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太湖重点区域水环境中邻苯二甲酸酯的污染水平及生态风险评价

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摘要: 为了解太湖重点区域水环境中邻苯二甲酸酯(phthalate esters, PAEs)的污染情况,对丰水期、枯水期和平水期目标区域的水体和沉积物中 6 种 PAEs 进行分析,3 个水期水体中 PAEs 浓度分别为 $1.6 \sim 11.2~\mu g \cdot L^{-1}$ (平均值 $3.68~\mu g \cdot L^{-1}$)、 $nd \sim 6.21~\mu g \cdot L^{-1}$ (平均值 $1.3~\mu g \cdot L^{-1}$)和 $nd \sim 1.72~\mu g \cdot L^{-1}$ (平均值 $0.48~\mu g \cdot L^{-1}$),从上游至下游未呈现明显浓度变化,其中邻苯二甲酸二(2-乙基己基)酯[di(2-ethylhexyl)) phthalate,DEHP]对 \sum PAEs 浓度的贡献比较大,邻苯二甲酸二正丁酯(di-n-butyl phthalate,DBP)在某些采样点高于国内标准。沉积物中 PAEs 含量范围在 $0.74 \sim 6.90~\mu g \cdot g^{-1}$ (平均值 $2.64~\mu g \cdot g^{-1}$),主要成分是 DBP 和 DEHP. 生态风险评价的结果表明,DBP 和 DEHP 是重点区域中最主要的风险因子;沉积物 PAEs 中所有种类的含量均未超过风险评价低值(effect range low,ERL),对生物的潜在危害较小。与国内外河流、湖泊与河口等沉积物中 PAEs 污染水平比较,太湖重点区域水环境中 PAEs 污染减于中等水平。工业污染和城市活动是水环境中邻苯二甲酸酯的主要来源。 关键词:邻苯二甲酸酯;太湖;水期;污染源;生态风险评价

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Contamination Levels and Ecological Risk Assessment of Phthalate Esters (PAEs) in the Aquatic Environment of Key Areas of Taihu Lake

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Abstract: To better understand phthalate esters (PAEs) pollution in key areas of Taihu Lake, water and sediment samples were collected for content analysis. The concentrations of \sum PAEs in water samples from wet, dry, and normal seasons ranged 1.6-11.2 $\mu g \cdot L^{-1}$ (mean; 3.68 $\mu g \cdot L^{-1}$), nd-6.21 $\mu g \cdot L^{-1}$ (mean; 1.3 $\mu g \cdot L^{-1}$), and nd-1.72 $\mu g \cdot L^{-1}$ (mean; 0.48 $\mu g \cdot L^{-1}$), respectively. No differences were found between upstream and downstream samples. DEHP was the predominant component in water samples, whereas DBP exceeded the national surface water environmental quality standards. The total PAE concentration in the sediment ranged between 0.74 and 6.90 $\mu g \cdot g^{-1}$ (mean; 2.64 $\mu g \cdot g^{-1}$), with DBP and DEHP the predominant PAEs. The risk quotient (RQ) results showed that DBP and DEHP contributed the most potentially adverse effects to the aquatic environment in the key areas. The contents of PAEs in sediment were all less than the ERLs, thus posing no significant threat to aquatic organisms. The overall level of PAEs in the study area was moderate compared to those in other areas, including rivers, lakes, and estuaries from cities worldwide. Industrial pollution and urban activities are the major sources of PAEs in the aquatic environment of key areas of Taihu Lake.

Key words: phthalate esters (PAEs); Taihu Lake; water period; pollutant source; ecological risk assessment

邻苯二甲酸酯(phthalate esters, PAEs)又称酞酸酯,这类化合物作为重要的化工原料已被广泛应用近50年,主要用作于增塑剂以提高产品的强度和可加工性,同时也被应用于个人护理品、特定医疗器械、驱虫剂等的生产原料,甚至可作为军火弹药的原料[1,2].全球每年 PAEs 类化合物的使用量在 820 万 t 以上,随着塑料品的无节制使用,大量PAEs 进入环境,由于其分布广泛、难降解性及可通过生物链浓缩, PAEs 在大气、土壤、沉积物以及生物体中被广泛检测出,并且 PAEs 会通过影响生态

平衡,进而对人体健康造成潜在威胁^[3,4]. PAEs 已被公认为全球性的环境有机污染物,特别是对水环境的污染,已引起世界各国的重视.

美国环保署(Environmental Protection Agency, USEPA)将邻苯二甲酸二甲酯(dinethyl phthalate, DMP), 邻苯二甲酸二乙酯 (diethyl phthalate,

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DEP),邻苯二甲酸二正丁酯(di-n-butyl phthalate, DBP),邻苯二甲酸丁苄酯(butylbenzyl phthalate, BBP),邻苯二甲酸二(2-乙基己基)酯 [di(2-ethylhexyl) phthalate,DEHP] 和邻苯二甲酸二正辛酯 (di-n-octyl phthalate, DOP)等 6 种 PAEs 列为优先控制有毒污染物,我国也将 DEP、DMP 和 DOP这 3 种 PAEs 确定为环境优先控制污染物 [5,6],同时,我国生活饮用水卫生标准(GB 5749-2006)中也规定了部分 PAEs 的限值,DEHP 和 DBP 分别为 0.008 mg·L $^{-1}$ 和 0.003 mg·L $^{-1}$. 据报道,国外河流沉积物中 PAEs 含量范围在 0.1 × $^{-3}$ ~ 100 $^{\mu}$ g·g $^{-1}$ 之间 $^{[7]}$,我国部分地区 PAEs 污染也已经非常严重 $^{[8]}$,对环境生态系统的影响不容忽视.

