监测与分析

应用凝胶渗透色谱净化土壤样品

孙思恩 刘秀芬

(中国科学院生态环境研究中心,北京 100085)

摘要 本文报道应用凝胶渗透色谱 (GPC) 净化环境样品的研究结果. 选择 Bio-Beads SX-3 凝胶树脂作柱填料. 根据 US EPA 对 GC 和 GC/MS 方法分析环境样品质量控制的要求,配制两种标样: 定量测定用的内标物和代用样品的混合溶液以及由 71 种目标化合物组成的试验溶液. 应用精制玉米油、五氯酚和双(2-乙基己基)邻苯二酸酯标定 GPC 柱. 对 6 种同位素标记的内标物,回收率在 95% 左右. 严重污染的环境土壤样品,净化后清澈透明. 生物大分子、植物色素以及聚合物能净化掉,但蜡状烃类 (Wax) 不能完全净化掉.

关键词 凝胶渗透色谱,土壤样品,目标化合物,净化效果.

凝胶渗透色谱 (GPC) 是一种利用有机溶剂作流动相,疏水性凝胶作为固定相(柱填料)来分离高分子混合物的一种方法. 它广泛应用于大分子化合物分子量范围测定及分离上. Frech. D. M. 等人应用 GPC 研究纤维素和木质素[1], Thurman, E. M. 等应用 GPC 研究腐殖酸和黄腐酸[2], Kato, Y. 等应用它研究蛋白质,多肽及其它生物物质[3], Tshii Ya Sho 等用它净化低水平农药残留的环境样品[4].

某些天然的和合成的聚合物,甚至某些无机物与小分子和溶剂易形成胶状结构物. 它具有高含量溶剂和少量的固体物质. 其结构和性能与基质的化学性质,试剂的相对浓度以及生成凝胶时的溶度条件有关. 所形成的交联结构的孔隙度决定被分离化合物的分子量范围. 在 GPC 分离过程中,在适当的溶剂和亲有机物的凝胶柱中,非极性的分子会更近似于凝胶色谱 (GC) 中的理想的分离机理,分子渗入凝胶结构,主要取决于微孔与分子大小的比值,而与其它因素,如分子溶剂间的相互作用,或者分子与凝胶结构间的相互作用,关系很小,可以忽略. 因此 GPC 分离机理,实际上,是一种筛分排斥过程 (Size exclusion procedure).

GPC 是一种重要的环境样品的净化方法与技术. 在分析严重污染的环境样品,特别是土壤样品时,若对痕量有害物应用高效 GC 或 GC-MS 进行定量测定,则是相当困难,甚至是不可能的. 这类样品中不仅含有合成的有机物,而且也含有天然有机物,诸如脂肪、聚合物、共聚物、蛋白质、天然树脂、纤维素、病毒、甾类化合物以及其它分散的高分子化合物. 这些化合物如不有效地从样品中清除,则无法测定低含量的优先监测污染物. 而且,未经净化的样品用 GC 或 GC/MS 分析时,势必毁坏色谱柱,污染整个分析系统. 致使较干净样品再进行分析时,也无法通过质量控制 (QC) 的要求.

本文报道应用 GPC 净化严重污染环境样品的分析结果. 应用同位素标记内标物及由 71 种优先监测的化合物标准溶液研究回收率与净化效果,标定 GPC 柱,净化一个严重污染的土壤样品,并对结果进行讨论.

一、实 验 部 分

1、试剂

(1) 二氯甲烷、五氯酚、双(2-乙基己基)邻苯二甲酸酯,均属分析纯、市购.

(2) 精制玉米油,市购

(3) 内标物: 1,4-二氯苯 d-4,萘-d8,苊-d10,菲-d10,䓛-d12,苝-d12由 US EPA 提供.

(4) 由 71 种目标化合物组成的混合试验样,均由 US EPA 提供,详见表 1.

