出國報告（出國類別：開會）

參加第30屆國際有機鹵化環境污染物及持久性有機污染物研討會（2010戴奧辛年會）報告

服務機關：行政院環境保護署環檢所、空保處、毒管處

姓名職稱：蔡清蘭環境技術師、丁培修技正、

顏子修助理毒管師

派赴國家：美國德州

出國期間：99年9月12日至99年9月17日

報告日期：99年12月15日

摘 要

本署於本（99）年核派空保處丁培修技正、毒管處顏子修助理毒化物管理師及環檢所蔡清蘭環境技術師等三員，前往美國德州聖安東尼奧 The Marriott Rivercenter 參加第 30 屆環境鹵化持久性有機污染物國際研討會(30th International Symposium on Halogenated Persistent Organic Pollutants，通稱 2010 戴奧辛年會) 。研討會會期自 99 年 9 月 12 日至 9 月 17 日，共計 6 日，本屆會議共有來自四十多個國家六百多位專家學者與會，計發表論文 641 篇，分成口頭論文宣讀及壁報論文展示二種，其中口頭宣讀 275 篇，壁報展示有 366 篇。

參加本次大會之重要心得及建議如下：

一、本次研討會之重點包括持久性有機污染物 (persistent organic pollutants, POPs) 之研究現況 Perfluorinated (PFCs)和 PBDEs 於不同基質之分佈及健康效應以及全氟辛酸（perfluorooctanoic acid ，PFOA）與全氟辛烷磺酸（PFOS）)等。其中溴化阻燃劑和全氟化物是今年大會熱門的有機鹵化環境污染物，本所已經針對多溴二苯醚類、全氟辛酸和全氟辛烷磺酸等化合物進行檢測分析，建議持續關切相關分析技術之發展趨勢與流布調查。

二、FMS 公司所展示 PowerPrep SPE 全自動萃取濃縮系統，因所需樣品體積少，分析期程快速，並可同時處理多個樣品，有效提昇前處理效率，建議本所未來採購並建置相關技術。

三、Büchi 公司固液萃取裝置 B-811，除了可以進行傳統索氏方法外，利用萃取管也有加熱裝置與玻璃閥門的設計，可以進行連續的萃取，提高萃取效率，降低萃取時間；並可以將溶劑蒸發收集於萃取管中，不回流至溶劑杯內，縮短後續濃縮的時間。此外，此裝置也提供了玻璃樣品管或是大容量的萃取管，方便放入空氣或水質採樣泡棉或其他大體積的吸附介質。若本所未來有新機採購計畫時可將其納入考量。

四、對環保署環境檢驗所而言，參與本研討會除可讓他國專業人士了解我國對於相關議題之重視程度及所做的努力外，更可透過本研習會與會中專家學

者員即時交換彼此相關資訊，亦是吸收相關領域之新知及技術交流絕佳機會，第 31 屆戴奧辛年會預定於 2011 年 8 月 21-25 日在比利時布魯塞爾（歐盟的總部）舉行，期望環境檢驗所內同仁有機會參與盛會，發表論文並吸收先進國家經驗。

五、本屆研討會爲英語系之國家，初次見識全美語生活，對於英語之聽說讀寫能力之學習與提升頗有助益，下屆研討會亦爲英語系之國家，建議同仁及早規劃英語學習計畫，俾利出國研習之應用。

目次

壹、目的

Dioxin 20XX 爲由International Advisory Board of the InternationalSymposium on Halogenated POPs 建立的非營利組織，每年舉辦國際戴奧辛研討會。戴奧辛研討會此領域之盛會，爲持久性有機污染物科學研究提供開放的公共論壇。從1990 年開始舉辦此研討會，今年已爲第30 年，其領域涵蓋有分析與環境化學、分子生物學、人體健康、風險評估與風險管理等。國際有機鹵化環境污染物及持久性有機污染物研討會（通稱戴奧辛年會）是一個重要的國際研討會，於1980年約百餘位科學家在義大利羅馬舉辦第一屆，當時的會議名稱是“International Symposium on Chlorinated Dioxins and Related Compounds”，主要是因爲當時有許多重大的污染事件，如發生在台灣和日本的米糠油事件、越南的橘劑和2,4,5-T殺蟲劑污染，以及義大利Seveso農藥廠戴奧辛外洩事件，此後每年定期舉辦研討會。隨著國際上對於持有性有機污染物的關注與認識，大會的名稱從2006年起改爲“International Symposium on Halogenated Persistent Organic Pollutants”，所討論的議題，也從戴奧辛增加到多種有機鹵化物如殺蟲劑、溴化阻燃劑與全氟化學品等等。

爲充分掌握並持續了解國際研究動向、分析技術之發展及收集最新研究資料，本所乃派員參加本（99）年於舉行第 30 屆國際有機鹵化環境污染物及持久性有機污染物研討會（2010 戴奧辛年會），除發表論文分享本所工作成果外，亦期望藉此大會吸取先進國家之經驗與其他國家專家學者交流，以提升本所分析技術使達國際水準。

貳、過程

一、 行程紀要

第 30 屆「國際鹵化持久性有機污染物研討會」 International Symposium on Halogenated Persistent Organic Pollutants (Dioxin 2010)，於美國德州聖安東尼奧市 The Marriott Rivercenter（如圖）舉行，會期自 2010 年 9 月 12 日至 17 日，共計 6 日。

日　期	地　點	工作紀要
99.09.11	台北-東京-舊金山-聖安東尼奧市-Marriott Rivercenter 會議中心	啓程
99.9.12-9.17	美國德州聖安東尼奧市	參加「第 30 屆國際鹵化持久性有機污染物研討會」
99.9.18-9.19	Marriott Rivercenter 會議中心-聖安東尼奧市-舊金山-東京-台北	返程