太湖是我国五大淡水湖之一, 地处长江经济发 达地区, 是流域内最主要的供水水源地和重要的淡 水生态系统, 担负着周边大城市(无锡及苏州等)的 城市供水和改善下游地区水质的重要作用[9]. 太滆 运河和太滆南运河是太湖重污染区竺山湾的重要外 部来源, 该流域内水体污染主要来源于沿岸的生 活、农业和工业污染源的排放及受上游客水的影 响,太滆南运河总体水质以 V 类和劣 V 类为 主[10,11]. 太湖重点区域(太滆运河以南、太滆南运 河以北、滆湖以东和太湖以西约 220 km² 的片区) 涉及无锡宜兴市和常州武进区, 该地区经济发达, 人口密集, 污染负荷较大, 近年来, 由于流域生活 污染源和农业面源的影响, 加上河道沉积物中污染 物含量高, 水生生态系统遭到破坏, 水体自净能力 受到损伤, 重点区域内分布有精细化工、塑料制 品、纺织工业等行业,这些行业都是 PAEs 潜在的 污染来源[12]. 区域内太滆运河、漕桥河和太滆南运 河等3条主要入湖河流,入湖污染量占西部沿岸主 要河流入湖污染量的 40% 左右[13], 因此该区域内 的 PAEs 污染与排放强度,直接影响西太湖乃至整 个太湖 PAEs 的分布情况.

本项目选择太湖治太科研示范区为重点调研区域,针对区域内主要水体以及沉积物中蓄积的6种PAEs污染现状开展监测调查,分析污染水平、组成特征和潜在风险,旨在为太湖流域PAEs的多介质归趋研究和区域风险提供了理论依据.

1 材料与方法

1.1 样品的采集

为了综合考察太湖重点区域水体和沉积物中 PAEs的时空分布规律,采样时间为:丰水期 (2016年8月)、枯水期(2016年11月)和平水期(2017年4月),13个点位分布在太滆运河、漕桥河与太滆南运河的上游、中游与下游及太滆运河与太滆南运河的两个人湖口(图1),各采样点位的经纬度与其他信息如表1所示.水样分别采集于3个水期,收集在1L棕色广口玻璃采样瓶中;沉积物采集于平水期,采用抓泥斗进行采集,取0~5cm表层沉积物,由于4号和11号点位属于沙质湖底,未采集到沉积物样品.采集的水样和沉积物样品置于4℃冰柜中保存,并于24h内运回实验室冷冻待分析.



图 1 太湖重点区域采样点示意

Fig. 1 Map of the sampling sites from the key areas of Taihu Lake

1.2 仪器与试剂

ISQ 气相色谱质谱联用仪(赛默飞世尔科技Thermo Fisher Scientific 公司), 快速溶剂萃取仪(Accelerate Solvent Extractor, ASE200), Milli-Q 纯水系统(美国 Millipore 公司). DMP、DEP、DBP、BBP、DEHP与DOP等6种PAEs 混合标准溶液(溶剂为二氯甲烷)购于德 Dr. Ehrenstorfer 公司;替代标准物氘代邻苯二甲酸二正丁酯(d4-DBP)、内标

物氘代邻苯二甲酸二乙酯(d4-DEP)和氘代邻苯二甲酸二正辛酯(d4-DOP)购于美国 Accustandard 公司(New Haven, CT, USA);实验所用二氯甲烷、丙

酮、正己烷均为色谱纯;无水硫酸钠(优级纯)和玻璃棉于马弗炉 450℃灼烧 4 h, 冷却后装瓶,于干燥器中保存.

表 1 太湖重点区域采样点地理信息

Table 1	Geographical	information	of	sampling	sites i	from	the l	kev	areas o	f Taihu	Lake
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编号	监测断面	纬度/(°)	经度/(°)	备注
1	太滆河口区	31. 6167	119. 885 2	太滆出水
2	武宜运河1	31. 604 5	119. 909 2	武宜运河与太滆运河交汇
3	永安河口	31. 574 6	119. 964 4	永安河与太滆运河交汇
4	锡溧漕河	31. 554 3	120. 014 9	锡溧漕河与太滆运河交汇
5	太滆河口区	31. 535 1	119. 847 5	太滆出水
6	武宜运河2	31. 536 0	119. 921 1	武宜运河水与漕桥河交汇
7	漕桥	31. 521 8	119. 984 8	宜兴与武进共有河段
8	分水桥	31. 496 5	120. 036 9	太滆运河与漕桥河交汇前太滆运河上对照断面
9	王母桥西	31. 513 7	119. 825 4	滆湖出水
10	武宜运河3	31. 496 0	119. 900 6	太滆南运河与武宜运河交汇断面
11	陈桥	31. 459 5	120. 012 7	人湖口段面
a	漕桥河入湖	31. 486 1	120. 052 7	湖体
b	殷村港入湖	31. 456 5	120. 021 4	湖体

