WANG Yai-Don, et al. (117) Variation Characteristics and Environmental Significant of Tarce Elements Under Rainfall Condition in Kanet Gonzalvater CHEN Yau-Bin, YAMC Ping-berng, LAN Jucheng, et al. (123) Major Ino Chemistry of Surface Water in the Xliin River Bosin and the Possible Controls TANG Xi-wen, WU Lin-kii, Xi W. Li-yang, et al. (131) Impact of Rice Agriculture on Xivogen and Phosphoras Exports in Streams in Hilly Red Sul Earth Region of Central Subropies SONG Li-lang, WANG Yi, WU Lin-shair, et al. (150) Suby on Distribution and Optimization of the North-EDTA Extracts for Sultino 219-Possible State State Subra on Distribution and Optimization of the North-EDTA Extracts for Sultino 219-Possible State State Subra on Distribution and Optimization of the North-EDTA Extracts for Sultino 219-Possible State State Subra on Distribution and Optimization of the North-EDTA Extracts for Sultino 219-Possible State State Subra on Distribution and Optimization of the North-EDTA Extracts for Sultino 219-Possible State State Subra on Distribution and Optimization of the North-EDTA Extracts for Sultino 219-Possible State State Subra on Sultino 219-Possible State State Subra on Subra of Subra on Subra on Sultino 219-Possible State State Subra on Subra of Subra on Subra on Subra of Subra on Subra of Subra on Subra of Subra on Subra on Subra of Subra on Subra on Subra of Subra on Subra on Subra of Subra on	Geochemical Distribution of Dissolved Bismuth in the Yellow Sea and East China Sea	WU Xiao-dan, SONG Jin-ming, WU Bin, et al. (100)
Determination of Enterportic compounds in Water of Indong River Using Padar Organic Coemical Integrative Sampler ————————————————————————————————————	Temporal-spatial Distribution and Pollution Assessment of Heavy Metals in the Upper Reaches of Hunhe River (Qingyuan Section	on), Northeast China
Narieto Chemistry of Surface Water in the Xillin River Rasin and the Possible Controls TANG X-was May Surface Water in the Xillin River Rasin and the Possible Controls TANG X-was Willinskin, XUE Liyang, et al. (133) Homest of Rice Agriculture on Nitrogen and Phosphorus Exports in Streams in Hilly Red Sul Earth Region of Central Sultropies SONG Li-fang, WANG Yi, WU Jin-shui, et al. (135) Impact of Rice Agriculture on Nitrogen and Phosphorus Exports in Streams in Hilly Red Sul Earth Region of Central Sultropies SONG Gas-dong, JUL Sx-newi, 2HANG Goo-ling (157) Characterization and Optimization of the NaOH-EDTA Extracts for Solution 31 P-NMR Analysis of Organic Phosphorus in River Sediments WU Xiao-Fei, JU Depeng, WAMC Ming (171) Sediment Risk Assessment and Heavy Metal Scarce Analysis in Typical Country Water Level Fluctuated Zuee (WILF2) of the Three Googs. WU Xiao-Fei, JU Depeng, WAMC Ming (171) Sediment Risk Assessment and Peterstal Ecological Risk Assessment of Heavy Metals in Sediments from the Different Eastern Deciging Regions of Late. Tailur. MAO Zhi-gang, GU Xiao-Jong, LU Xiao-ming, et al. (185) Study on the Stages of Major Sediments in Darachi Lake MAO Zhi-gang, GU Xiao-Jong, LU Xiao-ming, et al. (186) Study on the Stages of Major Sediments in Darachi Lake MAO Zhi-gang, GU Xiao-Jong, LU Xiao-ming, et al. (202) Treatment of Shudge Lispace Produced in Deep Delephraticolop Synchronous-Matrix-Fluorescence Spectra WANC Chans, SMI Xiao-Geng, LU Waso-ming, et al. (202) Treatment of Shudge Lispace Produced in Deep Delephraticolop Synchronous-Matrix-Fluorescence Spectra WANC Xiao-Ji, WANC Shi-feng, WU Jan-Feng, et al. (202) Treatment of Shudge Lispace Produced in Deep Delephraticolop Synchronous-Matrix-Fluorescence Spectra WANC Xiao-Ji, WANC Shi-feng, WU Jan-Feng, et al. (202) Treatment of Shudge Lispace Produced in Deep Delephraticolop Synchronous-Matrix-Fluorescence Spectra WANC Xiao-Ji, WANC Shi-feng, WU Jan-Feng, et al. (202) Treatment of Shudge Lispace Produced in Deep Delephraticolop Synchronous-Matrix-Flu		MA Ying-qun, SHI Yao, QIN Yan-wen, et al. (108)
Forms and Spatial Distribution Characteristics of Nitrogen in Zya River Basin and the Possible Cantrals ZHAO Yu., SHAN Baso-qing, ZHANG Wen-qiang, et al. (131)	Determination of Estrogenic Compounds in Water of Jiulong River Using Polar Organic Chemical Integrative Sampler	······· ZHANG Li-peng, WANG Xin-hong, LI Yong-yu, et al. (117)
Forms and Spatial Distribution Characteristics of Nitrogen in Ziya River Resin — ZHAO Yu, SHAN Bao-qing, ZHANG Wen-qiang, et al. (143) Impact of Rice Agriculture on Nitrogen and Phosphoran Exports in Streams in Hilly Red Soil Earth Region of Central Subtropies — SONG Li-fang, WANG Ti, WU Jin-shai, et al. (150) Characterization and Optimization of the NoDH-EDTA Extracts for Solution 3 ¹ P-NMR Analysis of Organic Phosphorans in River Sediments — WU Xiao-fei, Li Dapeng, WANG Ming (157) Characterization and Optimization of the NoDH-EDTA Extracts for Solution 3 ¹ P-NMR Analysis of Organic Phosphorans in River Sediments — WU Xiao-fei, Li Dapeng, WANG Ming (171) Sediment Risk Assessment and Heavy Metal Source Analysis in Typical Country Water Level Fluctuated Zone (WLPZ) of the Turne Congs. — AO Liang, LEI Bo, WANG Ye-chum, et al. (179) Pollution Distribution and Potential Ecological Risk Assessment of Heavy Metals in Sediments from the Different Eastern Dredging Regions of a lake Tailu. — MAO Zhi-gang, GU Xiao-bang, LU Xiao-ming, et al. (186) Study on the Stages of Major Sediments in Danchi Lake — WANG Xiao-yao, ZiliO Feng, Yi Xiao, et al. (194) Oil Spill Healthfording Lisage Fraing Method Based on Concentration-Synchronous-Martir-Pluorescence Spectra. — WANG Xiao-yao, ZiliO Feng, Yi Xiao, et al. (202) Treatment of Sludge Liquor Produced in Deep Dehydration by Photoelectro-Fenton Process — WANG Xiao-lii, WANG Shi-feng, WU Jun-feng, et al. (202) Treatment of Sludge Liquor Produced in Deep Dehydration by Photoelectro-Fenton Process — WANG Xiao-lii, WANG Shi-feng, WU Jun-feng, et al. (202) Compositions and Residual Properties of Petroleum Hydrocarbon in Contaminated Sail of the Oilfields — SIN Hun-gave, in Clu Ping, PEAC Yorg-fene Liquor Study on Long-Term Salahily of Robogola Pixoge Pixogen Salahila Shipping Liquor Salahila Shipping Liquor Salahila Shipping Liquor Liquor in Vivo Kinds of Clay Minester Salahila Shipping Liquor Salahila Shipping Liquor Salahila Shipping Liquor Salahila Shipping Liquor Salahila Shipping L		