會議中心 Marriott Rivercenter 位於美國德州聖安東尼奧市，會場所在位處於聖安東尼奧市中心，距離機場約 30 分鐘車程，交通尚稱便利；大會地點亦與聖安東尼奧市許多著名景點相鄰，每天都可經由住宿飯店穿過市中心 River Walk、Alamo、Menger Hotel 等景點。

圖 1 大會會場- Marriott Rivercenter

圖 2 參加人員：丁培修、顏子修、蔡清蘭、謝季吟

二、　會議紀要

本次研討會台灣地區尚有行政院農業委員會農業藥物毒物試驗所李貽華組長、徐慈鴻副研究員，經濟部標準檢驗局林雅琳技士，中央大學張木彬教授、洪保正博士生、屏東科技大學謝季吟助理教授、中央研究院紀凱獻博士、國家衛生研究院王淑麗小姐以及中鋼公司林群勛先生等人參加。

大會於 9 月 12 日下午開始受理報到；而 9 月 13 至 16 日是論文及演講發表時間，會中發表之論文總數達 641 篇(包括大會專題演講)，分成口頭論文宣讀及壁報論文展示二種，其中口頭宣讀 275 篇，壁報展示有 366 篇。

口頭論文宣讀部分共分 5 個場地同時進行，每天每個場地可發表約 15 篇論文，進行方式是使用 Power Point 簡報軟體進行 15 分鐘簡報，然後接受 5 分鐘提問；壁報論文部分因數量較多，雖然是全部共同展出，但分爲兩個時段作者必須於在論文旁邊接受提問。

此次大會將儀器展示安排與壁報展示在同一展示廳且相鄰的場地，讓參觀者可以在口頭論文宣讀的休息時間同時參觀兩種展示，在儀器展示方面本次參展廠商計有 25 家，包括 POPs 標準品、參考物質供應商、前處理、分析儀器及分析技術等

廠商。相關大會議程與各主題論文宣讀之篇名及作者如附。整個大會於 9 月 17 日中午劃下完美的句點。

圖 3 大會演講廳及會議主席 Dr. Laurie Haws 開幕致詞

圖 4　壁報論文展示

圖 5　儀器展示會場

參、心得

一、本次研討會有別於以往，大會於最後一天議程中特別安排規劃特定主題（Special session topics），分別邀請 Dr. Martin Scheringer 等 4 位學者專家進行演講，並開放現場進行交流。此次參加第 30 屆戴奧辛年會，聆聽並觀看與本所業務相關之論文發表，包括目前世界各國對於各種持久性有機污染物的分析技術與污染物於環境之流布、來源、人體暴露及風險評估等，這些資訊將可提供本所目前及未來執行有關鹵化持久性污染物研究之參考依據。

二、第 30 屆國際持久性有機污染物研討會（30th International Symposium on Halogenated Persistent Organic Pollutants）本屆研討會共有 5 場大會演講，35 個主題論文宣讀以及 20 個主題論文壁報。

大會演講：

1. Indoor Exposure to PBDEs and PFCs: You!re Not Just What You Eat.
2. Ten Years of PFOS: Past, Present and Future Analytical Trends
3. Omic Examination of the Hepatic Mode of Action of 2,37,8-Tetrachlorodibenzo-p-dioxin: A Species Comparison with Risk Assessment Implications
4. Dioxin (PBDD/Fs) in Food ! Living with Regulation
5. International Regulation of POPs: Bridging the Gap Between Science and Policy

論文宣讀 Oral Sessions：

1. Dioxins and Related Compounds in Diet: Evaluation, Trends, and Risks
2. Disease Risk and TCDD Exposure Estimated from Serum Evaluations
3. Human Exposure to Fluorinated Compounds
4. Dechlorane Plus: A Recently Discovered, High Production Volume Flame Retardant
5. Advances in Analytical, Screening and Confirmatory Methods
6. Environmental Exposure to PCBs - Anniston Community Health Survey (ACHS)/PCBs and Other POPs in Schools and the Workplace
7. Advances in the Toxicology of Dioxins and POPs
8. Brominated Compounds -Fate and Transport
9. Sources of POPs
10. Risk Assessment, Management, and Regulation
11. Epidemiology of POPs
12. Flame-Retardants in a Post-PBDE World
13. Dioxin-Like Compounds in Urban Waterbodies
14. Contaminated Sites: Cases, Remediation, Risk and Policy -Part 1
15. Emission Control
16. POPs in Marine Mammals: Levels, Trends, and Effects
17. Human Exposure to Brominated Compounds
18. Current Issues Regarding Human Health Risks Posed By Dioxin Like Compounds -Part 1
19. POPs in the Environment
20. Environmental Forensics -State of Knowledge in Determining the Sources & Fate of Organohalogen Compounds in the Environment

21.Current Issues Regarding Human Health Risks Posed By Dioxin Like Compounds -Part 2

22.Emerging and Naturally Occurring Compounds in the Environment

23.Sampling Strategies, Preparation and Quality Assurance Aspects of POPs Analysis

24.Toxicology of Brominated and Fluorinated Compounds

25.Human Exposure to Dioxins and PCBs

26.Contaminated Sites: Cases, Remediation, Risk and Policy -Part 2

27.Exposures to Dioxin-Like Compounds in Soil and the Potential Impact on Human Health

28.Developmental Neurotoxi Consequences

29.New Biological Roles for the Misunderstood Aryl-Hydrocarbon Receptor

30.Fluorinated Compounds -Fate and Transport

31.POPs in Soil and Sediment

32.HBCD Part 1 -Wildlife Toxicology and Exposure

33.HBCD Part 2-Environmental Fate and Distribution

34.Global Fate & Long Range Transport

35.Perfluorinated and Brominated Compounds: Analytical Approaches and Developments