1.3 样品的前处理

水样:取500 mL 水样置于分液漏斗中,加入30 mL 二氯甲烷,液液萃取前加入回收率指示物(d4-DBP),振荡5min后静置分层,下层有机相经无水硫酸钠干燥过滤后收集在浓缩管中,重复提取3次,合并提取液,用氮吹仪将提取液吹至近干,加入内标化合物(d4-DEP与d4-DOP),用二氯甲烷定容至1 mL 进行 GC/MS 分析.

沉积物:准确称取2g干燥沉积物样品,与无水硫酸钠混匀后放入快速溶剂萃取池,萃取前加入回收率指示物(d4-DBP). 提取溶剂为二氯甲烷/正己烷(1:1,体积比)混合溶剂,压力为103 MPa,温度90℃下加热5 min,静态时间5 min,冲洗体积60%,吹扫时间60 s,静态循环次数3次.萃取液用内径10 mm的层析柱净化,从下至上依次填入12 cm 硅胶、6 cm 氧化铝和1 cm 无水硫酸钠.用40 mL 丙酮/正己烷(2:8,体积比)洗脱,洗脱液用旋转蒸发仪和氮吹仪浓缩至0.5 mL以下,加入内标物(d4-DEP与d4-DOP)后用正己烷定容至1 mL,待测.

1.4 仪器分析

依据 USEPA 8270D-2014 方法, 采用 GC-MS 进行分析, 色谱柱类型为 DB-5MS(30 m×0.25 mm×

0. 25 μm) 毛细管柱,初始柱温为 50℃,保持 3. 5 min,以 8 ℃ · min ⁻¹ 的速率升温至 310℃,载气为氦气,流速为 1. 0 mL · min ⁻¹,进样口温度 250℃,进样方式为分流进样。离子源电子能量为 70 eV,离子源温度 270℃,传输线温度为 280℃,以保留时间和质谱全扫描方式(Sean)进行定性分析,以质谱选择离子(SIM)模式进行定量分析。

1.5 质量保证和质量控制(QA/QC)

由方法空白、加标空白、基质加标、基质加标平行样、样品平行样等 USEPA 的 QA/QC 控制样监控整个分析过程,并用回收率指示物检测样品的制备和基质的影响. DMP、DEP、BBP 和 DOP 的实验室空白和野外空白均未检出,DBP 和 DINP 的空白约为方法的检出限,故忽略不计. 水体中 6 种 PAEs检出限为 0.07 μg·L⁻¹(DMP) ~ 0.052 μg·L⁻¹(DIBP),空白加标回收率为 78% ~ 83%,基质加标回收率为 77% ~ 81%;沉积物中 6 种 PAEs 检出限为 0.05 μg·kg⁻¹(DBP) ~ 1.67 μg·kg⁻¹(DINP),空白加标回收率为 74% ~ 89%,基质加标回收率为 83% ~ 94%.

1.6 总有机碳(TOC)测定

样品去除无机碳(10% HCl 浸泡)后使用 CHNS 元素分析仪测定 TOC 含量, 结果见表 2.

表 2 太湖重点区域沉积物总有机碳含量

			Tabl	e 2 TOC in	n sediment fr	om the key a	reas of Taihu	ı Lake			
点位	1	2	3	5	6	7	8	10	11	a	b
TOC/%	1. 34	1. 06	1.60	4. 73	1. 15	2. 11	1. 36	3.45	1. 48	1. 66	1. 78

2 结果与讨论

2.1 水相和沉积物中 PAEs 的含量及组成

从上游滆湖到下游太湖入湖口,主要有太滆运河、漕桥河与太滆南运河这3条入湖河流,其中各点位 PAEs 水平及组成如图2、3 所示. 丰水期 PAEs 的总量为 $1.6 \sim 11.2 \ \mu g \cdot L^{-1}$ (平均值 $3.68 \ \mu g \cdot L^{-1}$), 6种 PAEs 平均浓度按照 DEP > DEHP > DBP > BBP > DOP > DMP 顺序递减,其中 1 号点位

浓度最高比重最大的 DBP 含量为 5.99 $\mu g \cdot L^{-1}$,三条河流由上游至下游并没有明显浓度或组成的波动及变化,枯水期 PAEs 的总量 $nd \sim 6.21 \ \mu g \cdot L^{-1}$ (平均值 $1.3 \ \mu g \cdot L^{-1}$),仅 BBP 和 DEHP 有检出,平水期太湖重点区域 PAEs 的浓度范围在 $nd \sim 1.72 \ \mu g \cdot L^{-1}$ (平均值 $0.48 \ \mu g \cdot L^{-1}$),太滆南运河以及两个人湖口几乎未检出,这与丰水期和枯水期水体中的情况有较大差异.