Impact of Rice Agriculture on Nitrogen and Phosphorus Exports in Stemas in Hilly Red Sul Larth Region of Central Subtropies		
Sudy on Distribution of Phosphorus in Surface Sediments of the Yellow Sea and the East China Sea ZHANG Goo-long, LIU Su-meir, ZHANG Goo-ling (157) Characterization and Optimization of the NOH-EDTA Extracts for Solution ¹¹ P-NMR Analysis of Organic Phosphorus in River Sediments ZHANG Wen-qiang, SHAN Bao-qiag, ZHANG Hong, et al. (163) Regeneration and Transformation of BAPP in Suspended Solids Under Short-term Sediment Disturbance WU Xiao-fei, LI De-peng, WANG Ming (171) Pollution Distribution and Potential Ecological Risk Assessment of Heavy Medals in Sediments from the Different Eastern Dredging Regions of Lake Tailu MAO Zhi-gang, GU Xiao-bong, LU Xiao-bing, LU	Forms and Spatial Distribution Characteristics of Nitrogen in Ziya River Basin	······ ZHAO Yu, SHAN Bao-qing, ZHANG Wen-qiang, et al. (143)
Characterization and Optimization of the NuOH-EDTA Extracts for Solution 31 P-NMR Analysis of Organic Phosphorus in River Sediments		
ZHANG Wen-qiang, SHAN Boo-qing, ZHANG Hong, et al. (163) Seciment Risk Assessment and Heavy Metal Source Analysis in Typical Country Water Level Fluctuated Zane (WLFZ) of the Three Gorges —— AD Liang, LEI Bo, WANG Ver-chun, et al. (179) Publistion Distribution and Potential Ecological Risk Assessment and Heavy Metal Source Analysis in Typical Country Water Level Fluctuated Zane (WLFZ) of the Three Gorges —— AD Liang, LEI Bo, WANG Ver-chun, et al. (189) Publistion Distribution and Potential Ecological Risk Assessment of Heavy Metals in Sediments from the Different Eastern Deedging Regions of Lake Tailu —— MAO Zhi-gang, GU Xiao-bong, LU Xiao-ming, et al. (186) Study on the Stages of Major Sediments in Dianchi Lake ————————————————————————————————————		
Regeneration and Transformation of BAPP in Suspended Solids Under Stort-term Sediment Disturbance	Characterization and Optimization of the NaOH-EDTA Extracts for Solution 31P-NMR Analysis of Organic Phosphorus in River Solution 31P-NMR Analysis of Organic Phospho	sediments
Sediment Risk Assessment and Heavy Metal Source Analysis in Typical Country Water Level Fluctuated Zone (WIFZ) of the Three Gorges — AO Liang, IEI Bo, WANG Ye-chun, et al. (179) Pollution particular Distribution and Potential Ecological Risk Assessment of Heavy Metals in Sediments from the Different Eastern Deedging Regions of Lake Tailus — MAO Zhi-gang, GI Xiao-hong, LU Xiao-ming, et al. (186) Study on the Stages of Major Sediments in Dianchi Lake — WANG Xin-yu, ZHOU Feng, Yi Xuan, et al. (194) Oil Spaill Identification Using Partial Surface Fitting Method Based on Concentration-Synchronous-Matrix-Fluorescence Spectra — WANG Chun-yan, SHI Xiao-feng, LI Went-dong, et al. (202) Treatment of Studge Liquor Produced in Deep Dehydration by Photoelectro-Fenton Process — WANG Xin-yin, Zhi Xiao-feng, LI Went-dong, et al. (208) Characteristics of Nitrification and Denitrification for Simultaneous Nitrogen and Phosphorous Renoval by Granular Studge — IIU Xiao-ying, LIN Hui, MA Zhao-rui, et al. (214) Study on Long-Term Stability of Biological Nitrogen Renoval via Nitrite from Real Landfill Leachate — SUN Hong-wei, GUO Ying, PENG Yong-shen (221) Compositions and Residual Properties of Petroleum Hydrocarbon in Contaminated Sail of the Olifields — HU Di, LI Chaun, DONG Qian-qian, et al. (224) Dynamics of the Mineralization and Trans-Gornation of Rice Photosymbosical Carbon in Paddy Soils - a Batch Incubation Experiment — TAN Li-min, PENC Pei-qie, nt Lee Hung, et al. (233) Effects of Land Use and Abandonment on Soil Labile Organic Carbon in the Karst Region of Southwest China — Liao Hung, and Liao H		
Pollution Distribution and Potential Ecological Risk Assessment of Heavy Metals in Sediments from the Different Eastern Dredging Regions of Lake Tailuu MAO Zhi-gang, GU Xiao-bong, LU Xiao-bing, et al. (186) Study on the Stages of Major Sediments in Diamehi Lake	Regeneration and Transformation of BAPP in Suspended Solids Under Short-term Sediment Disturbance	WU Xiao-fei, LI Da-peng, WANG Ming (171)