收稿日期: 1992 年 3 月 13 日

表 1　目标化合物

1	酚	37	4-硝苯酚
2	双(2-氯乙基)醚	38	二苯并呋喃
3	2-氯酚	39	2,4-二硝基甲苯
4	1,3-二氯苯	40	邻苯二甲酸二乙酯
5	1,4-二氯苯	41	4-氯苯基-苯基醚
6	苯甲醇	42	芴
7	1,2-二氯苯	43	4-硝基苯胺
8	2-甲酚	44	4,6-二硝基-2-甲酚
9	双(2-氯异丙基)醚	45	N-亚硝苯二苯基胺
10	4-甲酚	46	4-溴苯基-苯醚
11	N-亚硝基-di-n-丙胺	47	六氯苯
12	六氯乙烷	48	五氯酚
13	硝基苯	49	菲
14	异佛尔酮	50	蒽
15	2-硝苯酚	51	邻苯二甲酸二丁酯
16	2,4-二甲酚	52	荧蒽
17	苯甲酸	53	芘
18	双(2-氯乙氧基)甲烷	54	邻苯二甲酸苯基丁基酯
19	2,4-二氯酚	55	3,3'-二氯联苯胺
20	1,2,4-三氯苯	56	苯并 (a) 蒽
21	萘	57	䓛
22	4-氯苯胺	58	双(2-乙基己基)邻苯二甲酸酯
23	六氯丁二烯	59	邻苯二甲酸二正辛酯
24	4-氯-3-甲酚	60	苯并 (b) 荧蒽
25	2-甲基萘	61	苯并 (K) 荧蒽
26	六氯环戊二烯	62	苯并 (a) 芘
27	2,4,6-三氯酚	63	茚并(1,2,3-cd)芘
28	2,4,5-三氯酚	64	二苯并 (a,h) 蒽
29	2-氯代萘	65	苯并 (g,h,i) 苝
30	2-硝基苯胺	66	硝基苯-d5
31	二甲基萘	67	2-氟联苯
32	苊	68	三联苯-d14
33	2,6-二硝基甲苯	69	酚-d5
34	3-硝基苯胺	70	2-氟苯酚
35	苊	71	2,4,6-三溴酚
36	2,4-二硝基酚		

(5) 替代化合物　硝基苯-d5, 2-氟代联苯, 三联苯-d14,酚-d5, 2-氟代酚, 2,4,6-三溴酚等,由 US EPA 提供.

2、仪器

(1) 凝胶渗透色谱仪, MILTON ROY 厂出品,配有强化玻璃柱: 25mm 内径×700mm, 填充 70g BIO-Beads SX-3 凝胶,配有 254nm UV 检测器及 C1400 数据处理系统.

(2) HP-5890 气相色谱仪,氢火焰检测器 DB-5 毛细管柱,0.3mm 内径 × 30m 长.

3、实验步骤

首先要配制标定用的标准溶液 S1872501, 称取玉米油 40.00g, 五氯酚 0.800g 和双(2-乙基己基)邻苯二酸酯 0.800g,一并溶于 200ml 的二氯甲烷中.

装 GPC 柱将 BIO-Beads SX-3 凝胶用分析纯的二氯甲烷浸泡 24h, 之后将泥浆状的凝胶树脂一次填入玻璃柱内、固定在仪器上后,用事先经超声脱气后的二氯甲烷淋洗, 排除柱内残存气泡. 通过调节泵压方法,将流量调至 5.0 ml/min. 打开 UV 检测器并调至 254nm 处, 数据处理系统设在方法 1 位置, 所有参数将自动输入进去,仪器全部起动后,开始自动采集与处理数据,最后输出谱图及计算结果.

仪器稳定后,取标定溶液 S1872501 5.0ml 进 GPC, 确定这 3 种用于标定化合物的出峰时间, 每个峰相对应的化合物用 GC 或 GC-MS 确定. 之后将含有 6 种内标化合物标准液 5ml, 进样 GPC 柱, 确定其出峰时间, 这个样品中所含化合物的出峰时间基本包括了 US EPA 所规定的优先监测的半挥发性的有机污染物. 之后再取 5.0ml 的由 71 种化合物组成的,每种化合物浓度为 50ng/ml 标样溶液, 进 GPC 柱,以完全确定环境样品净化时的流分收集范围.收集流分一般在70—80ml,之后用K-D 浓缩器浓缩至1ml,为 GC 分析用. 应用 HP-5890 GC 的工作条件为: 柱箱温度35—260℃, 10℃/分程序升温;载气 (He) 2ml/min; 进样量 1 μl.

