

文献[7]中指出:肝癌的发生可能与人摄入一些致癌性真菌毒素或其代谢产物的作用有关。本实验受试的 15 株真菌分离物有 9 株具有诱变性,进一步表明肝癌高发的扶绥县粮食真菌分离物中含有诱变性物质。这些 DNA 损伤剂不仅导致 DNA 结构的改变而致癌且可发生遗传性疾病,说明摄入霉变食物在肝癌发生上可能起协同作用^[2,7,8]。本实验以 S₉ 活化真菌分离物其诱导原噬菌体释放的能力明显增强,从而估计这些物质对动物或人体的潜在危险是有一定实际意义的。

近十多年,多种细胞诱变试验已广泛应用于环境诱变剂的监测和研究中。原噬菌体诱导法和 Ames 试验一样都有经济、快速、灵敏等特点,但 Ames 试验作为初筛致癌物质假阳性太多,诸如用 Ames 法检测为阳性物的 2-氨基嘌呤、苯(e)芘已知并无致癌作用,这些没有致癌作用的诱变剂(如上述二者)用诱导检测法测得的结果均为阴性^[1],从而排

除 Ames 试验的一些假阳性结果。此外,诱导检测法只用一组菌株就可检测许多不同类型的化合物,尤其成份复杂的混合物潜在致癌活性。由于大多数致癌物质均能诱导溶源性大肠杆菌释放 λ 噬菌体,所以诱导检测法作为遗传毒物的预警系统初筛潜在致癌危险的物质,具有经济、快速、灵敏、准确等特点,如能配合其它测试系统,这对环境诱变剂的研究无疑是一种极为有用的手段。

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大气中甲酸和乙酸测定方法研究

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摘要 本文研究了一种用红色担体经强碱(KOH)处理作为吸附的载体,去离子水超声浸取,离子色谱法分析测定大气中甲酸和乙酸的方法。对固体吸附管的特性进行了实验室内模拟及野外研究。在采样体积为 2.4m³ 时,该法对大气中甲、乙酸的最低检出限分别为 0.2 μ g/m³ 和 0.4 μ g/m³。利用此法,测出北京冬季大气中甲、乙酸浓度分别为 0.5—2.0 μ g/m³ 和 0.6—8.7 μ g/m³,广州白云山春季大气中甲、乙酸浓度分别为 0.2—1.0 μ g/m³ 和 <0.4—2.0 μ g/m³,桂林市大气中甲、乙酸浓度分别为 0.37—0.4 μ g/m³ 和 0.5—1.1 μ g/m³。

自从 Galloway 等^[1]在纽约雨水中首次测到挥发性的有机酸(C₁—C₁₀)以来,许多研究^[2,3]表明有机酸是对流层大气中的重要化学组份。Keene 等^[2]在研究边远地区的湿沉降时,得出有机酸(主要是甲酸和乙酸)对降水自由酸的最大贡献为 25% 到 98%;Chapman 等^[3]在美国威士康星春季降雨中测出甲、乙酸浓度范围分别为 1.2—56 μ eq/l

和 1.9—33 μ eq/l,其对自由酸的最大贡献为 2.4—68.1%,他们认为有机酸是边远陆地地区降水的重要致酸因子。最近俞绍才等^[4]的研究初步得出树木尤其是针叶松林伴随着树叶的蒸腾作用可向大气排放甲、乙酸,这对陆地地区的降水有一定的酸化作用。总之,随

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着对酸雨致酸机制的进一步研究,有机酸尤其是可挥发到大气中的甲、乙酸的作用已受到极大重视。

大气中微量有机酸主要有两种富集方法:(1)化学反应法,即用碱性水溶液或用碱浸泡过的滤膜收集^[5]; (2)用适当吸附剂吸附的方法,如用多孔性聚合物微球(Porapak N)^[6], Tenax-GC^[7], 硅胶^[8]及用石墨化碳黑(Carbopack C)上涂有 FFAP+H₃PO₄^[9] 作吸附剂。测定有机酸的方法,目前已利用了化学色谱技术^[10]、液相色谱^[11]、气相色谱^[12]及离子色谱法^[13,14],此外还有色质联用(GC-MS)法^[14]。本文研究了一种测定大气中甲、乙酸的方法,即用红色担体经强碱处理作为富集的固体载体,去离子水超声浸取,离子色谱直接分析。并用此法实际测量了北京及两广地区大气中的甲、乙酸。