壁報論文 Poster Session s：

1.Advances in Analytical, Screening and Confirmatory Methods

2.Perfluorinated and Brominated Compounds: Analytical Approaches and Developments

3.Sampling Strategies, Preparation and Quality Assurance Aspects of POPs Analysis

4.Brominated Compounds - Fate and Transport

5.Emerging and Naturally Occurring Compounds in the Environment

6.Fluorinated Compounds - Fate and Transport

7.Global Fate & Long Range Transport

8.POPs in Soil and Sediment

9.POPs in the Environment

10.Sources of POPs

11.Human Exposure to Brominated Compounds

12.Human Exposure to Dioxins and PCBs

13.Human Exposure to Fluorinated Compounds

14.Advances in the Toxicology of Dioxins and POPs

15.Epidemiology of POPs

16.Toxicology of Brominated and Fluorinated Compounds

17.Contaminated Sites: Cases, Remediation, Risk and Policy

18.Emission Control

19.Risk Assessment, Management, and Regulation

20.PCBs and Other POPs in Schools and the Workplace

三、本次戴奧辛年會，本所發表了壁報論文 1 篇，於本研討會中之 Source, Fate and Transport, Environmental Monitoring 分組議程發表與屏東科技大學謝季吟助理教授共同合作壁報論文，題目為” Characteristics of dioxin-like compounds in leachates from landfills containing incineration residues in Taiwan.”， 壁報論文展覽期間有多位國外學者駐足論文張貼處並索取論文相關資料，顯示對於利用大體積採樣器採集戴奧辛於環境累積特性及水體戴奧辛採樣自動控制系統相當有興趣。

四、與會學者研究領域極為廣範，囿於時間限制且本所目前之工作重點為環境中污染物之檢驗分析，因此針對所參與相關主題重點及其內容整理如下：

1.由儀器商Waters 所舉辦的NewTechnology Forum Seminar2010 戴奧辛年會現場其針對 Advanced Techniques for the Analysis of Persistent alogenatedOrganics 等議題進行學術工作會議，會議進行中充分瞭解目前世界各國針對持久性有機污染物分析儀器之研發進展，並可做為未來研究之規劃參考。

2. FMS 所舉辦的”Total Solution for POP Analysis ” Workshop 。當日議題為「From Rapid Sample Preparation to Comprehensive High Resolution Mass Spectrometric (HRMS) Analysis」，主要針對快速及有效萃取水體、牛奶、食物及血液中的PCB, Pesticides, Dioxins 等相關研究進行報告，其中由加拿大等相關實驗室發表研發進展，未來可做為本所研究之規劃參考。

3.大會安排國外學者Dr. Jon Martin, University of Alberta 主講有關”Ten Years of PFOS: Past, Present and Future Analytical Trends”之專題講座(演講內容針對PFOS 及其前驅物(PreFOS)之檢測分析方法之研發及對人體實際致癌效應進行探討。Dr. Martin提到氟辛烷磺酸(PFOS)是如何直接或間接經由不同途徑(飲食、灰塵、飲水及空氣)進入人體為目前研究重點，其實最早PFOS之相關研究已經存在42年，其發展過程為學者在1968年Nature等知名期刊發表有證據顯示人體血清中有兩種型態的氟化物存在，到了1970年時由NMR光譜確定了結構。接下來2002～2004年分別在空氣中、年老長者的血液及房子灰塵中偵測到了PreFOS，在2009年PFOS和PreFOS被正式列入持久性有機物名單。Dr. Martin的演講拋出了幾個未來可以更深入了解的問題：1. PreFOS在人類和野生動物的角色為何? 2. PFOS和PreFOS的許多資訊在同分異構物來源特徵(Isomer Signature)確認上是否喪失(PFOA也有同樣情形?) 3. 如何增加PFP或PFO檢測準確度和靈敏度等問題。

4.密西根大學Dr. Tim Zacharewski 主講，題目是 “Omic Examination of the Hepatic Mode of Action of 2,3,7,8-Tetrachlorodibenzo-p-dioxin: A Species Comparison with Risk Assessment Implications”，其內容針對受世紀之毒2,3,7,8 四氯戴奧辛之動物及人體毒害特性進行長時間觀測，觀測結果顯示，不同種類之生物物種其 Ah 受器與戴奧辛鍵結反應之毒害特性亦不相同，其人體基因之反應機制亦與其他生物截然不同。其結果非常有趣，由於目前國內外相關戴奧辛毒性測試實驗，多半透過動物活體進行測試，但實際對人類之影響機制似乎需要更多研究來進一步釐清。

5.英國 The Food and Environment Research Agency學者Dr. Martin Rose.主講 “ Dioxins (PBDD/Fs) in food – living with regulation”之專題講座，其內容針對歐盟國家食品中受持久性有機污染物污染之管制措施及後續緊急因應方案有相當多的論述。會後也藉由屏東科技大學謝季吟老師協助與Dr. Rose 進行交流， Dr. Rose 與曾經到環檢所與屏東科技大學訪問過的學者Dr. Alistair Boxall 爲研究夥伴，也更熱心的承諾未來可以有更進一步的交流。

6.國際研討會的最後一天， Dr. Martin Scheringer and Laurie Haws 演講 “International Regulation of POPs: Bridging the gap between science and policy” 。另外還有 3 位學者的演講，題目分別爲(1)Dr. Derek Muir “Are current screening and assessment programs capable of identifying persistent organic pollutants among chemicals in commerce? ” 提到現行化學物質規範和 POPs 清單確認，從此化學清單去篩選時可能失敗的原因，及未來以 QSAR 爲主來進行化學物質篩選的可能性。事實上，每年美國有約 1000 種新的物質被產生，而從 1970 年代歐美國家開始禁用 DDT 到 2010 年斯得哥爾摩公約又多了 39 項禁用的 POPs，其他還包括歐盟(European Union)的 EINECS 和 ELINCS、中國的 IECS 及加拿大的 DSL 和 NDSL 清單中均列出化學物質數量的變動。而在 610 種首要化學物質分類圖中，其中