13个采样点丰水期检测出的PAEs总量均比枯

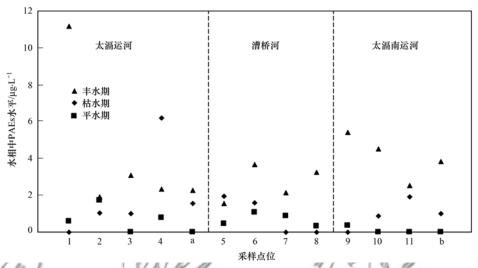


图 2 丰水期、枯水期和平水期各采样点水相中 PAEs 的浓度

Fig. 2 Total content of PAEs in water samples from dry, wet, and normal seasons

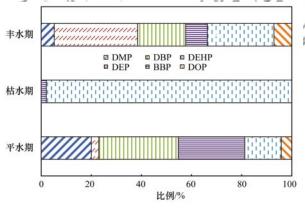


图 3 丰水期、枯水期和平水期水相中 6 种 PAEs 的组成比例 Fig. 3 PAE composition profiles for water samples from dry, wet, and normal seasons

水期与平水期要高(采样点 4、5 除外)且 6 种 PAEs 在丰水期均有检出.可能原因是丰水期大量的外源物质汇入水体,如大气颗粒物的沉降和地表径流带来的表层土壤冲刷^[14].另外,现场调研和采样期间发现河流周边化工厂的排污设备非常隐蔽,在丰水期,大部分排污口被淹没在河流以下,难以发现,工厂在丰水期期间不达标随意排放废水现象也可能

加剧水体中 PAEs 含量.

分析测试 6 种 PAEs 的含量分布,太湖重点区域沉积物中 PAEs 总含量介于 0.74 ~ 6.90 $\mu g \cdot g^{-1}$ (平均值 2.64 $\mu g \cdot g^{-1}$)(图 4), 6 种 PAEs 至少在一个点位检出,其中 DBP 的比重最高(23.9% ~ 94.4%)(a、b 两点除外),含量介于 0.57 ~ 2.45 $\mu g \cdot g^{-1}$,两个人湖口 a 和 b 点位沉积物中 DEHP 含

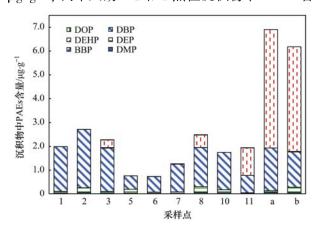


图 4 太湖重点区域沉积物中 PAEs 含量

Fig. 4 PAEs concentrations in sediment from the key areas of Taihu Lake

量占到总含量的 70%,分别为 4.97 μg·g⁻¹和 4.36 μg·g⁻¹,比巢湖沉积物约高一个数量级^[15]. 从滆湖至太湖,太滆运河与太滆南运河的沉积物中 PAEs的含量自上游至下游未出现明显波动,漕桥河下游含量略高于上游两点,说明该区域以及漕桥河的客水存在 PAEs 的排放. 太湖湖体沉积物中 PAEs 的含量明显高于重点区域河流.

骆马湖湖底沉积物中只检测出两种 PAEs^[16],与水体中检出的种类一致,但含量远远高于太湖重点区域,这可能由于骆马湖周边 PAEs 污染较为严重,在沉积物中富集周期长,含量高^[17,18].与国内其他水源地相比,太湖 PAEs 污染属于较低水平,但由于 PAEs 具有持久性和蓄积性,应加强污染防护,防止水质继续恶化.

国内外已有许多关于 PAEs 在沉积物与水之间分配系数的研究,结果一致认为发生在沉积物与水相间的吸附作用受沉积物中有机碳含量的显著影响,且沉积物对不同 PAEs 组分的吸附能力也不一致. 对太湖重点区域沉积物中 PAEs 和 TOC 相关性 (n=11)作图表明,彼此在 P=0.05 的置信水平上相关性不显著(图5),说明在太湖重点区域 TOC 不是影响沉积物中 PAEs 的重要因素. 而胡雄星等[19]发现苏州河沉积物中 PAEs 分布与 TOC 有正相关性,因为 TOC 代表了沉积物中有机质的含量,沉积物中 TOC 含量越高,其对 PAEs 的吸附能力也越强,导致沉积物中 PAEs 含量升高.