Study on the Stages of Major Sediments in Dianchi Lake MAO Zhi-gang, GU Xiao-hong, LU Xiao-ming, et al. (186) Study on the Stages of Major Sediments in Dianchi Lake WANG Kin-yu, ZHOU Feng, YI Xuan, et al. (194) Old Spill Identification Using Partial Surface Fitting Method Based on Concentration-Synchronous-Matrix-Fluorescence Spectra WANG Chun-yan, SHI Xiao-Geng, LI Were-dong, et al. (202) Treatment of Studge Liquor Produced in Deep Dehydration by Photoelectro-Fenton Process WANG Xian-li, WANG Shi-feng, WU Jun-feng, et al. (208) Characteristics of Nirification and Denitrification for Simultaneous Nirogen and Phosphorus Removal by Ganular Studge LIU Xiao-ying, LIN Hui, MA Zhao-rui, et al. (214) Study on Long-Term Stability of Biological Nirogen Removal via Nirite from Real Landfill Leachate SUN Hong-wei, GUO Ying, PENG Yong-zhen (221) Compositions and Residual Properties of Petroleum Hydrocardon in Contaminated Soil of the Olifields SUN Hong-wei, GUO Ying, PENG Yong-zhen (221) Compositions and Residual Properties of Petroleum Hydrocardon in Contaminated Soil of the Olifields SUN Hong-wei, GUO Ying, PENG Yong-zhen (221) Compositions and Residual Properties of Petroleum Hydrocardon in readoly Soils - a Batch Incubation Experiment TAN Li-min, PENG Pei-qin, LI Ke-lin, et al. (227) Dynamics of the Mineralization and Transformation of Rice Photosynthesized Carbon in Paddy Soils - a Batch Incubation Experiment TAN Li-min, PENG Pei-qin, LI Ke-lin, et al. (224) Liffect of Cuf VI) Anions on the Cuf II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIAO Hong-kai, LI Juan, LIONG Jian, et al. (234) Liffect of Guf VI) Anions on the Cuf II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (234) Liffect of Guf VI) Anions on the Cuf II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (234) Liffect of Guf VI) Anions on th	Sediment Risk Assessment and Heavy Metal Source Analysis in Typical Country Water Level Fluctuated Zone (WLFZ) of the To	Three Gorges ····· AO Liang, LEI Bo, WANG Ye-chun, et al. (179)
Study on the Stages of Major Sediments in Dianchi Lake WANG Xin-yu, ZHOU Feng, YI Xuan, et al. (194) Oil Spill Identification Using Partial Surface Fitting Method Based on Concentration-Synchronous-Matrix-Fluorescence Spectra WANG Chun-yan, SHI Xiao-feng, LI Wendong, et al. (202) Treatment of Sludge Liquor Produced in Deep Dehydration by Photoelectro-Fenton Process WANG Xian-li, WANG Shi-feng, Ul Jun-feng, et al. (208) Characteristics of Nitrification and Dentification for Simultaneous Nitrogen and Phosphorus Removal by Granular Sludge LIU Xiao-jing, LIN Hui, Ma Zhao-rui, et al. (214) Study on Long-Term Stability of Biological Nitrogen Removal via Nitrite from Real Landfill Leachate SUN Hong-wei, GUO Ying, PENG Yong-zhen (221) Compositions and Residual Properties of Petroleum Hydrocarhon in Contaminated Soil of the Officids Huisting of the Mineralization and Transformation of Rice Photosynthesized Carbon in Paddy Soils - a Batch Incubation Experiment TAN Li-min, PENG Pei-qin, LI Ke-lin, et al. (233) Effects of Land Use and Abandonment on Soil Labile Organic Carbon in the Karst Region of Southwest China Liddon Hong-kai, Li Juan, LONG Jian, et al. (248) Alaminum Dissolution and Changes of pH in Soil Solution During Sorption of Copper by Aggregates of Paddy Soil XU Hai-bo, ZHAO Dao-yuan, QIN Chao, et al. (248) Effect of Cr. (VI) Anions on the Cut (II) Adsorption Behavior of Two Kinds of Caly Minerals in Single and Binary Solution LUI Juan-juan, LIANG Dong-li, Wi Xiao-long, et al. (224) Preliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG Ning-hong, ZHANG Cong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria JIANG Dong-sheng, SHI Xiao-rong, et al. (286) Influence of the Coexistence of Zn² on the Enantinescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn² on the Enantinescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (Pollution Distribution and Potential Ecological Risk Assessment of Heavy Metals in Sediments from the Different Eastern Dredgir	ng Regions of Lake Taihu ·····
Oil Spill Identification Using Partial Surface Fitting Method Based on Concentration-Synchronous-Matrix-Pluorescence Spectra WANG Chun-yan, SHI Xiao-feng, II Wen-dong, et al. (202) Treatment of Sludge Liquor Produced in Deep Dehydration by Photoelectro-Fenton Process WANG Xian-li, WANG Shi-feng, WU Jun-feng, et al. (208) Characteristics of Nitrification and Denitrification for Simultaneous Nitrogen and Phosphorus Removal by Granular Sludge LIU Xiao-ying, LIN Hui, MA Zhao-rui, et al. (214) Study on Long-Term Stability of Biological Nitrogen Removal via Nitrite from Real Landfill Leachate SUN Hong-wei, GUO Ying, PENG Yong-zhen (221) Compositions and Residual Properties of Petroleum Hydrocarhon in Contaminated Soil of the Oilfields HU Di, II Chuan, DONG Qian-qian, et al. (227) Dynamics of the Mineralization and Transformation of Rice Photosynthesized Carbon in Paddy Soils - a Batch Incubation Experiment TAN Li-min, PENG Pei-qin, II Ke-lin, et al. (233) Effects of Land Use and Abandonment on Soil Labilo Organic Carbon in the Karrs Region of Southwest China LIL JAD Hong-kai, IJ Juan, LONG Jian, et al. (248) Aluminum Dissolution and Changes of pH in Soil Solution During Sorption of Copper by Aggregates of Paddy Soil XU Hai-bo, ZHAO Boa-yuan, QIN Chao, et al. (248) Effect of Gr (VI) Anions on the Cut (II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (254) Effect of Flooding Time Length on Mycorrhizal Colonization of Three Aff Puning in Two Wetland Plants MA Lei-meng, WANG Peng-teng, WANG Peng-teng, WANG Shu-guang (263) Preliminary Study on the Relationship Between the Water Quality Criteria JIANG Dong-sheng, SHI Xiao-rong, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Laminescent Bacteria JIANG Dong-sheng, SHI Xiao-rong, CUI Yi-bin, et al. (279) Evaluation of Biotic Ligand Model and Evaluation of Predicted Results HAU Gran, JANG Fan, MU Yu-feng, et al. (286) Influence of the Co		······· MAO Zhi-gang, GU Xiao-hong, LU Xiao-ming, et al. (186)