30%共 181 種含氟化合物(perfluoroalkyl alcohols, acids phosphates)裏有 73%可能是 perfluorocarboxylates and /or perfluoroalkylsulfonates ，所以未來對此類物質的掌控必須明確，才能充分了解 POPs 的變異。(2) Dr. Jim Bus from Dow Chemical 針對”Opportunities for Emerging Technologies to Impact Chemical Evaluation Policy: Building Science-Informed Decisions”之專題講座(圖 6)，其演講主題針對美國持久性有機污染物使用生物檢測技術之研究現況以及相關技術瓶頸進行深入探討，最後提出目前所急迫需要的研究爲(A)動物毒性試驗的劑量與人類暴露的連結(B)能進行環境真實濃度狀態及確實模擬劑量效應的模式或新興技術。(3) Dr. Martin Scheringer 演講“Polychlorinated biphenyls－still a challenge for science and policy”中提到在 2004 斯德哥爾摩公約已全球禁止 PCB, 但是問題似乎尙未解決, 因爲 Zurich City 檢測到來自城市中的建築物 PCB，其最高濃度出現在夜晚，預估每年都市約有 600kg 的 PCB 被釋出，顯示不斷有 PCB 從工業化地區被排出。另外，在 Uetliberg 也發現空氣中存在 PCB，在 8/24/2007~8/27/2007 三天監測中，其最高濃度出現在白天。因此提出目前當務之急爲要如何確認仍排放 PCB 的排放源或更有效控制，仍須建立持續長期監測機制。

本次大會中關於溴化阻燃劑（Brominated flame retardants，BFRs）、全氟化物（Perfluorocarbons，PFCs）和其他新興污染物的研究比例持續增加中，本所如何在未來研究議題上增加深度和廣度並與對相關領域之學者或單位互相合作，進而在國際會議上與其他國家並駕齊驅，實爲刻不容緩之議題。

五、現場儀器展示

高解析氣相層析質譜儀（HRGC/HRMS）由於靈敏度要求高、技術難度高且價格昂貴，故全世界只有 Micromass、JEOL 及 Thermo 三個廠牌的產品。今年大會各廠家並沒有的全新機種發表，Thermo 的 DFS HRGC/HRMS 在 60m 管柱時 TCDD 100 fg 的 S/N 比可輕易達到 100：1 以上，可檢測相當低的濃度（<<100 fg）、敏感度亦很高（S/N=200：1）。

圖 6 Thermo 公司的 DFS HRGC/HRMS

FMS 公司也展示了同樣是自動化的前處理設備，本所在 2005 年曾購置了該公司的自動淨化系統 Power-Pre™，該系統為並聯式的設計，可以同時進行多個樣品的管柱淨化步驟。而本次 FMS 公司展示的是 Total-Rapid-Prep™系統（如圖），除了原有的管柱淨化，更加上了加壓溶劑萃取（Pressurized Liquid Extraction, PLE）與濃縮裝置，因為其模組化的設計也可再結合 GPC 與 SPE，形成一套從萃取、淨化到濃縮的全自動化裝置。本次大會中也有相關的論文發表，如 Focant JF 等人利用此自動化裝置，針對魚肉和魚油進行 PCDDs、PCDFs 與共平面 PCBs 的分析，除了得到良好的回收率與低變異係數之外，文章中也特別強調利用這樣的自動化裝置，能夠在一個工作天之內完成樣品的前處理與得到分析報告，並且對於不熟悉戴奧辛分析技術的實驗室，也可以進行戴奧辛的檢測分析。

圖 7 FMS 公司 的 PowerPrep™ SPE System

本次年會中，Büchi 公司還展示了一套固液萃取裝置 B-811（如圖），除了可以進行傳統索氏方法外，利用萃取管也有加熱裝置與玻璃閥門的設計，還可以進行連續的萃取，以提高萃取效率，降低萃取時間；並可以將溶劑蒸發收集於萃取管中，不回流至溶劑杯內，縮短後續濃縮的時間。此外，樣品除了放置於於圓筒濾紙之外，此裝置也提供了玻璃樣品管或是大容量的萃取管，方便放入泡棉或其他大體積的吸附材質。

圖 8　Büchi Extraction System B-811

肆、建議

一、目前國內應用戴奧辛細胞快速篩檢以減少實際樣品檢測需求量之技術已趨成熟，然而對於實際結合生物快篩及化學檢測之成功案例之相關資料還是不多。荷蘭 RIKILT 花了兩年時間利用 DR CALUX○X 進行了 504 個樣品篩選，發現 72 個樣品(14%)反應高於參考樣品。而 HRGC/ HRMS 進一步確認了其中 55 個樣品(29%)超過 dioxins 或 dl-PCBs 的 AL+ML 值，但最後確認只有 5 個樣品需要管制。執行結果證實靠著正確的判斷，可以節省許多時間與人力，也能更有效的處理突發事件。

二、本次研討會之重點包括持久性有機污染物 (persistent organic pollutants, POPs) 之研究現況 Perfluorinated (PFCs)和 PBDEs 於不同基質之分佈及健康效應以及氟辛烷磺酸(PFOS)等。其中溴化阻燃劑和全氟化物是今年大會熱門的有機鹵化環境污染物，本所已經針對多溴二苯醚類、全氟辛酸和全氟辛烷磺酸等化合物進行檢測分析，建議本所持續關切相關分析技術之發展趨勢與流布調查。