一、实 验

1. 主要试剂和仪器

(1) 试剂 红色担体(酸洗),颗粒度 40—60 目,北京化工厂; KOH, 优级纯,天津化学试剂三厂。

(2) 仪器 2010i 型离子色谱仪(IC), U. S. A. Dionex. Corp., HPICE-AS1 (9 × 250mm); H6600 超声波清洗机,无锡超声电子设备厂。

2. 固体吸附剂和固体吸附管的制备

(1) 吸附剂 称 5g KOH 于 500ml 烧杯中,加 100ml 去离子水溶解,加 45g 红色担体,混匀,于 110℃ 的烘箱中烘干。在 600℃ 的马福炉中灼烧 8h,以降低有机本底,使用前存于保干器中。

(2) 吸附管的制作 称 1g 处理过的吸附剂,装进洗净的玻璃管(内径 0.5cm,长 16cm)中,用 1cm 厚的化纤绵固定吸附剂,轻敲使吸附剂装紧,用火焰将吸附管两端封死。采样时打开两端,待采完样后,用乳胶管封死两端,装含 0.5g 吸附剂的吸附管与装含

1g 的方法同,如图 1 示。

3. 气态有机酸的发生装置及吸附管的采样方法

吸附管的收集效率和解吸效率等特性是评价吸附管的主要参数。用动态 U 型管采样装置在室内产生气态甲、乙酸^[15],模拟大气条件进行采样,如图 2。

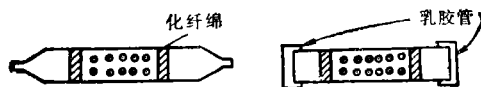


图 1 固体吸附管

采样方法:在一定流速下,将一定量的甲、乙酸标准溶液用微量注射器注入浸于 95±1℃ 恒温槽的 U 型管中,甲、乙酸在 U 型管中被气化,随着气流被吸附在吸附管中。利用在气体洗瓶中装不同饱和盐溶液来产生不同相对湿度^[16],采样系统内的湿度由湿度计直接测定。利用两支分别装有 1g 和 0.5g 吸附剂的吸附管依次联在采样气路上来观测吸附管的收集效率及相对湿度的影响。

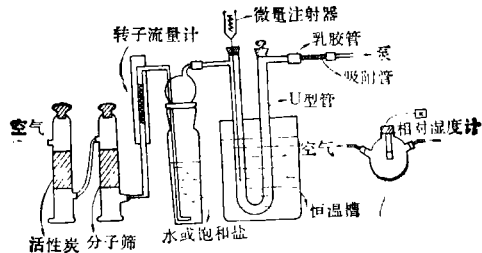


图 2 气态有机酸的发生装置

4. 样品的解吸过程和分析方法

解吸过程:将吸附管中的吸附剂取出置于 20mL 的小烧杯中,加 3ml 去离子水,超声浸取 20min,过滤,残渣洗至烧杯中,然后按同样方法浸取一次,过滤,用去离子水洗涤残渣,最后将残渣抽干,滤液合并定容 10mL,得到样品的浸取液。作该过程的解吸效率时,将抽干的残渣用去离子水洗至原来烧杯中,加入 5mL 去离子水,超声 20min,过滤,定容 10ml。该浸取方法的解吸效率定义为:

解吸率(%)=[(第一次浸取的该组分总量)/
(第一次浸取的该组分总量+第
二次浸取的该组分总量)]×100%
浸取液中的甲、乙酸浓度用离子色谱法
分析测量^[4]。

二、结果与讨论

1. 条件实验

(1) 解吸效率 用图 2 的有机酸发生装置模拟大气过程产生不同浓度的甲、乙酸, 固体吸附管收集, 去离子水超声浸取, 浸取过程如前所述。表 1 中列出了实验结果。当吸附 4.6 μg 到 127.4 μg 的甲酸和吸附 6.4 μg 到 166.2 μg 的乙酸时, 其平均解吸效率分别为 96±5% 和 93±6%, 与 Gilland 等^[8]所用的吸附管的解吸率相近。从表 1 可以看出, 第二次浸取过程得到甲、乙酸量比第一次低得多, 可以肯定其回收率较好。因解吸效率均大于 90% 以上, 能满足实验的要求。