二、结果与讨论

样品 S1872501 的 GPC 图示于图 1,根据 GC 分析确定,1# 峰为玉米油,2# 和 3# 峰分别为五氯酚和双(2-乙基己基)邻苯二酸酯. 谱图表明, GPC 柱对这 3 种化合物有很好的分离效果,峰形没有拖尾,在本实验条件下, 玉米油出峰时间为 14.48min, 双(2-乙基己基)邻苯二酸酯峰出完时间为 41.63min.在两峰(1# 和 3#)之间, 就是环境样品中优先监测污染物的出峰时间,实验条件不同, 化合物流出时间也不同,

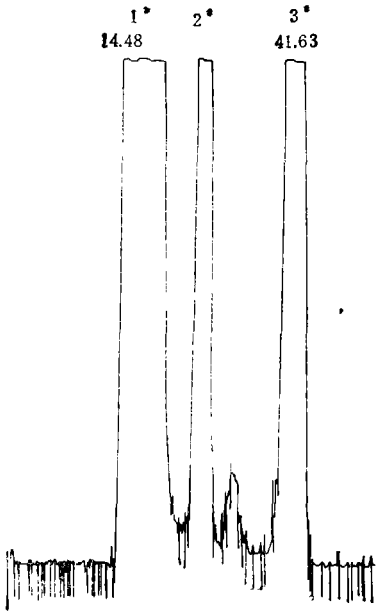

图 1　S1872501 样品的 GPC 图

但只要收集玉米油与双(2-乙基己基)邻苯二甲酸之间的流分，就可达到对目标化合物的流分收集和净化要求，而且不会损失，其它大分子化合物，天然有机物都会被净化掉.

用配制内标物(共 6 种)的混合标样，浓度为 50μg/ml，S102201，对 GPC 净化环境样品进行标定. 其中 6 种内标化合物，为同位素标记的，而且是比较稳定的化合物，它们在 71 种目标化合物的 GC 图中，较均匀的分布在这些色谱峰之间，并成为与这些内标物化学性质近似的一些目标化合物进行定量测定的依据，替代化合物则是一组稳定性差的化合物，在样品处理与分析过程中容易变化，用于分析过程中的质量控制.

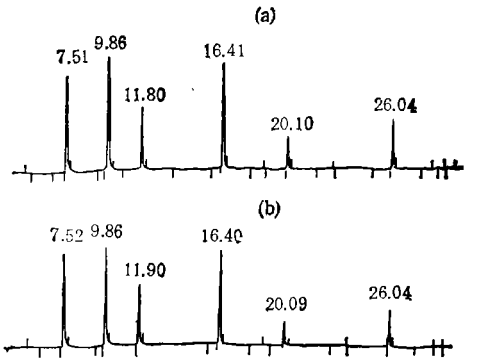

图 2　标样经 GPC 净化前 (a) 后(b)的 GC 图

为了检验上述标定的可靠性，以及 GPC 净化的回收率，将含有内标物的混合标样 S102201 1ml 进样 GPC，收集 20—35min 内的流分 75ml，浓缩至 1ml，取 1μl 进样 GC 分析，所得谱图示于图 2b. 图 2a 是未经 GPC 净化的原样.

比较图 2a 和 2b，可以看出经 GPC 净化并且收集在玉米油和双(2-乙基己基)邻苯二酸酯之间流分，其回收率在85—95%. 完全满足 US EPA 对应用 GPC 净化环境样品，回收率要达到 85% 的要求.