三、FMS 公司所展示 PowerPrep SPE 全自動萃取濃縮系統，因所需樣品體積少，分析期程快速，並可同時處理多個樣品，有效提昇前處理效率，建議本所未來採購並建置相關技術。

四、Büchi 公司固液萃取裝置 B-811，除了可以進行傳統索氏方法外，利用萃取管也有加熱裝置與玻璃閥門的設計，可以進行連續的萃取，提高萃取效率，降低萃取時間；並可以將溶劑蒸發收集於萃取管中，不回流至溶劑杯內，縮短後續濃縮的時間。此外，此裝置也提供了玻璃樣品管或是大容量的萃取管，方便放入空氣或水質採樣泡棉或其他大體積的吸附介質。，若本所未來有新機採購計畫時可將其納入考量。

五、對環保署環境檢驗所而言，參與本研討會除可讓他國專業人士了解我國對於相關議題之重視程度及所做的努力外，更可透過本研習會與會中專家學者員即時交換彼此相關資訊，亦是吸收相關領域之新知及技術交流絕佳機會，第 31 屆戴奧辛年會預定於 2011 年 8 月 21-25 日在比利時布魯塞爾(歐盟的總部)舉行，期望環境檢驗所內同仁有機會參與盛會，發表論文並吸收先進國家經驗。

六、本屆研討會爲英語系之國家，初次見識全美語生活，對於英語之聽說讀寫能力之學習與提升頗有助益，下屆研討會亦爲英語系之國家，建議同仁及早規劃英語學習計畫，俾利出國研習之應用。

圖 9　會場互動交流-1

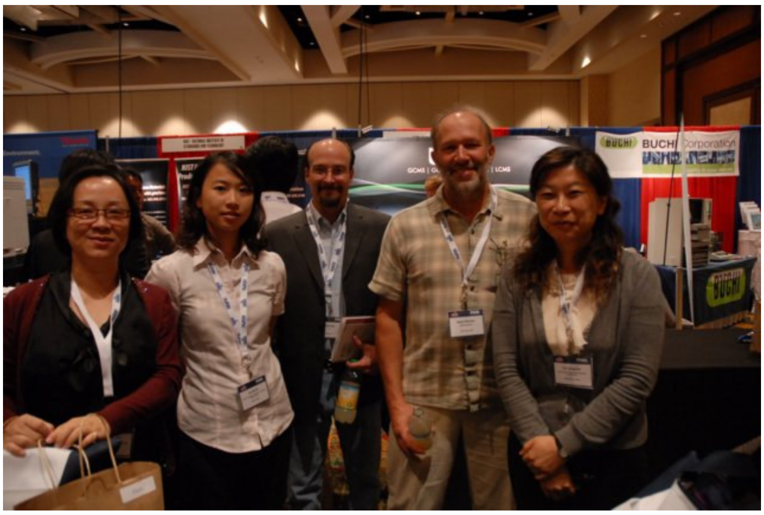


圖 10　會場互動交流-1

圖 11 會場互動交流-1

圖 12 講者爲 University of Alberta 的 Dr. Jon Martin, 講題爲 Ten Years of PFOS: Past, Present and Future Analytical Trends

圖 13 講者爲 Martin Rose from the Food and Environment Research Agency 題目 Dioxins (PBDD/Fs) in food －living with regulation

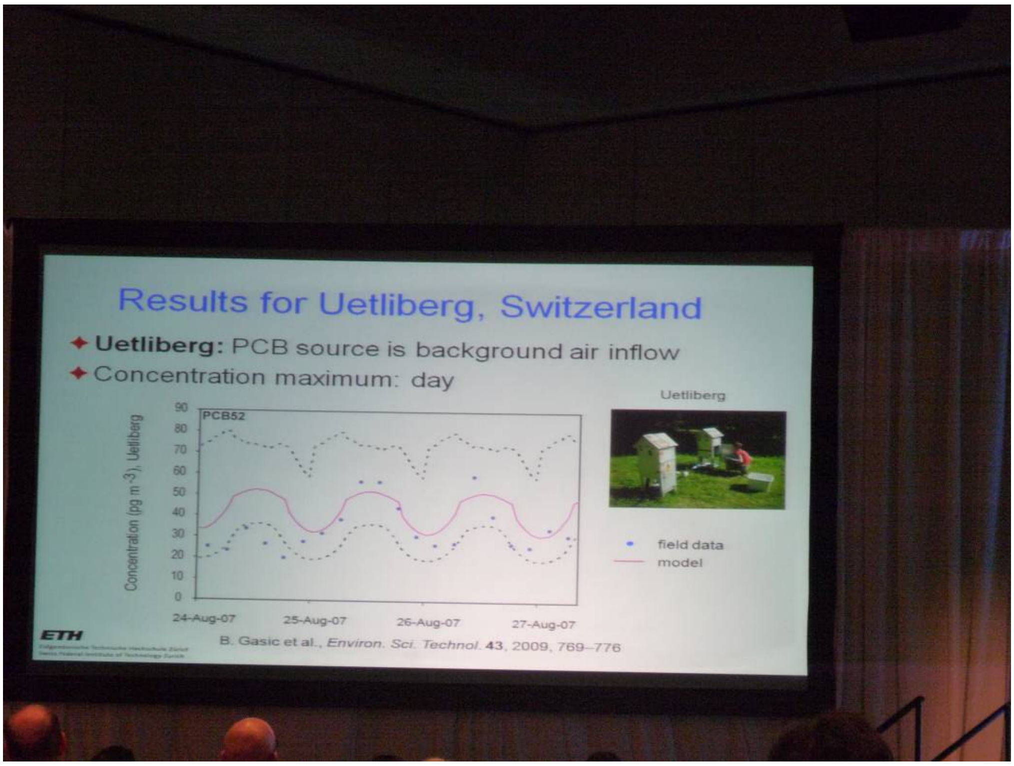


圖 14 講者爲 Dr. Martin Scheringer，題目爲 Polychlorinated biphenyls－still a challenge for science and policy