(2) 固体吸附管的收集效率 固体吸附管的收集效率实验, 采样过程如前所述, 穿

透按下式计算:

$$\text{穿透率}(\%) = [(\text{第二支管收集的该组分量}) / (\text{第一支管} + \text{第二支管收集的该组分的总量})] \times 100\%$$

Kim 等^[16]认为当第二支吸附管上所收集的量小于总吸附量的 10% 时, 通常是可以接受的, 不算有明显的穿透; 若大于 25%, 则有明显穿透, 结果必须校正。表 2 为实验室内利用图 2 装置模拟大气条件的研究结果, 表 3 列出实际野外采样时吸附管的穿透率实验结果。在 R.H 为 22%—98%, 采样流速小于 5 l/min 时, 用装有 1g 含 10% KOH 的红色担体的吸附管吸收气态甲、乙酸时, 其穿透率均小于 10%, 可满足实际野外测量要求。由于固体吸附管阻力比较大, 实际采样时可依动力泵的情况取小于 5 l/min 的任何流速, 一般取 5 l/min 较好。

(3) 固体吸附管样品的稳定性实验 在采样条件完全相同的情况下, 用图 2 装置平行采两个样品, 实验结果表明有机酸的 U-型管发生装置有较好的重现性, 平行样品的相

表 1 甲、乙酸在固体吸附剂上的解吸效率

酸 编号	甲 酸 (μg)			乙 酸 (μg)		
	第一次浸取总量	第二次浸取量	解吸率(%)	第一次浸取量	第二次浸取量	解吸率(%)
1	4.6	—*	90	6.4	—*	86
2	8.5	1.5	85	11.4	2.0	85
3	12.1	1.6	94	21.6	4.6	83
4	17.4	1.2	94	29.9	3.2	91
5	18.5	0.2	99	33.1	1.9	95
6	23.4	0.4	98	34.8	1.9	95
7	30.7	0.5	99	45.7	2.5	95
8	33.0	0.6	98	47.5	1.5	97
9	69.4	1.2	98	99.0	3.2	97
10	83.8	0.7	99	158.6	2.5	99
11	118.0	1.5	99	152.9	3.2	98
12	127.4	1.5	99	166.2	2.3	99
平均值	96±5%			93±6%		

* 用分析的最低检出限代人

表 2 在不同采样流速及 R.H. 下的穿透率

编号*	HCOOH		CH ₃ COOH		实验条件	
	收集量 (μg)	穿透率 (%)	收集量 (μg)	穿透率 (%)	R. H.	采样流速 (l/min)
{L ₁ L ₂ }	10.7 —	—	21.8 1.9	8%	22%	1.5
{L ₃ L ₄ }	16.4 —	—	27.7 1.5	5%		
{L ₅ L ₆ }	35.5 —	—	51.5 —	—		
{L ₇ L ₈ }	99.7 —	—	123.4 —	—		
{L ₉ L ₁₀ }	7.9 —	—	11.4 —	—		
{L ₁₁ L ₁₂ }	14.7 —	—	22.1 —	—	61%	1.5
{L ₁₃ L ₁₄ }	42.4 —	—	65.1 —	—		
{L ₁₅ L ₁₆ }	70.8 1.0	1%	111.4 —	—		
{L ₁₇ L ₁₈ }	9.2 —	—	13.4 —	—		
{L ₁₉ L ₂₀ }	17.1 —	—	32.5 0.5	2%		
{L ₂₁ L ₂₂ }	34.8 —	—	59.2 —	—	80%	0.7
{L ₂₃ L ₂₄ }	71.7 —	—	103.4 1.5	1%		
{L ₂₅ L ₂₆ }	8.7 —	—	19.1 0.6	3%		
{L ₂₇ L ₂₈ }	30.0 —	—	47.0 —	—		
{L ₂₉ L ₃₀ }	69.4 0.3	0.4%	99.0 —	—		
{L ₃₁ L ₃₂ }	127.4 1.4	1%	166 —	—	98%	1.4