由 71 种目标化合物包括 6 种内标物和 6 种替代化合物配制的溶液中(每种化合物为 50

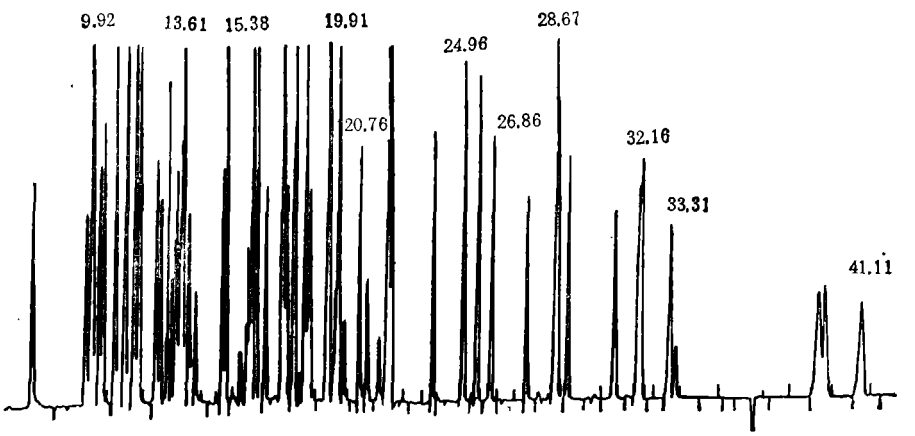

图 3　目标化合物的 GC 图

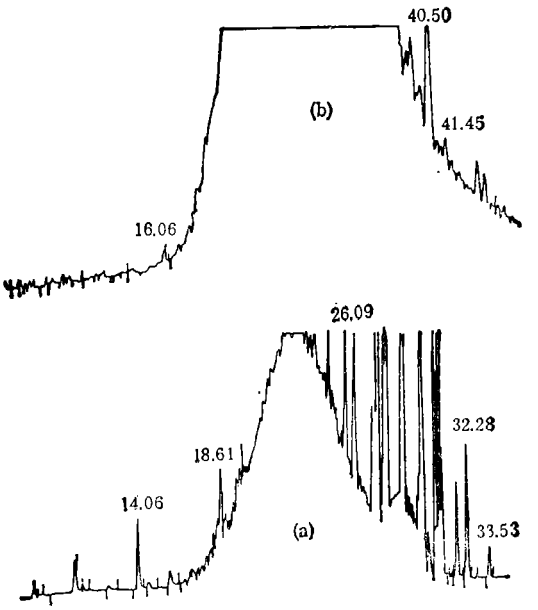

图 4　GPC 净化样品 915121# 效果比较
(a) 净化前　(b) 净化后

μg/ml) 取 1ml 进 GPC 净化，同样收集上述时间间隔内的流分 75ml，浓缩至 1ml 进 GC 分析，色谱图示于图 3. 与未经 GPC 净化的 GC 图对照，得出结论：全部 71 种目标物都包含有这段流分内. 因此应用玉米油和双 (2-乙基已基)邻苯二甲酸标定结果是可靠的.

S1942303 标样中含半挥发的碱、中性目标化合物，然而未包括在标样内的另外一些环境重要的污染物，如有机磷农药，有机氯农药和多氯联苯 (PCB'S)，有机氯除草剂，卤代烃类，其它多环芳烃，芳香胺和环酮类中绝大多数化合物，应用 GPC 都能得到良好的净化.

应用上述实验条件，研究了由 US EPA 提交的一组严重污染的土壤样品中的915121#，取土样 30g 用二氯甲烷 30 × 30 × 20ml 在超声振荡器中提取 3 次，合并提取液，经无水硫酸钠脱水后，在 K-D 浓缩器上浓缩至 5ml，进样 GPC 净化，收集相应时间间隔内的流分 75ml，再经浓缩至 1ml，再从中取出 1μl，进样 GC-5890，该样品经 GPC 净化前后的 GC 分析结果分别示于图 4a 和 4b. 谱图 4(a) 表明，一个非常脏的样品，不经 GPC 净化，无法用 GC 或 GC-MS 分析，即使高倍数稀释(如 500 倍)，勉强用 GC 分析，也导致要想鉴定的那些痕量污染物稀释到仪器灵敏度以下，并且这种稀释办法也根本不可能通过质量控制这一关. 未净化的样品处理前呈浓酱油色、粘稠，将 5ml 样品进 GPC 柱，样品在柱内展开后呈现各种色带，有明显的萤光. 净化后的样品，清澈透明(略带黄色，1μl 进 GC 后，得 GC 图示于图 4(b). 样品得到很大程度的净化，去掉了一些色素，生物大分子，聚合物等，但仍保持着一个