Treatment of Sludge Liquor Produced in Deep Dehydration by Photoelectro-Fenton Process WANG Xian-li, WANG Shi-feng, WU Jun-feng, et al. (208) Characteristics of Nitification and Dentification for Simultaneous Nitrogen and Phosphorus Removal by Granular Sludge LIU Xiao-ping, LIN Hui, Ma Zhao-mi, et al. (214) Study on Long-Term Stability of Biological Nitrogen Removal via Nitrite from Real Landfill Leachate SUN Hong-wei, GUO Ying, PENG Yong-zhen (221) Compositions and Residual Properties of Petroleum Hydrocarbon in Contaminated Soil of the Oilfields HIU Bi, LI Chuan, DONG Qian-qian, et al. (227) Dynamics of the Mineralization and Transformation of Rice Photosynthesized Carbon in Paddy Soils - a Batch Incubation Experiment TAN Li-min, PENG Pei-qin, LI Ke-lin, et al. (233) Effects of Land Use and Abandonment on Soil Labile Organic Carbon in the Karst Region of Southwest China LIAO Hong-kai, IJ Juan, LONG Jian, et al. (240) Aluminum Dissolution and Changes of pH in Soil Solution During Sorption of Copper by Aggregates of Paddy Soil XU Hai-bo, ZHAO Dao-yuan, QIN Chao, et al. (248) Effect of Crf VI) Anions on the Cuf [I] Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIU Juan-juan, LIANG Dong-li, WU Kiao-long, et al. (254) Effect of Flooding Time Length on Myoorrhizal Colonization of Three AM Fungi in Two Wetland Plants MA Lei-meng, WANG Peng-leng, WANG Shu-guang (263) Preliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG Ning-bong, ZHANG Yong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria LILA Dong-sheng, SHI Xiao-mag, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Darmaceutical Wastewater to Luminescent Bacteria DI Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn ^{2-r} on the Enantioselective Toxicity of Metolachlor to Scenedesmus obliquus WANG Wan-bin, CHEN Sha, WU Yu-feng, et al. (
Characteristics of Nitrification and Denitrification for Simultaneous Nitrogen and Phosphorus Removal by Gramular Studge LIU Xiao-ying, LIN Hui, MA Zhao-rui, et al. (214) Study on Long-Term Stability of Biological Nitrogen Removal via Nitrite from Real Landfill Leachate SUN Hong-wei, CUO Ying, PENG Yong-zhen (221) Compositions and Residual Properties of Petroleum Hydrocarbon in Contaminated Soil of the Oilfields HU Di, LI Chuan, DONG Qian-qian, et al. (227) Dynamics of the Mineralization and Transformation of Rice Photosynthesized Carbon in Paddy Soils - a Batch Incubation Experiment TAN Li-min, PENG Pei-qin, LI Ke-lin, et al. (233) Effects of Land Use and Abandomment on Soil Labile Organic Carbon in the Karst Region of Southwest China LIAO Hong-kai, LI Juan, LINGO Dao-yuan, QIN Chao, et al. (240) Aluminum Dissolution and Changes of pH in Soil Solution During Sorption of Copper by Aggregates of Paddy Soil XU Hai-bo, ZHAO Dao-yuan, QIN Chao, et al. (248) Effect of Cr (VI) Anions on the Cu(II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (254) Effect of Flooding Time Length on Mycorrhizal Colonization of Three AM Fungi in Two Wetland Plants Peliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG King-hong, ZHANG Yong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria JIANG Dong-sheng, SHI Niao-nong, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn ² on the Enantioselective Toxicity of Metolachlor to Senedesmus obliquus WANG Wan-bin, CHEN Gai-dong, et al. (292) Simplification of Boite Ligand Model and Evaluation of Predicted Results Wang Alanching and Screening of Coke Industry based on USElox Model HAO Tian, DU Peng-fei, DU Bin, et		
Study on Long-Term Stability of Biological Nitrogen Removal via Nitrite from Real Landfill Leachate SUN Hong-wei, GUO Ying, PENG Yong-zhen (221) Compositions and Residual Properties of Petroleum Hydrocarbon in Contaminated Soil of the Oilfields HU Di, IL Chuan, DONG Qian-qian, et al. (223) Dynamics of the Mineralization and Transformation of Rice Photosymthesized Carbon in Paddy Soils - a Batch Incubation Experiment TAN Li-min, PENG Pei-qin, Li Ke-lin, et al. (223) Effects of Land Use and Abandonment on Soil Labile Organic Carbon in the Karst Region of Southwest China LIAO Hong-kai, LJ Juan, LONG Jian, et al. (240) Aluminum Dissolution and Changes of pH in Soil Solution During Sorption of Copper by Aggregates of Paddy Soil XU Hai-bo, ZHAO Dao-yuan, QIN Chao, et al. (248) Effect of Cr (VI) Anions on the Cu (II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (254) Effect of Flooding Time Length on Mycorrhizal Colonization of Three AM Fungi in Two Wetland Plants MA Lei-meng, WANG Peng-teng, WANG Shu-yaung (263) Preliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG Ning-bong, ZHANG Yong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria JIANG Dong-sheng, SHI Xiao-rong, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn ^{2+*} on the Enantisoselective Toxicity of Metolachlor to Scenedesmus obliquus HU Xiao-na, ZHANG Shu-rian, CHEN Sha, WU Min, et al. (299) Simplification of Biotic Ligand Model and Evaluation of Predicted Results WANG Wan-bin, CHEN Sha, WU Min, et al. (299) Simplification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (313) Inhibition of the Acti		