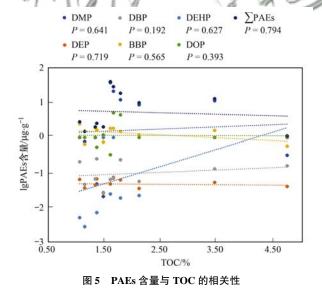


Fig. 5 Relationship between the concentrations of PAEs and TOC

2.2 太湖重点区域 PAEs 污染来源

PAEs 在丰水期的检出率和检出浓度最高,浓度水平在 $\mu g \cdot L^{-1}$,在丰水期和枯水期,水体中各点

位检出的 DEHP 浓度最高,与商品化的 PAEs 组分 相同,说明水体中有新进的 PAEs 污染来源,如工 业、商业活动以及人类生活活动等,这种污染特征 与其他有机污染物如多溴联苯醚等一致. 水体中, 检出的 PAEs 主要是 DEHP, 而沉积物中检出的主 要是 DMP、DEP 和 DBP 等小分子 PAEs, 作为疏水 类物质, PAEs 一旦进入水体, 会被颗粒物快速且大 量地带向下游,小颗粒悬浮物由于比表面积大,容 易吸附有机质,因此,相比于长链的 PAEs 如 DEHP, 低分子量的 DBP等, 容易被大颗粒物吸附, 沉降于 PAEs 源附近的沉积物中, 而长链的 PAEs 被小的颗粒吸附,不停地随河流流向下游,因此沉 降较慢, 故在水体中主要检出 DEHP 等长链 PAEs. 在漕桥河上, 漕桥河污水处理厂下游(8 号点) 沉积 物中, PAEs 的含量比上游(7号点)高 0.96 倍, 说 明污水处理厂对河流中 PAEs 有贡献.

2.3 水相 PAEs 与国内外同类研究的比较

PAEs 在全球主要工业国家的生态环境中已达到普遍检出的程度,成为全球性最普遍的污染物之一.将太湖重点区域水体中 PAEs 与国内外已有研究报道的水域表层水体和沉积物进行比较,结果见表 3 和表 4.

Yuan 等^[31]对中国台湾地区河流表层水样中 8种 PAEs 测定结果显示, 8种 PAEs 在所有样品中均有不同程度的检出. 对长江表层水体中 PAEs 检测结果发现 DBP 浓度较高^[32]. Wang 等^[33]分季节对长江武汉段水体中 PAEs 浓度进行了检测,结果表明冬季水体中 PAEs 的浓度高于夏季, DBP 和DEHP 对 PAEs 浓度的贡献较大. 从表 3 可以看出中国北方 PAEs 污染比太湖重点区域表层水严重,且部分点位 DBP 浓度超过 GB 5749-2006《生活饮用水卫生规范》和 GB 3838-2002《地表水环境质量标准》中规定的限量值 3 μg·L⁻¹.

沉积物中 PAEs 污染以 DBP 和 DEHP 为主,比较 2003 年太湖区域、巢湖和国内以及世界其他湖泊沉积物 PAEs 的含量,太湖重点区域沉积物中 DBP 和 DEHP 含量高于九龙河、印度和意大利的湖泊河流^[25,28,29],比松花江河口沉积物 PAEs 含量低约两个数量级^[21].随着流域内经济的高速增长,受沿湖地区生活污水、工业废水和农业废水直接或间接排入的影响。太湖水体污染日趋严重.

2.4 水体 PAEs 生态风险评估

采用欧盟适用于现有化学物质与新化学物质的 风险评价技术指南(technical guidance document,

表 3 世界其他地区河流、湖泊水体 PAEs 污染水平/ $\mu g \cdot L^{-1}$

	Table 3	PAEs levels in	water from r	rivers and lakes	around the world/ug·L	- 1
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地点	DMP	DEP	DBP	BBP	DEHP	DOP	文献
太湖	nd ¹⁾ ~ 1. 24	nd ~ 2. 23	nd ~ 5. 99	nd ~ 2. 47	nd ~ 6. 21	nd ~ 0. 47	本研究
九龙河	0.03 ~ 0.24	$0.01 \sim 0.09$	0. 03 ~ 1. 77	nd	0. 62 ~ 12. 4	2)	[20]
松花江	0. 98 ~ 4. 12	1. 33 ~ 6. 67	1.69 ~11.8	nd ~4.39	2. 26 ~ 11. 6	0.69 ~6.14	[21]
Tama 河,日本	$nd \sim 0.09$	$nd \sim 0.31$	nd ~0. 54	_	_	nd	[22]
Lowland 河,荷兰	nd ~0.19	$nd \sim 2.30$	nd ~3. 10	nd ~ 1. 8	nd ~ 5. 00	nd ~0.078	[23]

¹⁾ 表示未检出; 2) 表示无相关数据, 下同

表 4 世界其他地区河流、湖泊沉积物中 PAEs 污染水平/µg·g-1

Table 4 PAEs levels in surface sediment from rivers and lakes around the world/µg·g⁻¹