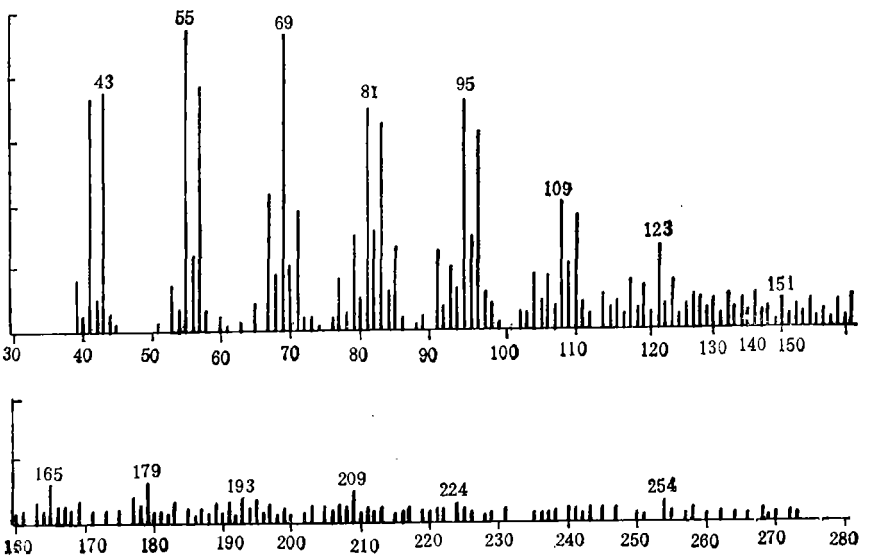

图 5　山峰的 EI-MS 图

山峰，其它污染物峰出现在这个山峰上，经质谱分析这个山峰是由烃类产生的，属于蜡状物质(Wax)．在峰的不同位置取 MS 图，得相似的谱图，基中一张 MS 图示于图 5．由于峰宽大，而且出峰时间又概括了绝大多数目标化合物出峰时间，给未知目标化合物的鉴定造成困难，而这系列不被 GC 分开的蜡状烃类，广泛存在于严重污染的各类环境样品中．本研究结果表明，凝胶 Bio-beads SX-3 对净化色素，生物大分子，聚合物等是十分有效的，但不能完全净化掉石蜡类污染物．

参 考 文 献

1 French D M, Nauflett G W. *J. Liq Chromatogr.* 1981, 4: 197

2 Thurman E M, Malcoles R L. *Enuiron. Sci Technol.* 1981, **15**: 463

3 Kato Y, Komiya K, Sasaki H, Haxhimetio T. *J. Chromatogr.* 1981, **211**:383

4 Ishii Yasuo, Adachi, Noriyoshi. *Nippon Nayaku Gakkaishi.* 1990, **15** (2):225

大气环境中气相和颗粒相上酞酸酯的分析

仝 青　乌 兰　冯沈迎　高春梅　阮玉英

(内蒙古环境保护科学研究所，呼和浩特市 010010)

摘要　本文选用聚氨基甲酸酯泡沫塑料 (PUFP) 吸附块和玻璃纤维滤膜 (GF) 构成大气全态采样头，捕集大气中气相和颗粒相中酞酸酯化合物，样品经提取分离后用气相色谱 (GC) 进行测定．以呼和浩特市居民区和草原对照区为采样点，分析夏冬两季大气中酞酸酯 (DNBP 和 DEHP)．结果表明，冬季大气气相中，DNBP 和 DEHP 平均浓度为 0.46 和 1.89μg/m³，夏季为 2.19 和 1.82μg/m³；大气颗粒物相，冬季平均为 1.34 和 1.66μg/m³，夏季为 0.51 和 0.36μg/m³．夏季大气气相酞酸酯含量高，冬季大气颗粒相酞酸酯含量高．草原对照区大气颗粒物上 DNBP 和 DEHP 的平均浓度为 0.17 和 0.14 μg/m³，夏季为 0.23 和 0.10μg/m³．DNBP 和 DEHP 在大气全态中的总含量冬季和夏季较为接近．