Compositions and Residual Properties of Petroleum Hydrocarbon in Contaminated Soil of the Oilfields Pynamics of the Mineralization and Transformation of Rice Photosynthesized Carbon in Paddy Soils - a Batch Incubation Experiment TAN Li-min, PENG Pei-qin, Li Ke-lin, et al. (233) Effects of Land Use and Abandonment on Soil Labile Organic Carbon in the Karst Region of Southwest China LIAO Hong-kai, Li Juan, LONG Jian, et al. (240) Aluminum Dissolution and Changes of pH in Soil Solution During Sorption of Copper by Aggregates of Paddy Soil KU Hai-bo, ZHAO Dao-yuan, QIN Chao, et al. (248) Effect of Cr (W) Anions on the Cu (II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution ILU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (254) Effect of Flooding Time Length on Mycorrhizal Colonization of Three AM Fungi in Two Welland Plants MA Lei-meng, WANG Peng-leng, WANG Shu-guang (263) Preliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG Ning-hong, ZHANG Yong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria IlaNG Dong-sheng, SHI Xiao-roag, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn ²⁺ on the Enantioselective Toxicity of Metolachlor to Scenedesmus obliquus Hu Xiao-na, ZHANG Shu-xian, CHEN Cai-dong, et al. (292) Simplification of Boite Ligand Model and Evaluation of Predicted Results Wang Wan-bin, CHEN Sha, WU Min, et al. (292) Priority Pollutants Ranking and Screening of Coke Industry based on USEtox Model HAO Tian, DU Peng-fei, DU Bin, et al. (304) Isolation, Identification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) Inhibition of the Activity of Suldate-reducing Bacteria in Produced W		
Dynamics of the Mineralization and Transformation of Rice Photosynthesized Carbon in Paddy Soils - a Batch Incubation Experiment TAN Li-min, PENG Pei-qin, Li Ke-lin, et al. (233) Effects of Land Use and Abandomment on Soil Labile Organic Carbon in the Karst Region of Southwest China LiAO Hong-kai, Li Juan, LiONG Jian, et al. (240) Aluminum Dissolution and Changes of pH in Soil Solution During Sorption of Copper by Aggregates of Paddy Soil XU Hai-bo, ZHAO Dao-yuan, QIN Chao, et al. (248) Effect of Cr (VI) Anions on the Cu (II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (254) Effect of Flooding Time Length on Mycorrhizal Colonization of Three AM Fungi in Two Wetland Plants MA Lei-meng, WANG Peng-teng, WANG Shu-guang (263) Preliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG Ning-hong, ZHANG Yong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria JIANG Dong-sheng, SHI Xiao-rong, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria DU Li-na, YANG Fan, Mu Yu-feng, et al. (286) Influence of the Coexistence of Za ²⁺ on the Enantioselective Toxicity of Metolachlor to Scenedesmus obliquus HU Xiao-na, ZHANG Shu-xian, CHEN Cai-dong, et al. (299) Priority Pollutants Ranking and Screening of Coke Industry based on USEtox Model HAO Tian, DU Peng-fei, DU Bin, et al. (304) Isolation, Identification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate YANG De-yu, ZHANG Ving, SHI Rong-jiu, et al. (319) Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains Wu Jum-mei, MAA An-zhou, CJI Meng-meng,		
Effects of Land Use and Abandonment on Soil Labile Organic Carbon in the Karst Region of Southwest China LIAO Hong-kai, LI Juan, LONG Jian, et al. (240) Aluminum Dissolution and Changes of pH in Soil Solution During Sorption of Copper by Aggregates of Paddy Soil XU Hai-bo, ZHAO Dao-yuan, QIN Chao, et al. (248) Effect of Cr(VI) Anions on the Cu (II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (254) Effect of Flooding Time Length on Mycorrhizal Colonization of Three AM Fungi in Two Wetland Plants MA Lei-meng, WANG Peng-teng, WANG Shu-guang (263) Preliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG Ning-hong, ZHANG Yong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria JIANG Dong-sheng, Sfll Xiao-rong, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn ²⁺ on the Enantioselective Toxicity of Metolachlor to Scenedesmus obliquus HU Xiao-na, ZHANG Shu-xian, CHEN Cai-dong, et al. (292) Simplification of Biotic Ligand Model and Evaluation of Predicted Results WANG Wan-bin, CHEN Sha, WU Min, et al. (299) Priority Pollutants Ranking and Screening of Coke Industry based on USElox Model WANG Wan-bin, CHEN Sha, WU Min, et al. (304) Isolation, Identification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains WU Jun-mei, MA An-zhou, CU Meng-meng, et al. (327) Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) Study on the Distinguishing of Root Respiration from		
Aluminum Dissolution and Changes of pH in Soil Solution During Sorption of Copper by Aggregates of Paddy Soil		
Effect of Cr(VI) Anions on the Cu(II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution LIU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (254) Effect of Flooding Time Length on Mycorrhizal Colonization of Three AM Fungi in Two Wetland Plants MA Lei-meng, WANG Peng-teng, WANG Shu-guang (263) Preliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG Ning-hong, ZHANG Yong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria JIANG Dong-sheng, SHI Xiao-rong, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn² + on the Enantioselective Toxicity of Metolachlor to Scenedesmus obliquus Simplification of Biotic Ligand Model and Evaluation of Predicted Results WANG Wan-bin, CHEN Sha, WU Min, et al. (299) Priority Pollutants Ranking and Screening of Coke Industry based on USEtox Model HAO Tian, DU Peng-fei, DU Bin, et al. (304) Isolation, Identification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (327) Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, China Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, Wu Rong-jun, et al. (384) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, Jamese Deng, et al. (365) Fe-ZSM-5 Catalysts with Different Silica-Al		