					100	2	
地点	DMP	DEP	DBP	BBP	DEHP	DOP	文献
太湖	0. 026 ~ 0. 071	0.027 ~ 0.244	0. 568 ~ 2. 45	nd ~ 0. 024	nd ~4. 97	nd ~0.011	本研究
太湖	_	_	1. 08 ~ 21. 5	_	2. 22 ~ 23. 9	_	[24]
巢湖	0.006 ~ 1.34	0.001 ~ 0.042	0.080 ~ 2.63	0.0004 ~ 0.286	0.031 ~ 1.82	0.0002 ~ 0.029	[15]
永定河	nd ~ 0. 021	0.009 ~ 0.054	0.095 ~ 0.16	nd	0.017 ~ 1.090	$nd \sim 0.020$	[25]
松花江	25. 18 ~ 87. 8	26.7 ~ 38.2	58. 1 ~ 881	nd ~96. 3	227 ~ 566	$nd \sim 377$	[21]
钱塘江	nd ~ 0. 18	nd ~0.22	0. 034 ~ 0. 24	nd ~ 0. 021	0. 36 ~ 6. 24	nd ~0.019	[3]
珠江	0.001 ~ 0.019	0.001 ~ 0.091	0.042 ~ 5.03	nd ~ 0. 11	0.41 ~29.5	nd ~0.18	[2]
九龙河	nd ~ 0. 001	$nd \sim 0.002$	0.002 ~ 0.092	nd	0.007 ~ 0.39	nd	[14]
高雄港	nd	nd	0. 29	nd	4. 90	0. 14	[26]
The Ogun 河,尼日利3	区 0.21	0. 18	0. 41	_ /	0.050	- /	[27]
Gomti 河, 印度	0.011	0.005	0.011	- /	0.032	0. 005	[28]
Rieti 河,意大利	nd	$nd \sim 0.002$	nd ~ 0. 028	nd ~0.018	nd ~0.49	nd ~ 0. 017	[29]
Klang 河, 马来西亚	nd ~0. 010	nd ~0.003	0.067 ~ 0.637	-/"	0. 49 ~ 15. 0	nd ~ 0. 017	[30]

TGD)中的商值风险评估方法对太湖重点区域水体中 PAEs 进行生态风险评价^[34],对 3 个水期重点区域 4 种 PAEs 的风险商值(risk quotient, RQ = MEC/PNEC)进行分析,MEC 代表环境中 PAEs 的测量浓度,PNEC 代表预测的无效应浓度,文献给出 DMP、DEP、DBP 和 DEHP 的 PNEC 值分别为 96.0、96.0、0.500 和 1.54^[35],计算出各水期 PAEs 的 RQ 见表5,DBP 在丰水期和枯水期 RQ 均大于 1,DEHP 在丰水期和平水期 RQ 均大于 1,表明这两种 PAEs 存在潜在的生态风险.

表 5 太湖重点区域水体中 4 种 PAEs 生态风险评价结果

Table 5 Ecological risk assessment results of PAEs in water from the key areas of Taihu Lake

水期	化合物	水体浓度/μg·L ⁻¹	RQ_{rk}
	DMP	0. 503	0.005
丰水期	DEP	3. 87	0.040
十小州	DBP	14. 5	29
	DEHP	20. 0	13.0
	DMP	nd	nd
平水期	DEP	nd	nd
1 / 7/7	DBP	nd	nd
	DEHP	17. 0	11.0
	DMP	1. 24	0.013
枯水期	DEP	0. 186	0.002
1日/八朔	DBP	1. 97	3.94
	DEHP	0. 903	0.586

沉积物是 PAEs 的源和汇,但目前尚未建立起统一的评价标准,有关沉积物中 PAEs 的环境风险评价研究较少, Van Wezel 等 $^{[36]}$ 通过大量的体内和体外毒理实验,建议 DEHP 和 DBP 的风险评价低值 (effect range low,ERL)分别为 $1\,000\,$ ng·g $^{-1}$ 和 700 ng·g $^{-1}$. 当 PAEs 污染物含量小于 ERL 时,认为不存在 PAEs 的内分泌干扰和生态毒理风险.将沉积物中检测到的 PAEs 含量与 ERL 对比分析可知相对污染系数(relative contamination factor,RCF = MEC/ERL)结果均小于 1,即沉积物中 PAEs 的含量未超过 ERL,对生物的潜在危害比较小.

3 结论

我国水环境中 PAEs 的污染已相当普遍,已威胁到我国水环境生态安全. 6 种 PAEs 在太湖重点区域水体和沉积物中均有检出,从上游至下游未出现明显波动. 总体来说,丰水期水体中 PAEs 的浓度比枯水期和平水期要高, DEHP 对水体中 〉PAEs 浓度的贡献远高于其他 PAEs, DBP 在某些采样点高于国内标准. DBP 和 DEHP 是沉积物中最主要的两种 PAEs,与世界其他地方河口湖泊沉积物做比较,太湖重点区域中 PAEs 污染处于中等

偏下水平.目前针对有效去除水体中 PAEs 污染技术的研究已初见报道,对我国不同环境介质中 PAEs 的来源、污染分布特征、毒性和生态风险水平等急需掌握,并且应持续跟踪污染状况,对饮用水污染加以控制和治理,防止污染加剧,降低饮用水 PAEs 污染的风险.