关键词　酞酸酯，气相和颗粒相，GC．

酞酸酯类化合物普遍存在于环境大气的飘尘、河流和土壤中[1]，环境中多数酞酸酯是由人类活动的各种污染源所造成的，此外还有自然界产生的[2]．据文献报道，酞酸酯自 1920 年合成以来，在环境中的污染逐年上升，现已成为全球性环境污染物．80 年代初，美国毒理实验报告证实了酞酸二异辛酯 (DEHP) 可引起肝癌[3]，从此以后，国外有关部门开始对酞酸酯的毒性和对生态环境的影响进行了更深入的研究．

目前，我国对酞酸酯污染环境的研究不太多，只有少量资料专门探讨这方面研究[4,5]．本文在前人研究基础上，对大气飘尘中气相酞酸酯进行分析测定，并探讨了季节变化中酞酸酯 (DNBP 和 DEHP) 在气相和颗粒相的分布规律．

一、实　验

1. 采样地点与方法

采样地点和时间　选呼和浩特市小召为居民点，内蒙达茂旗草原(海拔 1500m，极少有人烟)为清洁对照点．分别于 1990 年元月和 8 月进行大气全态采样．采样高度距地面约 5m 左右．每张 GF 滤膜和三块 PUFP 吸附块，在采样流量为 100L/min 条件下，采集 30—40 min．每天 24h 间歇式连续采样 12 个，然后将每天采集的 12 个样合为一个，代表一天的样品．1990 年 1 月 18、19、20 日，8 月 17、18、19 日在市区采样，3 月 4、5 日，9 月 15、16、17 日在草原达茂旗点采样．

2. 大气全态采样器

根据文献[6]提供的“大气全态采样器”采

Abstracts

Environmental Engineering East China University of Chemical Technology, Shanhai 200237): *Chin. J. Environ. Sci.*, 1992, **13**(5), pp. 50—52

This paper describes the study on the effects of sulfate ion on the anaerobic biological treatment of wastewater under controlled or uncontrolled sulfide concentrations. A continually operated upflow anaerobic sludge bed (UASB) experimental reactor was used. It was found that sulfate ion itself is non toxic to anaerobic biological process. However, sulfate could be reduced to hydrogen sulfide which is toxic to the bacteria. When ferrous ion was used to control the concentration of hydrogen sulfide, sulfate did not exert any harmful effect on the removal efficiency of organic matter from the waste water and the gas producing rate, but it caused the gradual decrease of CH_4 content in the produced gas and methane yield and the increase of the yield of carbon dioxide as increasing the concentration of sulfate ion.

Key words: sulfate, anaerobic biological treatment, methane, wastewater.

A Study on the Strategy of the Utilization of Coal Fly-Ash Resources in Nanjing Area. Zuo Wensheng (Communication Planning and Designing Office of Zhenjiang, Nanjing 210003). Ye Liansheng (Department of civil Engineering, South-East University, Nanjing): *Chin. J. Environ. Sci.*, 1992, **13**(5), pp.53—57

This paper analyses the strategy, restrictive factors and policies of the utilization of coal fly-ash resources in Nanjing area by using systems engineering and decision-analysis method of operation research. A series of measures was put forward. This may lay a scientific foundation for the municipality of Nanjing to formulate the policy in the management of coal fly-ash in this area.

Key words: coal fly-ash strategy, hierarchcal analysis.

Changes of Ecological Environment in the Shiyanghe River Basin and Measures Proposed for Rational Utilization of Water Resources. Hou Yinwei, Li Shengcai, Wang Changming, Zheng Yi (Changchun college of Geology Science): *Chin. J. Environ. Sci.*, **13**(5) 1992, pp. 58—66

The authors present a new viewpoint that deterioration of ecological environment in the arid region the Shiyanghe River basin of northwest China, has originated from three causes: (1) people put undue emphasis on surface water controlling, and neglected the regulative function of natural ground water reservior; (2) water for farmland use was stressed but water for oasis use was neglected; (3) the backward way of irrigation leads so far to serious waste of water resources. In order to solve the problem, a proposed multi-goal decision-making model has been built for managing rational use of water resources in the Shiyanghe River basin. In this model, as the basin is divided into 16 sub-districts, the quantity of water for both oasis-farmland ecosystem and vegetation ecosystemn necessities is considered as a main variable, and integrates with economic development. the investment of water resource development, amelioration of ecological environment etc 9 goals to be regarded. The result of the model operation shaws that deterioration of ecological environment in the basin will be in effective control.