* 单号为第一支管,双号为第二支管,分别装 1g 和 0.5g 吸附剂,采样时间为 30min “—”表示没有测出或没穿透

对偏差小于 10%。样品稳定性实验方法为:用有机酸发生装置在条件不变的情况下,平行采集两个固体吸附管样品,其中一个立即浸取分析,另一个则立即用乳胶管封死两端,室温保存,不避光,放置 20 天后分析,比较两个结果。由表 4 可知存放的与立即分析的样品结果偏差小于 ±10%,说明该固体采样管样品在室温和不避光的条件下存放 20 多天不会发生变化,对结果不会有明显影响。由

于吸附剂是强碱性的,可抑制微生物繁殖,且有机酸在样品中是以稳定盐形式存在,估计在更长时间保存也会保持稳定,因而该固体吸附管适合野外采样。

2. 北京及两广地区大气中有机酸的实际情况测量

(1) 野外采样的平行性及该法的最低检出限 为了说明实际测量中数据的可靠性,用两支吸附管同时进行大气采样,两个样品

表 3 吸附管穿透率的野外实验

采样地点和时间	吸 附 管	流速(l/min)	R.H%	HCOOH(μg)		CH ₃ COOH(μg)	
				收集量	穿透率	收集量	穿透率
北京大学技物楼 1988.1.21,9:00—18:00	{第一支管 第二支管}	5	21	1.2 —	—	4.6 —	—
北京大学技物楼 1988.1.27,9:00—18:00	{第一支管 第二支管}	5	22	2.1 —	—	5.0 —	—
广州白云山 1988.3.15,8:00—18:00	{第一支管 第二支管}	5	94	1.8 —	—	— —	—

“—”表示没有测出或没有穿透

表 4 固体吸附管样品的稳定性

平行样编号	采样日期	分析日期	收集量 (μg)		相对误差(%)	
			HCOOH	CH ₃ COOH	HCOOH	CH ₃ COOH
{L ₁ L ₁ '}	1988 年 1 月 12 日	1988 年 1 月 12 日	8.7	17.5	-2	0
	1988 年 1 月 12 日	1988 年 2 月 1 日	8.5	17.5		
{L ₂ L ₂ '}	1988 年 1 月 12 日	1988 年 1 月 12 日	17.0	29.4	-2	0.6
	1988 年 1 月 12 日	1988 年 2 月 1 日	16.7	29.5		
{L ₃ L ₃ '}	1988 年 1 月 12 日	1988 年 1 月 12 日	34.5	52.5	1	7
	1988 年 1 月 12 日	1988 年 2 月 1 日	35.0	56.4		

分别进行分析,比较其结果。表 5 中列出所进行的三天野外平行采样的分析结果。从中可知两台采样泵采集的吸附管样品所测到大气中甲、乙酸量的百分偏差小于 $\pm 10\%$,说明该野外采样的平行性较好,满足观测的要求,利用本法测得的大气中甲、乙酸浓度是可靠的。

当大气采样体积为 2.4m^3 时,即采样流速为 5l/min ,采样时间为 8h ,根据离子色谱法测定的最低检出限可以算得本法对大气中

甲、乙酸的最低检出限分别为 $0.2\mu\text{g}/\text{m}^3$ 和 $0.4\mu\text{g}/\text{m}^3$ 。

(2) 实际大气测量结果 我们利用此法测量了北京冬季大气中(地点:中关村北京大学技物楼前)及广州白云山和广西桂林市春季大气中甲、乙酸浓度,表 6 给出了测量结果。由于在采样过程中,吸附管前没有加滤膜,因而,本法测得实际上应为大气中气态的有机酸及颗粒中的有机酸及其盐类的总和。北京在 12 月到 1 月份是燃煤采暖季节,空气中

表 5 野外采样的平行性(地点:北大技物楼前)

采样时间	采样编号	采样总体积 (m^3)	大气中有机酸测量结果 ($\mu\text{g}/\text{m}^3$)		两个样品相对偏差(%)	
			HCOOH	CH ₃ COOH	HCOOH	CH ₃ COOH
1988 年 1 月 19 日	台 1	2.18	2.00	8.23	3	3
	台 2	2.18	2.06	8.50		
1988 年 1 月 20 日	台 1	2.63	1.50	8.61	5	3
	台 2	2.63	1.58	8.85		
1988 年 1 月 27 日	台 1	2.1	1.01	2.36	6	7
	台 2	2.1	1.07	2.21		