参考文献:

- [1] 陈波, 林建国, 陈清. 水环境中的邻苯二甲酸酯类污染物及 其环境行为研究[J]. 环境科学与管理, 2009, 34(2): 71-75
 - Chen B, Lin J G, Chen Q. Research on contamination of phthalate esters in aqueous environment and its environmental behaviors [J]. Environmental Science and Management, 2009, 34(2): 71-75.
- [2] Liu H, Cui K Y, Zeng F, et al. Occurrence and distribution of phthalate esters in riverine sediments from the Pearl river delta region, South China [J]. Marine Pollution Bulletin, 2014, 83 (1): 358-365.
- [3] Sun J Q, Huang J, Zhang A P, et al. Occurrence of phthalate esters in sediments in Qiantang River, China and inference with urbanization and river flow regime [J]. Journal of Hazardous Materials, 2013, 248-249: 142-149.
- [4] Wang J, Bo L J, Li L N, et al. Occurrence of phthalate esters in river sediments in areas with different land use patterns [J]. Science of the Total Environment, 2014, 500-501; 113-119.
- [5] 赵振华. 酞酸酯对人与环境潜在危害的研究概况[J]. 环境化学, 1991, 10(3): 64-68.

 Zhao Z H. Review of environmental and human health hazards of phthalate esters[J]. Environmental Chemistry, 1991, 10(3): 64-68.
- [6] 周文敏, 傅德黔, 孙宗光. 中国水中优先控制污染物黑名单的确定[J]. 环境科学研究, 1991, 4(6): 9-12.

 Zhon W M, Fu D Q, Sun Z G. Determination of black list of China's priority pollutants in water [J]. Research of Environmental Sciences, 1991, 4(6): 9-12.
- [7] Sung H H, Kao W Y, Su Y J. Effects and toxicity of phthalate esters to hemocytes of giant freshwater prawn, *Macrobrachium rosenbergii*[J]. Aquatic Toxicology, 2003, 64(1): 25-37.
- [8] 莫测辉, 蔡全英, 吴启堂, 等. 我国城市污泥中邻苯二甲酸酯的研究[J]. 中国环境科学, 2001, **21**(4): 362-366.

 Mo C H, Cai Q Y, Wu Q T, et al. A study of phthalic acid esters (PAEs) in the municipal sludges of China [J]. China Environmental Science, 2001, **21**(4): 362-366.
- [9] 陆铭锋,徐彬,杨旭昌. 太湖水质评价计算方法及近年来水质变化分析[J]. 水资源保护,2008,24(5):30-33.

 Lu M F, Xu B, Yang X C. Evaluation method for water quality of Taihu Lake and its variation in recent years [J]. Water Resources Protection, 2008, 24(5):30-33.
- [10] 黄娟, 王惠中, 吴云波, 等. 太滆南运河入湖污染物控制对策研究[J]. 环境科学与管理, 2010, **35**(7): 1-3, 13. Huang J, Wang H Z, Wu Y B, *et al.* Study on measures to control pollutants into the lake of Taige South River [J]. Environmental Science and Management, 2010, **35**(7): 1-3, 13.
- [11] 翟淑华, 张红举. 环太湖河流进出湖水量及污染负荷(2000-

- 2002年)[J]. 湖泊科学, 2006, 18(3): 225-230.
- Zhai S H, Zhang H J. Water quantity and waste load variation of rivers around lake Taihu from 2000 to 2002 [J]. Journal of Lake Sciences, 2006, 18(3): 225-230.
- [12] 张文艺,韩有法,陆巧丽,等. 太滆运河流域水环境污染解析[J]. 中国农村水利水电,2012,(9):47-50.

 Zhang W Y, Han Y F, Lu Q L, et al. An analysis of water environmental pollution in the Taige canal watershed[J]. China Rural Water and Hydropower, 2012, (9):47-50.
- [13] 朱滨. 太湖主要入湖河流支浜水环境现状调查诊断与整治对策研究[D]. 南京: 东南大学, 2016. 23-26.

 Zhu B. Research on water environment survey and control strategies for rural tributaries of rivers in Taihu basin [D].

 Nanjing: Southeast University, 2016. 23-26.
- [14] 李霞,王东红,王金生,等. 北京市枯水季和丰水季水源水中持久性有机污染物的水平分析[J]. 环境科学学报,2015,35(2):437-442.
 - Li X, Wang D H, Wang J S, et al. Analysis of persistent organic pollutants (POPs) levels in dry and wet seasons in source water of municipal waterworks in Beijing [J]. Acta Scientiae Circumstantiae, 2015, 35(2): 437-442.
- [15] Kang L, Wang Q M, He Q S, et al. Current status and historical variations of phthalate ester (PAE) contamination in the sediments from a large Chinese lake (Lake Chaoluu) [J]. Environmental Science and Pollution research, 2016, 23 (11): 10393-10405.
- [16] 徐怀洲,宋宁慧,张圣虎,等. 骆马湖邻苯二甲酸酯分布特征及健康风险评价[J]. 生态与农村环境学报,2017,33 (10):928-934.

 Xu H Z, Song N H, Zhang S H, et al. Distribution characteristics and health risk assessment of phthalate esters in Lake Luoma[J]. Journal of Ecology and Rural Environment, 2017,33(10):928-934.
- [17] 张芹, 张圣虎, 汪贞, 等. 骆马湖表层水体中 32 种 PPCPs 类物质的污染水平、分布特征及风险评估[J]. 环境科学, 2017, 38(1): 162-169.

 Zhang Q, Zhang S H, Wang Z, et al. Pollution level, distribution characteristics and risk assessment of 32 PPCPs in surface water of Luomahu Lake [J]. Environmental Science,
- [18] 叶玲. 骆马湖面临的环境问题和保护对策[J]. 污染防治技术, 2015, **28**(6): 87-88, 96.