圖 15 第 31 屆環境毒性有機污染物國際研討會海報

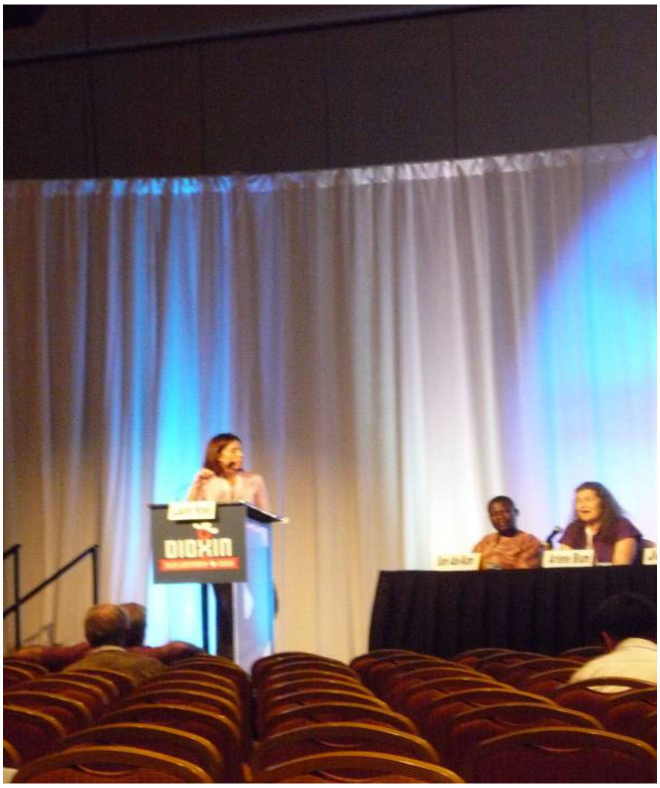


圖 16　　閉幕儀式

伍、參考資料

1、第 30 屆「國際有機鹵化環境污染物及持久性有機污染物研討會」論文集

2、第 30 屆「國際有機鹵化環境污染物及持久性有機污染物研討會」大會網站，

http://www.dioxin2010.org

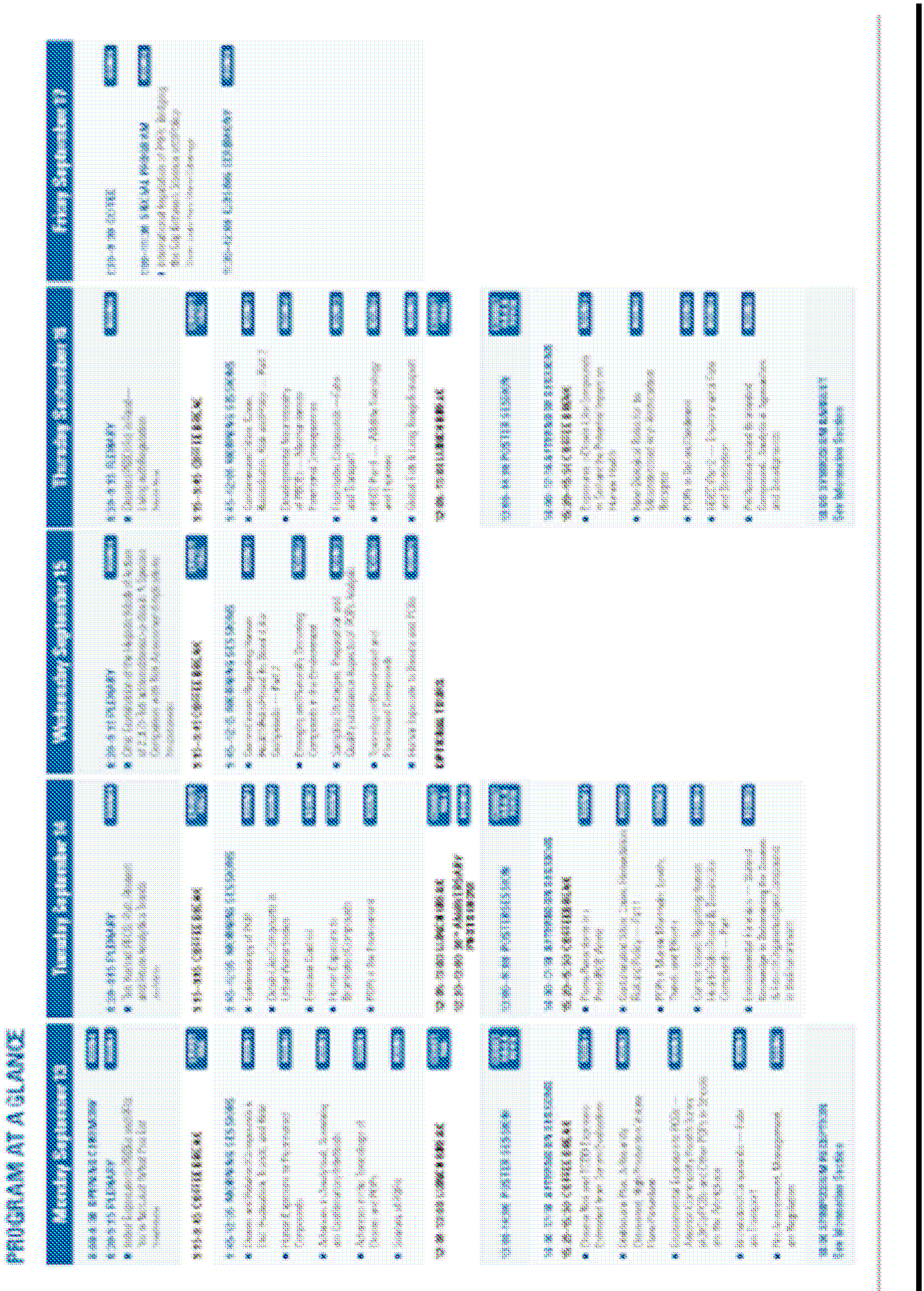
3、The International Symposium on Halogenated Persistent Organic Pollutants