表 6 北京、广州白云山及桂林市大气中有机酸的浓度

采样地点	采 样 时 间	采样总体积 (m ³)	$\overline{R.H}$ (%)	大气中有机酸测量 ($\mu\text{g}/\text{cm}^3$)	
				HCOOH	CH ₃ COOH
北京大学技物楼	1987 年 12 月 26 日 12:30—17:30	2.6	58	1.2	3.0
	1988 年 1 月 19 日 10:00—18:00	2.2	20	2.0	8.4
	1988 年 1 月 20 日 9:00—18:15	2.6	22	1.5	8.7
	1988 年 1 月 21 日 9:00—18:00	2.3	21	0.53	2.1
	1988 年 1 月 27 日 9:00—18:00	2.1	22	1.0	2.3
	1988 年 1 月 28 日 9:00—18:00	2.4	21	0.93	0.64
广州白云山顶	1988 年 3 月 11 日 8:00—18:00	2.7	92	0.50	0.80
	1988 年 3 月 12 日 8:00—18:00	2.7	90	0.2	2.0
	1988 年 3 月 13 日 8:00—19:00	1.1	90	0.39	ND
	1988 年 3 月 13 日—3 月 14 日	2.3	92	1.0	1.4
	1988 年 3 月 15 日 8:00—18:00	2.4	94	0.74	ND
桂林市	1988 年 3 月 26 日 8:15—17:00	2.4	59	0.37	1.1
	1988 年 3 月 29 日 17:30—30 日 3:15	2.3	56	0.40	0.96
	1988 年 3 月 30 日 5:30—16:30	2.4		0.37	0.45

ND: 没有检出

煤尘较多,采样时发现吸附管前段明显变黑,其颗粒物的影响可能较大。而白云山颗粒物中有机酸浓度很低^[4],其测得大气可能基本为气态的甲、乙酸浓度。测得北京冬季大气中甲、乙酸浓度分别为 $0.53\text{--}2.0\mu\text{g}/\text{m}^3$ 和 $0.64\text{--}8.7\mu\text{g}/\text{m}^3$;广州白云山山顶上春季大气中甲、乙酸浓度分别为 $0.2\text{--}1.0\mu\text{g}/\text{m}^3$ 和 $<0.4\text{--}2.0\mu\text{g}/\text{m}^3$ 。桂林市大气中甲、乙酸浓度分别为 $0.37\text{--}0.40\mu\text{g}/\text{m}^3$ 和 $0.45\text{--}1.1\mu\text{g}/\text{m}^3$ 。这些结果与 Brocco 和 Tappa^[13]用碱膜所测的大气中,甲、乙酸浓度分别为 $0.02\text{--}1.16\mu\text{g}/\text{m}^3$ 和 $0.33\text{--}4.08\mu\text{g}/\text{m}^3$ 是相近的。

三、结 束 语

本方法用装有 1g 含 10%KOH 红色担体的固体吸附管收集大气中的有机酸,该吸附管具有较好的收集效率和解吸率,且稳定性较好,适用于野外采样。同时,本法所用的吸附管制作简单,便于携带,试剂易购买,且去离子水起声浸取效率高,离子色谱分析方

法的前处理既简单又易操作,是值得推广应用的方法。

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测定大气颗粒物中金属元素的样品前处理方法比较

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摘要 本文对测定大气颗粒物中金属元素样品的前处理方法: 硫酸-灰化法, 常压混酸消解法, 高压消解法, 索氏提取法进行了探讨. 测定了 Cu, Pb, Cd, Cr, Be, Co, Ni 元素, 对各方法的空白值, 精密度、准确度, 以及样品测定等进行了对比与评价.

微量元素与人体健康已引起人们普遍关注, 目前国内广泛开展了这方面的研究. 但由于大气中微量元素含量低, 测定有一定难度. 本文对国内外目前广泛使用的几种样品前处理方法: 硫酸-灰化法^[1], 常压混酸消解法^[2], 高压消解法^[3], 索氏提取法^[4], 就其空白值、回收率、精密度, 以及样品测定对照分析进行了实验比较, 并对各法作出初步评价. 认为: 高压消解法具有仪器设备简单, 操作容易, 试剂用量少, 精密度好, 准确度高等优点, 是大气颗粒物中金属元素测定较理想的前处理方法. 常压消解法若精心操作, 防止沾污, 也是简单易行的方法.