Key Words: the Shiysnghe River basin, management of water resources, arid area, decision-making model

Sulfur Dioxide Removal from Flue Gas by Means of Active Carbon Catalysis——Dynamic Adsorption of SO_2 on Catalyst. Zhao Xiusong et al.(Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023): *Chin. J. Environ. Sci.*, 1992, **13**(5), pp. 67—70

Influence of the main component (O_2 and water steam) in flue gas on the amount of adsorption and the dynamics of adsorption of SO_2 on active carbon catalysts were studied by flow method. It was found that when the content of O_2 is about 5% (V%) and the content of water steam is about 8%, adsorption amount of SO_2 on the catalyst reached the maximum value. Adsorption dynamics of SO_2 almost exactly fit the law of Elovich. The apparent adsorption activation energy (E_a^0), Elovich parameters and the relation between adsorption activation energy and temperature were hence obtained.

Key words: active carbon, flue gas, SO_2 adsorption activation energy.

A Study on the Adsorbability of a New Separation Adsorbent for Heavy Metallic Ions. Zhu Guoyi, Zhou Yanxiu, Wang Bingwu(Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun, 130022): *Chin. J. Environ. Sci.*, 1992, **13**(5), pp. 70—73

The adsorbability of a new separation adsorbent containing sulfhydryl-activated carbon compounds for heavy metallic ions was studied. Experimental results indicate that in static state the equilibrium time for the adsorption is 1 hour for Cd^{2+} and Zn^{2+} and 1.5 hours for Pb^{2+} and Cu^{2+}. The sequence of adsorption velocity is $Pb^{2+}>Cu^{2+}>Zn^{2+}>Cd^{2+}$. When $[Mg^{2+}]<$ 200mg/L, $[Ca^{2+}]<400$mg/L and $[K^+]<350$ mg/L, the three kinds of ions do not interfere with the adsorption of Cu^{2+}. In dynamic state, the adsorbent could adsorb Hg^{2+} and Cu^{2+} ions completely under the following conditions: the amount of the adsorbent was 0.1g for Hg^{2+} or 0.15g for Cu^{2+}, pH was 0.3—8 for Hg^{2+} or 3—8 for Cu^{2+} and the velocity of flow <7 mL/min for Hg^{2+} or <10mL/min for Cu^{2+}. In addition the saturated capacity of adsorption of the new separation adsorbent is about 3—20 times higher than that of sulfhydryl cotton fiber. The adsorbent has high adsorbability and good stability.

Key words: adsorption, heavy metallic ions, new separation adsorbent.

Clean-up of Soil Sample by GEL Permeation Chromatography. Sun Sien, Liu Xiufen (Research Center for Eco-Environmental Sciences, Academia Sinica, Beijing 100085): *Chin. J. Environ. Sci.*, 1992, **13**(5), pp. 74—78

Abstracts

Chinese Journal of Environmental Science

This paper presents the results of the clean-up of environmental samples by using gel permeation chromatography (GPC). Bio-Bead SX-3 gel was selected as column packing. Two standard solutions: internal standard and surrogate standard solution, and a test standard solution of 71 target compounds were prepared based on the requirements for the analysis of environmental samples by GC-MS. The gel column was calibrated by using a purified maize oil, pentachlorophenol and Bis (2-ethylhexyl) phthalate. The recovery of six isotopelabelled standards reached 95%. The seriously polluted soil samples became clear and transparent after clean-up Biological macromolecules, plant pigments and polymers were eliminated, but wax was not completely cleaned up.

Key words: GPC, soil sample, clean-up.