http://www.dioxin20xx.org/index.html

4、行政院環境保護署。 2010 年修訂版。 「持久性有機污染物斯德哥爾摩公約國家實施計畫」

5、第 31 屆「國際有機鹵化環境污染物及持久性有機污染物研討會」大會網站，http://www.dioxin2011.org

附件一　大會主要議程表


PROGRAM AT A GLANCE
Monday September 13
Tuesday September 14
Wednesday September 15
Thursday September 16
Friday September 17

DAY AT A GLANCE

8:00 **OPENING CEREMONY** .... **ROOM 4**

Opening Address
Dr. Linda Birnbaum, Director NIEHS

8:30 **PLENARY** .... **ROOM 4**

Indoor Exposure to PBDEs and PFCs: You're Not Just What You Eat
Tom Webster

9:15 **COFFEE BREAK** .... **EXHIBIT HALL**

9:45 **MORNING BREAKOUT SESSIONS** .... SEE PAGES 16–18

ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5
Dioxins and Related Compounds in Diet: Evaluation, Trends, and Risks	Human Exposure to Fluorinated Compounds	Advances in Analytical, Screening and Confirmatory Methods	Advances in the Toxicology of Dioxins and POPs	Sources of POPs

12:05 **LUNCH BREAK** .... **EXHIBIT HALL**

13:00 **POSTER SESSION** .... SEE PAGES 21–25 **EXHIBIT HALL & FOYER**

14:00 **AFTERNOON BREAKOUT SESSIONS** .... SEE PAGES 18–20

ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5
Disease Risk and TCDD Exposure Estimated from Serum Evaluations	Dechlorane Plus: A Recently Discovered, High Production Volume Flame Retardant	Environmental Exposure to PCBs — Anniston Community Health Survey (ACHS)/PCBs and Other POPs in Schools and the Workplace	Brominated Compounds — Fate and Transport	Risk Assessment, Management, and Regulation

15:20 **COFFEE BREAK** .... **EXHIBIT HALL**

15:50

Disease Risk and TCDD Exposure Estimated from Serum Evaluations	Dechlorane Plus: A Recently Discovered, High Production Volume Flame Retardant	Environmental Exposure to PCBs — Anniston Community Health Survey (ACHS)/PCBs and Other POPs in Schools and the Workplace	Brominated Compounds — Fate and Transport	Risk Assessment, Management, and Regulation

18:00 **SYMPOSIUM OPENING RECEPTION at THE INSTITUTE OF TEXAN CULTURES** ..... (See Page 12)

Tuesday September 14

DAY AT A GLANCE

8:30 **PLENARY** .... ROOM 4

Ten Years of PFOS: Past, Present and Future Analytical Trends
Jon Martin

9:15 **COFFEE BREAK** .... EXHIBIT HALL

9:45 **MORNING BREAKOUT SESSIONS** .... SEE PAGES 28–30

ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5
Epidemiology of POPs	Dioxin-Like Compounds in Urban Waterbodies	Emission Control	Human Exposure to Brominated Compounds	POPs in the Environment

12:05 **LUNCH BREAK** .... EXHIBIT HALL

12:30 **30TH ANNIVERSARY PHOTO SHOW** .... ROOM 4

13:00 **POSTER SESSION** .... SEE PAGES 33–37

EXHIBIT HALL & FOYER

14:00 **AFTERNOON BREAKOUT SESSIONS** .... SEE PAGES 30–32

ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5
Flame-Retardants in a Post-PBDE World	Contaminated Sites: Cases, Remediation, Risk and Policy — Part 1	POPs in Marine Mammals: Levels, Trends, and Effects	Current Issues Regarding Human Health Risks Posed By Dioxin Like Compounds — Part 1	Environmental Forensics — State of Knowledge in Determining the Sources & Fate of Organohalogen Compounds in the Environment

15:20 **COFFEE BREAK** .... EXHIBIT HALL

15:50

ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5
Flame-Retardants in a Post-PBDE World	Contaminated Sites: Cases, Remediation, Risk and Policy — Part 1	POPs in Marine Mammals: Levels, Trends, and Effects	Current Issues Regarding Human Health Risks Posed By Dioxin Like Compounds — Part 1	Environmental Forensics — State of Knowledge in Determining the Sources & Fate of Organohalogen Compounds in the Environment

DAY AT A GLANCE

8:30 PLENARY .... ROOM 4

Omic Examination of the Hepatic Mode of Action of 2,3,7,8-Tetrachlorodibenzo-p-dioxin: A Species Comparison with Risk Assessment Implications
Tim Zacharewski

9:15 COFFEE BREAK .... EXHIBIT HALL

9:45 MORNING BREAKOUT SESSIONS .... SEE PAGES 40–41

ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5
Current Issues Regarding Human Health Risks Posed By Dioxin Like Compounds — Part 2	Emerging and Naturally Occurring Compounds in the Environment	Sampling Strategies, Preparation and Quality Assurance Aspects of POPs Analysis	Toxicology of Brominated and Fluorinated Compounds	Human Exposure to Dioxins and PCBs

12:05 OPTIONAL TOURS .... (See Page 12)

DAY AT A GLANCE

8:30 PLENARY ..... ROOM 4

Dioxins (PBDD/Fs) in Food — Living with Regulation
Chairs: Laurie Haws, Martin Scheringer