Effect of Flooding Time Length on Mycorrhizal Colonization of Three AM Fungi in Two Wetland Plants MA Lei-meng, WANG Peng-teng, WANG Shu-guang (263) Preliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG Ning-hong, ZHANG Yong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria JIANG Dong-sheng, SHI Xiao-rong, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn² + on the Enantioselective Toxicity of Metolachlor to Scenedesmus obliquus HU Xiao-na, ZHANG Shu-xian, CHEN Sha, WU Min, et al. (292) Simplification of Biotic Ligand Model and Evaluation of Predicted Results WANG Wan-bin, CHEN Sha, WU Min, et al. (299) Priority Pollutants Ranking and Screening of Coke Industry based on USEtox Model HAO Tian, DU Peng-fei, DU Bin, et al. (304) Isolation, Identification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (336) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-dong, et al. (386) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI		
Preliminary Study on the Relationship Between the Water Quality and the Aquatic Biological Health Status of Taihu Lake ZHOU Xiao-bai, ZHANG Ning-hong, ZHANG Yong, et al. (271) Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria JIANG Dong-sheng, SHI Xiao-rong, CUI Yi-bin, et al. (279) Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn² + on the Enantioselective Toxicity of Metolachlor to Scenedesmus obliquus HU Xiao-na, ZHANG Shu-xian, CHEN Cai-dong, et al. (292) Simplification of Biotic Ligand Model and Evaluation of Predicted Results WANG Wan-bin, CHEN Sha, WU Min, et al. (299) Priority Pollutants Ranking and Screening of Coke Industry based on USEtox Model HAO Tian, DU Peng-fei, DU Bin, et al. (304) Isolation, Identification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (327) Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, China Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-dong, et al. (365) Electricity Generation of Ch	Effect of Cr(VI) Anions on the Cu(II) Adsorption Behavior of Two Kinds of Clay Minerals in Single and Binary Solution	LIU Juan-juan, LIANG Dong-li, WU Xiao-long, et al. (254)
Acute Toxicity of Three Typical Pollutants to Aquatic Organisms and Their Water Quality Criteria Fixuluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria DU Li-na, YANG Fan, MU Yu-feng, et al. (286) Influence of the Coexistence of Zn²+ on the Enantioselective Toxicity of Metolachlor to Scenedesmus obliquus HU Xiao-na, ZHANG Shu-xian, CHEN Cai-dong, et al. (292) Simplification of Biotic Ligand Model and Evaluation of Predicted Results WANG Wan-bin, CHEN Sha, WU Min, et al. (299) Priority Pollutants Ranking and Screening of Coke Industry based on USEtox Model HAO Tian, DU Peng-fei, DU Bin, et al. (304) Isolation, Identification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, China Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (365) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N ₂ O Catalytic Decomposition LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371) Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration	Effect of Flooding Time Length on Mycorrhizal Colonization of Three AM Fungi in Two Wetland Plants	MA Lei-meng, WANG Peng-teng, WANG Shu-guang (263)
Evaluation of the Acute Toxicity of Pharmaceutical Wastewater to Luminescent Bacteria		
Influence of the Coexistence of Zn ²⁺ on the Enantioselective Toxicity of Metolachlor to Scenedesmus obliquus HU Xiao-na, ZHANG Shu-xian, CHEN Cai-dong, et al. (292) Simplification of Biotic Ligand Model and Evaluation of Predicted Results WANG Wan-bin, CHEN Sha, WU Min, et al. (299) Priority Pollutants Ranking and Screening of Coke Industry based on USEtox Model HAO Tian, DU Peng-fei, DU Bin, et al. (304) Isolation, Identification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, China Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N ₂ O Catalytic Decomposition LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371) Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea YAN Mi, QI Zhi-fu, LI Xiao-dong, et al. (385)		
Simplification of Biotic Ligand Model and Evaluation of Predicted Results		
Priority Pollutants Ranking and Screening of Coke Industry based on USEtox Model		
Isolation, Identification and Characterization of a Microcystin-degrading Bacterium Paucibacter sp. Strain CH YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, China SHI Jing-jing, GENG Yuan-bo (341) Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N ₂ O Catalytic Decomposition LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371) Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea YAN Mi, QI Zhi-fu, LI Xiao-dong, et al. (385) County Scale Characteristics of CO ₂ Emission's Spatial-Temporal Evolution in the Beijing-Tianjin-Hebei Metropolitan Region WANG Hao, CHEN Cao-cao, PAN Tao, et al. (385)		WANC Wan-bin CHEN Sha WII Min et al. (200)
Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, China Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N ₂ O Catalytic Decomposition LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371) Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea YAN Mi, QI Zhi-fu, LI Xiao-dong, et al. (380) County Scale Characteristics of CO ₂ Emission's Spatial-Temporal Evolution in the Beijing-Tianjin-Hebei Metropolitan Region WANG Hao, CHEN Cao-cao, PAN Tao, et al. (385)	Priority Pollutants Ranking and Screening of Coke Industry based on USEtox Model ·····	
Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains		
Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leynus chinensis Steppe in Inner Mongolia, China Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N ₂ O Catalytic Decomposition LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371) Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea YAN Mi, QI Zhi-fu, LI Xiao-dong, et al. (380) County Scale Characteristics of CO ₂ Emission's Spatial-Temporal Evolution in the Beijing-Tianjin-Hebei Metropolitan Region WANG Hao, CHEN Cao-cao, PAN Tao, et al. (385)		
Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, China SHI Jing-jing, GENG Yuan-bo (341) Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N ₂ O Catalytic Decomposition LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371) Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea YAN Mi, QI Zhi-fu, LI Xiao-dong, et al. (380) County Scale Characteristics of CO ₂ Emission's Spatial-Temporal Evolution in the Beijing-Tianjin-Hebei Metropolitan Region WANG Hao, CHEN Cao-cao, PAN Tao, et al. (385)	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate	
Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N2O Catalytic Decomposition LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371) Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea YAN Mi, QI Zhi-fu, LI Xiao-dong, et al. (380) County Scale Characteristics of CO2 Emission's Spatial-Temporal Evolution in the Beijing-Tianjin-Hebei Metropolitan Region WANG Hao, CHEN Cao-cao, PAN Tao, et al. (385)	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains	
Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N2O Catalytic Decomposition LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371) Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea YAN Mi, QI Zhi-fu, LI Xiao-dong, et al. (380) County Scale Characteristics of CO2 Emission's Spatial-Temporal Evolution in the Beijing-Tianjin-Hebei Metropolitan Region WANG Hao, CHEN Cao-cao, PAN Tao, et al. (385)	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains	
Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leynus chinensis Steppe in Inner Mongolia,	HAO Tian, DU Peng-fei, DU Bin, et al. (304) YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) China SHI Jing-jing, GENG Yuan-bo (341)
Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N2O Catalytic Decomposition	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer	HAO Tian, DU Peng-fei, DU Bin, et al. (304) YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) China SHI Jing-jing, GENG Yuan-bo (341) HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348)
Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water	HAO Tian, DU Peng-fei, DU Bin, et al. (304) YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) China SHI Jing-jing, GENG Yuan-bo (341) HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356)
County Scale Characteristics of CO ₂ Emission's Spatial-Temporal Evolution in the Beijing-Tianjin-Hebei Metropolitan Region	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant	HAO Tian, DU Peng-fei, DU Bin, et al. (304) YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) China SHI Jing-jing, GENG Yuan-bo (341) HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356)
	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant	HAO Tian, DU Peng-fei, DU Bin, et al. (304) YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) China SHI Jing-jing, GENG Yuan-bo (341) HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356)
Characterization and Soil Environmental Safety Assessment of Super Absorbent Polymers in Agricultural Application	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N ₂ O Catalytic Decomposition Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea	HAO Tian, DU Peng-fei, DU Bin, et al. (304) YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) China SHI Jing-jing, GENG Yuan-bo (341) HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371)
	Inhibition of the Activity of Sulfate-reducing Bacteria in Produced Water from Oil Reservoir by Nitrate Bioconversion of Cellulose to Methane by a Consortium Consisting of Four Microbial Strains Factors Influencing the Variability in Soil Heterotrophic Respiration from Terrestrial Ecosystem in China Study on the Distinguishing of Root Respiration from Soil Microbial Respiration in a Leymus chinensis Steppe in Inner Mongolia, Nitrous Oxide Flux at the Water-Air Interface of the Rivers in Nanjing During Summer Effects of Antiseptic on the Analysis of Greenhouse Gases Concentrations in Lake Water Electricity Generation of Surplus Sludge Microbial Fuel Cell Enhanced by Biosurfactant Fe-ZSM-5 Catalysts with Different Silica-Alumina Ratios for N ₂ O Catalytic Decomposition Inhibition of Chlorobenzene Formation via Various Routes During Waste Incineration by Ammonium Sulfate and Urea County Scale Characteristics of CO ₂ Emission's Spatial-Temporal Evolution in the Beijing-Tianjin-Hebei Metropolitan Region	HAO Tian, DU Peng-fei, DU Bin, et al. (304) YOU Di-jie, CHEN Xiao-guo, XIANG Hui-yi, et al. (313) YANG De-yu, ZHANG Ying, SHI Rong-jiu, et al. (319) WU Jun-mei, MA An-zhou, CUI Meng-meng, et al. (327) XIE Wei, CHEN Shu-tao, HU Zheng-hua (334) China SHI Jing-jing, GENG Yuan-bo (341) HAN Yang, ZHENG You-fei, WU Rong-jun, et al. (348) XIAO Qi-tao, HU Zheng-hua, James Deng, et al. (356) PENG Hai-li, ZHANG Zhi-ping, LI Xiao-ming, et al. (365) LU Ren-jie, ZHANG Xin-yan, HAO Zheng-ping (371) YAN Mi, QI Zhi-fu, LI Xiao-dong, et al. (380) WANG Hao, CHEN Cao-cao, PAN Tao, et al. (385)