Analysis of Particulate and Vapor Phase Phthalate Esters in the Atmosphere. Tong Qing et al. (Inner Mongolia monitoring Center for Environmental Protection, Huhehot 010010): *Chin. J. Environ. Sci.*, 1992, **13**(5), pp. 78—81

An air sampler composed of polyurethane foam and glass fibre filter was utilized to simultaneously collect phthalate esters both in the gas phase and on particulates in the atmosphere. The collected samples were then extracted, cleaned up and analysed with GC for phthalate esters. The levels of phthalate esters (DNBP and DEHP) in the residential areas of the city of Huhehot in winter and summer were thus determined and compared with those measured on the grasslands. Results show that the average concentrations of gas phase DNBP and DEHP in the city were determined to be 0.46 μg/m^3 and 1.89 μg/m^3 in the winter and 2.19 μg/m^3 and 1.82 μg/m^3 in the summer, respectively. While the levels of the two esters deposited on atmospheric particulates in the city were measured to be 1.34 μg/m^3 and 1.66 μg/m^3 in the winter and 0.51 μg/m^3 and 0.36 μg/m^3 in the summer compared with the low levels of 0.17 μg/m^3 and 0.14 μg/m^3 for winter time and 0.23 μg/m^3 and 0.10 μg/m^3 for summer time measured on the grassland.

Key words: air sampler, phthalate esters, air pollution.

Determination of Trace Phenol on Waste Water by Chemiluminescence. Wang Lun, Fan Foan, Yuan Hongchun (Department of Chemistry, Anhui Normal University. Wuhu 241000): *Chin. J. Environ. Sci.*, **13** (5), 1992, pp. 81—84

Trace phenol was determined by measuring phenol-quenched light emission from luminol oxidation by hydrogen peroxide. The detection limit was 200 ppb. A linear response was observed with the concentration of phenol ranging from 2.0×10^{-6} mol/L to 2.0×10^{-4} mol/L. The method was successfully applied to the analysis of several wastewater samples.

Key words: chemiluminescence, phenol.

Determination of Sulfide in Industrial Waste Water by Oscilloscopic Polarography Titration. Sun Jianhui et al. (Laboratory of Environmental Science, Henan Normal University, Xinxiang 453002): *Chin. J. Environ. Sci.*, 1992, **13**(5), pp. 84—89

Determination of sulfide in industrial waste water by oscilloscopic polarography titration was studied. In acetic acid-sodium acetate-potassium chloride base solution at pH 5.5, S^{2-} can be precipitated with standard solution of Cu^{2+} and the excess Cu^{2+} is back titrated with standard solution of oxine. Oxine gives sharp incission in the cell with one Pt-micro electrode, which can be used to indicate the end point. The colour and turbidity of the sample do not influence the determination and hence the sample needs no predistillation. The process is very simple and rapid. The relative deviation and variation coefficient are below 1.0% and 0.6%, respectively. The recovery was determined to be 97.0—103%.

Key words: oscillopolarographic titration, industrial wastewater, sulfide, oxine.

Levels of Radioactivity in the Red Mud and Red Mud Cement and Its Sendout to Local Resi dents. Wang Kunshan (Institute of Labor Protection, China National Nonferrous Metals Industry Company, Changsha 410014): *Chin. J. Environ. Sci.*, 1992,**13**(5), pp. 90—93

The levels of radioactivity in the red mud, the wastes of aluminium related industry, and in the cement made from red mud were measured and reported in this paper. The average dose rate in the red mud was estimated to be 25.9×10^{-8} Gy/h. The results show that average specific activities of ^{226}Ra, ^{232}Th and ^{40}K in the red mud are 477, 705 and 153Bq/kg, respectively. In the cement made from the red mud, the average specific activities of ^{226}Ra, ^{232}Th and K are 202, 211 and 140Bq/kg, respectively. It has been estimated that the effective dose equivalent to the local residents is 2.65—3.49 mSv/a. The annual effective dose equivalent to residents caused by the cement made from the red mud in mix construction material is 0.25mSv/a.

Key words: red mud, cement made from red mud, radioactivity levels.

中国科学院 1992 年度优秀期刊评选揭晓

《环境科学》荣获一等奖

根据《中国科学院优秀自然科学期刊奖暂行条例》和国家科委、中宣部、新闻出版署有关文件通知要求，经院优秀期刊评选委员会对申请参评的院属期刊进行认真评比，已评选出中国科学院 1992 年度优秀期刊 62 种，其中一等奖 14 种，二等奖 23 种，三等奖25种。《环境科学》荣获一等奖。中国科学院所属自然科学期刊(包括中国科协及地方主办，院内单位负责编辑的期刊)共计 260 余种。获得一等奖的还有《中国科学》和《科学通报》等期刊。

沈 颖 供稿