 Ye L. The environmental problems and protection countermeasures of Luoma Lake [J]. Pollution Control Technology, 2015, **28**(6): 87-88, 96.

2017, 38(1): 162-169.

- [19] 胡雄星, 韩中豪. 苏州河表层沉积物中邻苯二甲酸酯的分布 特征及风险评价[J]. 环境监测管理与技术, 2011, **23**(S1); 49-52. Hu X X Han Z H. Distribution of phthalic acid esters in surface
 - Hu X X, Han Z H. Distribution of phthalic acid esters in surface sediments from Suzhou River and its risk evaluation [J]. The Administration and Technique of Environmental Monitoring, 2011, 23(S1): 49-52.
- [20] Li R L, Liang J, Gong Z B, et al. Occurrence, spatial distribution, historical trend and ecological risk of phthalate esters in the Jiulong River, Southeast China[J]. Science of the Total Environment, 2017, 580: 388-397.
- [21] Gao D W, Li Z, Wen Z D, et al. Occurrence and fate of

- phthalate esters in full-scale domestic wastewater treatment plants and their impact on receiving waters along the Songhua River in China[J]. Chemosphere, 2014, 95: 24-32.
- [22] Suzuki T, Yaguchi K, Suzuki S, et al. Monitoring of phthalic acid monoesters in river water by solid-phase extraction and GC-MS determination [J]. Environmental Science & Technology, 2001, 35(18): 3757-3763.
- [23] Vethaak A D, Lahr J, Schrap S M, et al. An integrated assessment of estrogenic contamination and biological effects in the aquatic environment of the Netherlands [J]. Chemosphere, 2005, 59(4): 511-524.
- [24] Wang H, Wang C X, Wu W Z, et al. Persistent organic pollutants in water and surface sediments of Taihu Lake, China and risk assessment [J]. Chemosphere, 2003, 50 (4): 557-562.
- [25] Wang X T, Ma L L, Sun Y Z, et al. Phthalate esters in sediments from Guanting reservoir and the Yongding river, Beijing, people's republic of China [J]. Bulletin of Environmental Contamination and Toxicology, 2006, 76 (5): 799-806.
- [26] Chen C W, Chen C F, Dong C D. Distribution of phthalate esters in sediments of Kaohsiung Harbor, Taiwan [J]. Soil and Sediment Contamination: An International Journal, 2013, 22 (2): 119-131.
- [27] Adeniyi A A, Okedeyi O O, Yusuf K A. Flame ionization gas chromatographic determination of phthalate esters in water, surface sediments and fish species in the Ogun river catchments, Ketu, Lagos, Nigeria [J]. Environmental Monitoring and Assessment, 2011, 172(1-4): 561-569.
- [28] Srivastava A, Sharma V P, Tripathi R, et al. Occurrence of phthalic acid esters in Gomti River Sediment, India [J]. Environmental Monitoring and Assessment, 2010, 169 (1-4): 397-406.

- [29] Vitali M, Guidotti M, Macilenti G, et al. Phthalate esters in freshwaters as markers of contamination sources—A site study in Italy[J]. Environment International, 1997, 23(3): 337-347.
- [30] Tan G H. Residue levels of phthalate esters in water and sediment samples from the Klang River Basin [J]. Bulletin of Environmental Contamination and Toxicology, 1995, 54 (2): 171-176.
- [31] Yuan S Y, Liu C, Liao C S, et al. Occurrence and microbial degradation of phthalate esters in Taiwan river sediments [J]. Chemosphere, 2002, 49(10): 1295-1299.
- [32] Zhang L F, Dong L, Ren L J, et al. Concentration and source identification of polycyclic aromatic hydrocarbons and phthalic acid esters in the surface water of the Yangtze River Delta, China [J]. Journal of Environmental Sciences, 2012, 24(2): 335-342.
- [33] Wang F, Xia X H, Sha Y J. Distribution of phthalic acid esters in Wuhan section of the Yangtze River, China [J]. Journal of Hazardous Materials, 2008, 154(1-3): 317-324.
- [34] Verro R, Finizio A, Otto S, et al. Predicting pesticide environmental risk in intensive agricultural areas. I: Screening level risk assessment of individual chemicals in surface waters [J]. Environmental Science & Technology, 2009, 43(2): 522-529.
- [35] 韩文辉,赵颖,党晋华,等. 汾河流域邻苯二甲酸酯的分布特征及生态风险评价[J]. 环境化学,2017,36(6):1377-1387.
 - Han W H, Zhao Y, Dang J H, et al. Distribution and ecological risk evaluation of phthalate esters in Fenhe river basin [J]. Environmental Chemistry, 2017, $\bf 36(6)$: 1377-1387.
- [36] Van Wezel A P, Van Vlaardingen P, Posthumus R, et al.

 Environmental risk limits for two phthalates, with special emphasis on endocrine disruptive properties [J]. Ecotoxicology and Environmental Safety, 2000, 46(3): 305-321.

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