一、实 验

1. 主要仪器试剂

样品采集设备: KB-120D 型空气采样泵 (青岛崂山) 过氯乙烯滤膜 (遵义化工厂)

样品前处理仪器设备: 聚四氟乙烯、不锈钢高压消解瓶、石英坩埚、索氏提取器、四氟坩埚、电热板、马福炉、干燥箱、四-六联电热炉等.

测试仪器: 日立 170-70 型塞曼效应原子吸收分光光度计.

试剂: HNO_3 、 H_2SO_4 、 HClO_4 、 HCl (均为优纯) HF (超纯).

2. 操作步骤

采集样品体积一般 20—30m³. 样品前处理方法 (个别略有改动) 如下.

(1) 硫酸-灰化法^[1] 样品膜置入石英坩埚, 加 2mL 0.7% H_2SO_4 , 玻棒搅拌使样品充分润湿, 浸泡 1h, 然后电热板上加热小心蒸干, 将坩埚置马福炉 400±10℃ 加热 4h, 至有机物全部灼烧尽停止加热, 冷至室温. 再加 1mL HNO_3 及少量去离子水, 小心加热转入四氟坩埚, 加 4—6 滴 HF , 在电热板上 (铺石英砂) 小心加热至尽干, 用 0.01 mol HNO_3 溶解, 转移定容 15mL.

(2) 常压消解法^[2] 用不锈钢剪刀将样品膜剪成小块, 放入 200mL 三角瓶中, 加 2mL H_2SO_4 , 8mL HNO_3 , 瓶口放置小玻璃漏斗, 在电热板上加热至膜完全炭化, 取下冷却. 用水吹洗瓶壁, 再加入 3mL HNO_3 , 2mL HClO_4 , 继续加热至溶液清亮 (炭末除尽再加 HNO_3 , HClO_4), 取下漏斗, 将溶液蒸至冒 SO_3 白烟, 近干, 冷却, 加 0.1mol HNO_3 少许, 微热使残渣溶解. 转移定容 15mL.

(3) 高压消解法^[3] 将样品膜置入四氟乙烯瓶, 加入 HNO_3 2mL, H_2SO_4 , 0.5mL, HF 1mL, 拧紧不锈钢外套, 置入干燥箱于 190±5℃ 保温 3h 左右, 冷却后取出四氟瓶置铺有石英砂的电热板上敞口加热, 先缓慢

Shanghai): *Chin. J. Environ. Sci.*, 11(3), 1990, pp. 24—27

It has been proved that there is a root microecosystem in the process of dyeing wastewater treatment by the hyacinth. With four days' retention, the percentage of COD removal in the oxidation tank, where the hyacinth was planted and its root sterilized with chloride, was 13%. However the percentage of COD removal in ordinary biological oxidation pond without the hyacinth was 15%. In comparison with this, a water hyacinth oxidation tank without sterilization showed higher COD removal percentage of 35% due to existence of a root microecosystem. Similar results were obtained when wastewater containing PVC, detergent and some dyes were treated with the three methods mentioned above. Some organic compounds that could scarcely be absorbed by the hyacinth, for example, those easy to be coagulated or flocules, could be stuck and fixed on the root surface, and then degraded by the root microecosystem.

The Toxicological Effect of Cr (VI) on Chlorophyll and Iron Contents and Activities of Some Enzymes in the Leaves of Pepper (*Capsicum annuum*). Zhou Yiyong, Liu Tongchou, Deng Boer (Dept. of Soil and Agrochemistry, Huazhong Agricultural University, Wuhan): *Chin. J. Environ. Sci.*, 11(3), 1990, pp.28—29

The toxicological effect of Cr(VI) on some biochemical parameters in pepper were studied both in soil culture and in nutrient cultural experiments. The treatments of the heavy metals decreased fresh weight and promoted senescence of the pepper plant by decreasing chlorophyll and activities of superoxide dismutase and catalase as well as increasing iron content and peroxidase activity over control values.