《环境科学》第6届编辑委员会

主 编:欧阳自远

副主编:赵景柱 郝吉明 田 刚

编 委: (按姓氏笔画排序)

万国江 王华聪 王凯军 王绪绪 田 刚 田 静 史培军

朱永官 刘志培 汤鸿霄 陈吉宁 孟 伟 周宗灿 林金明

欧阳自远 赵景柱 姜 林 郝郑平 郝吉明 聂永丰 黄 霞

黄耀 鲍强潘纲潘涛魏复盛

环维种草

(HUANJING KEXUE)

(月刊 1976年8月创刊) 2014年1月15日 35卷 第1期

ENVIRONMENTAL SCIENCE

(Monthly Started in 1976)
Vol. 35 No. 1 Jan. 15, 2014

		1 77 - 11 - 3 /11 //7			
主	管	中国科学院	Superintended	by	Chinese Academy of Sciences
主	办	中国科学院生态环境研究中心	Sponsored	by	Research Center for Eco-Environmental Sciences, Chinese
协	办	(以参加先后为序)			Academy of Sciences
		北京市环境保护科学研究院	Co-Sponsored	by	Beijing Municipal Research Institute of Environmental
		清华大学环境学院			Protection
主	编	欧阳自远			School of Environment, Tsinghua University
编	辑	《环境科学》编辑委员会	Editor-in -Chief	•	OUYANG Zi-yuan
>m	7-4	北京市 2871 信箱(海淀区双清路	Edited	by	The Editorial Board of Environmental Science (HUANJING
		18号,邮政编码:100085)			KEXUE)
		电话:010-62941102,010-62849343			P. O. Box 2871, Beijing 100085, China
		传真:010-62849343			Tel:010-62941102,010-62849343; Fax:010-62849343
		E-mail; hjkx@ reees. ac. cn			E-mail; hjkx@ rcees. ac. cn
		http://www.hjkx.ac.cn			http://www.hjkx.ac.cn
出	版	4 学业版社	Published	by	Science Press
-	742	北京东黄城根北街 16 号			16 Donghuangchenggen North Street,
		邮政编码:100717			Beijing 100717, China
印刷装	订	北京北林印刷厂	Printed	by	Beijing Bei Lin Printing House
发	行	斜华出版社	Distributed	by	Science Press
		电话:010-64017032			Tel:010-64017032
		E-mail:journal@mail.sciencep.com			E-mail; journal@ mail. sciencep. com
订 购	处	全国各地邮电局	Domestic		All Local Post Offices in China
国外总统	せい とうけい とうしゅう とうしゅう とうしゅう とうしゅう とうしゅう とうしゅう とうしゅう とうしゅう しゅう しゅう しゅう しゅう しゅう しゅう しゅう しゅう しゅう	中国国际图书贸易总公司	Foreign		China International Book Trading Corporation (Guoji
		(北京 399 信箱)			Shudian), P. O. Box 399, Beijing 100044, China

中国标准刊号: ISSN 0250-3301 CN 11-1895/X

国内邮发代号: 2-821

国内定价:90.00元

国外发行代号: M 205

国内外公开发行