Study on the Pretreatment of Coke-Plant Wastewater by Anaerobic Acidification. Zhao Jianfu, Qian yi, Gu Xiasheng (Dept. of Environmental Engineering, Tsinghua University, Beijing): *Chin. J. Environ. Sci.*, 11(3), 1990, pp.30—34

According to analysis of the constituents and concentrations of organic pollutants in wastewater at Beijing Coke Plant using combined gas chromatography and mass spectrometry (GC/MS), the effect of anaerobic acidification on the bio-treatability of coke-plant wastewater has been studied and the possibility of using anaerobic acidification as pretreatment of aerobic treatment has also been explored. The results described that aerobic biotreatability of coke-plant effluent could obviously increase through 2—6 hours' anaerobic acidification. After 6 hours and 12 hours, anaerobic acidification, COD in the effluent could be removed by 91%, i.e. removal rate increased about

40% more than that without applying anaerobic acidification. As the influent COD of the wastewater was 1780 mg/L, the effluent COD removed to 158 mg/L.

Preparation of Polyaluminum Chloride with Sulfate Ion and Study on Its Properties.

Gao Baoyu et al. (Environmental Science Center, Shandong University, Jinan): *Chin. J. Environ. Sci.*, 11(3), 1990, pp. 34—37

Polyaluminum chloride with sulfate ion (PACS) has been prepared by using aluminum hydroxide, hydrochloric acid, sulfuric acid and sodium carbonate as raw materials, and the properties of PACS have also been studied. The factors affecting the flocculating effect of PACS have been investigated. The experimental results show that the flocculating effect of PACS is influenced by the amount of sulfate ion in PACS, basicity of PACS and pH of water solution. When the molar ratio of Al^{3+} to SO_4^{2-} is in the range of 15 to 17, the flocculating effect of PACS is best.

Problems on Yellow-Colouring of the Wastewater Treated with the Coagulant, Ferrous Salt. Guan Xijun, Wang Fei (Dept. of Environmental Engineering, Qingdao Institute of Architectural Engineering): *Chin. J. Environ. Sci.*, 11(3), 1990, pp.38—40

When ferrous salt is used as a coagulant to treat wastewater, if there exists superfluity in the process of coagulation to sedimentation, purged water will be clear. However, When the purged water is laid aside, it becomes turbid and turns to yellow-colouring. The reason is that oxygen in the air has dissolved in it as time goes on. The authors have proposed a measure to control the phenomenon that a higher pH or an optimal quantity of the mixed coagulant paralleled with tests can avoid color changing.

Application of Inductest in Research of Environmental Mutagens. Ruan Cuicai et al. (Guangxi Cancer Institute, Nanning): *Chin. J. Environ. Sci.*, 11(3), 1990, pp.41—43

The possible mutagenic activity of 35 different chemicals has been tested with inductest, in which S_9 mixture was used as a metabolizing system. The results showed that 13(37%) chemicals had mutagenic activity, 10 of these chemicals gave positive reaction in inductest in the presence of S_9 mixture, three chemicals gave positive reaction in inductest in the presence of S_9 mixture or without it. Some of the chemicals are known as potent mutagens and carcinogens (aflatoxin B_1) or anticancer drugs (mitomycin C). It is considered that inductest is an effective method in research of environmental mutagens.

A Study on Determination of Formic and Acetic Acids in the Atmosphere. Yu Shaocai,

Bi Mutian Li Xin(Environmental Science Center, Peking University, Beijing): *Chin. J. Environ. Sci.*, **11**(3), 1990, pp.43—49

The method was based on collection of formic and acetic acids in solid sorbent tubes containing Red Chromosorb (40/60 mesh) impregnated with potassium hydrate. The analytes were desorbed with deionized water in an ultrasonic bath and analyzed via IC analysis. This method was applied successfully to determination of formic and acetic acids in the ambient air of Beijing and some areas in Guangdong and Guangxi provinces. In the case of 2.4 m³ sample gas volume, the minimum detectable concentrations were about 0.2 µg/m³ and 0.4 µg/m³ for formic and acetic acids respectively.

A Discussion of Four Pretreatment Methods of Analysing Elements in Atmospheric Particulates. Li Zhensheng, Lang Yongshe (Environmental Protection Institute of the Ningxia Hui Autonomous Region, Yinchuan): *Chin. J. Environ. Sci.*, **11**(3), 1990, pp.49—53

This article presents a discussion on four pretreatment methods of analysing metal elements in air particulate samples. In determination of Cu, Pb, Cd, Cr, Be, Co and Ni, the four methods that are sulfate-ash method, acid mixture digestion, high pressure wet digestion and Soxhlet's extraction have been compared. The results demonstrate that the method of high pressure wet digestion with low blank is easy to handle and has a desirable precision (CV% 2.3—7.1%) and high recovery (91—117%).

Determination of Volatile Rates of Organic Compounds in a Simulated River Ecosystem. Zhao Yuanhui, Lang Peizhen, Long Fenshan (Dept. of Environmental Science, Northeast Normal University, Changchun): *Chin. J. Environ. Sci.*, **11**(3), 1990, pp.53—57

Studies were carried out in a simulated river ecosystem for determination of volatile rates of 37 kinds of organic compounds. The results showed that volatile process of organic compounds was in line with first-order kinetics. Volatile rate constants were predicted with modified two-film mass transfer model. The predicted constant values approach the values determined practically. In addition, the methods for determining and estimating parameters have been introduced in this paper.

Some Viewpoints on Constructing Dual Water System in Hotels. Shen Guanfan (Beijing Municipal Institute of Environmental Protection): *Chin. J. Environ. Sci.*, **11**(3), 1990, pp.58—63

This article describes that in order to ease urban water supply, Beijing Municipality has provided that dual water system should be constructed in the newly-built hotels for treating and reusing a partial sewage on the spot. In China some water-short cities have been constructing dual water system one after another. According to researches and practice concerned, the author makes a

suggestion in the following aspects: the importance of constructing dual water system; choice of treatment process adapted to different sewage; technical and economic assessment of the system, and implementing the system in a planned way.

Study on Environmental Capacity of a Tidal River. Zheng Yingming, Gao Jianqun (Hohai University, Nanjing): *Chin. J. Environ. Sci.*, **11**(3), 1990, pp.63—69

This paper introduces a methodology on computing environmental capacity of a tidal river in variable conditions of water quality. The main factors affecting the capacity of a tidal river, design of the key factors for computation, a suitable calculating method have been discussed. Finally, a case study has been performed with the hydrologic data of the Suzhouhe River (Shanghai) and the result shows that the method is rational.

An Investigation on Community Response to Environmental Vibration. Tu Ruihe et al. (Beijing Municipal Institute of Labour Protection, Beijing): *Chin. J. Environ. Sci.*, **11**(3), 1990, pp.70—73

Based on the investigations into environmental vibration caused by industrial machines in five cities in China, the paper analyzes the community responses in terms of subjective evaluation. The annoyance percentage increases with the Z-weighted vibration level and tendency behaves in the shape of S. The annoyance thresholds calculated by the u-test, the principle of psychological physics and turning point of the S-shaped curve are in the range from 70 to 76 dB(Z-weighted vibration level). The results have provided the national standard "GB10070-88 Standard of Environmental Vibration in Urban Area" on this basis.

Application of Photoionization Detector to Gas Chromatography. Jing Shilian et al. (Research Center for Eco-Environmental Sciences, Academia Sinica, Beijing): *Chin. J. Environ. Sci.*, **11**(3), 1990, pp.84—86

This paper describes gas chromatography with photoionization detector to be applied in three fields: analysis of environmental samples, detection of drugs and identification of specific organic compounds. The instrument has its remarkable features with high sensitivity, low detection limit and selective measurements. The GC with PID has been designed and made by the authors.

A New Type of Hydrogen Fluoride Generator. Wu Changnian, Chen Shuyuan (Jiangsu Institute of Botany, Nanjing): *Chin. J. Environ. Sci.*, **11**(3), 1990, pp.87—91

Reported in this paper is a new type of HF generator which has been developed in Jiangsu Institute of Botany in 1989. The process of producing HF is substantially improved in the generator, so that HF solution of a specified concentration can be vaporized at a high temperature to form HF gas of a desirable concentration. The generator is suitably applied to the field experiments with the open-top chamber.