9:15 COFFEE BREAK ..... EXHIBIT HALL

9:45 MORNING BREAKOUT SESSIONS ..... SEE PAGES 44–46

ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5
Contaminated Sites: Cases, Remediation, Risk and Policy — Part 2	Developmental Neurotoxicity of PBDEs — Mechanisms to Functional Consequences	Fluorinated Compounds — Fate and Transport	HBCD Part 1 — Wildlife Toxicology and Exposure	Global Fate & Long Range Transport

12:05 LUNCH BREAK ..... EXHIBIT HALL

13:00 POSTER SESSION ..... SEE PAGES 49–53 EXHIBIT HALL & FOYER

14:00 AFTERNOON BREAKOUT SESSIONS ..... SEE PAGES 46–48

ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5
Exposures to Dioxin-Like Compounds in Soil and the Potential Impact on Human Health	New Biological Roles for the Misunderstood Aryl-Hydrocarbon Receptor	POPs in Soil and Sediment	HBCD Part 2 — Environmental Fate and Distribution	Perfluorinated and Brominated Compounds: Analytical Approaches and Developments

15:20 COFFEE BREAK ..... EXHIBIT HALL

15:50

ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5
Exposures to Dioxin-Like Compounds in Soil and the Potential Impact on Human Health	New Biological Roles for the Misunderstood Aryl-Hydrocarbon Receptor	POPs in Soil and Sediment	HBCD Part 2 — Environmental Fate and Distribution	Perfluorinated and Brominated Compounds: Analytical Approaches and Developments

18:00 SYMPOSIUM BANQUET at COWBOY'S DANCEHALL ..... (See Page 13)

DAY AT A GLANCE

8:30	COFFEE	ROOM 4
9:00	SPECIAL PROGRAM International Regulation of POPs: Bridging the Gap Between Science and Policy Chairs: Paolo Mocarelli, Martin Rose	ROOM 4
11:30	CLOSING CEREMONY	ROOM 4

附件二　本次大會本所發表之論文

PROGRAM　Tuesday September 14

13:00–14:00 POSTER SESSION

EXHIBIT HALL & FOYER

#085 POLYCHLORINATED BIPHENYLS (PCBS) ANALYSIS CAPACITY DEVELOPMENT AND PCBS MONITORING IN ASIA
B.Wang, F.Iino, M.Morita, Y.Shibata, K.Nakagawa **1257**

Sources, Fate and Transport, Environmental Monitoring

#088 GEOGRAPHIC VARIATION IN THE CONCENTRATIONS OF POLYBROMINATED DIPHENYL ETHERS (PBDES) AND METHOXYLATED PBDES IN SPERM WHALE (PHYSETER MACROCEPHALUS) BLUBBER
S.Eagle, H.Stapleton, I.Kerr, J.Wise **1464**

#091 DEVELOPMENT OF ENVIRONMENTAL FATE MODEL FOR HEXABROMOCYCLODODECANES (HBCDS) WITH ISOMERISATION PROCESS
Y.Hirai, T.Eguchi, S.Sakai **1314**

#095 LEVELS AND TRANSPORT OF PBDES AND ALTERNATIVE BROMINATED FLAME RETARDANTS IN AIR AND SEAWATER FROM THE ARCTIC TO THE ANTARCTICA
A.Moeller, Z.Xie, R.Sturm, R.Ebinghaus **1270**

#099 PBDES, HBCD AND OTHER NON-PBDES FLAME RETARDANTS IN CAR DUST SAMPLED IN THE CZECH REPUBLIC IN 2009
M.Stavelova, K.Kalachova, J.Pulkrabova, P.Hradkova, M.Kovar, J.Hajslova **1451**

#103 LEVELS OF PERFLUORINATED COMPOUNDS(PFCs) IN KOREAN AQUATIC ENVIRONMENTS
I.-C.Eom, J.Yoon, B.Lee, C.Cho, S.Kim, K.Choi **1638**

#106 DETERMINAION OF CARCINOGENIC PRIMARY AROMATIC AMINES ORIGINATED FROM AZO DYES IN COMMERCIAL TEXTILE PRODUCTS IN JAPAN
T.Kawakami, K.Isama, H.Nakashima, T.Tsuchiya, A.Matsuoka **1088**

#110 CONCENTRATION OF DECHLORANE, DECHLORANE PLUS, DECHLORANES 602, 603 AND 604 IN MARINE ENVIRONMENT OF NORTHERN CHINA
Y.-F.Li, H.Jia, X.Liu, D.Wang, M.Yang, H.Qi, L.Liu, E.Sverko, E.Reiner, L.Shen **1475**

#113 TRENDS AND EXPOSURE OF OH-PBDEs, MeO-PBDEs AND PBDDs IN BALTIC BIOTA
K.Lofstrand, A.Malmvarn, P.Haglund, A.Bergman, L.Asplund **1434**

#115 THE PAH CALUX BIOASSAY AS A PROMISING IN VITRO TOOL FOR DETECTION AND MONITORING OF THE CARCINOGENIC POTENCY OF PAH MIXTURES
B.Pieterse, R.Winter, E.Felzel, E.Sonneveld, B.van der Burg, A.Brouwer **1249**

#116 SURVEY OF DIOXINS AND DIOXIN-LIKE COMPOUNDS IN ANIMAL FEED IN POLAND
J.Piskorska-Pliszczynska, S.Maszewski, R.Lizak, M.Warenik-Bany, T.Wijaszka **1071**

#119 STUDY ON POLLUTION SITUATION OF PCDD/Fs ON URBAN DIFFERENT FUNCTIONAL DISTRICTS
Y.Shi, J.Hu, A.Cheng **1488**

#120 TIME TRENDS OF PERFLUORINATED PHOSPHONIC ACIDS, POLYFLUOROALKYL PHOSPHORIC ACIDS, PERFLUORINATED CARBOXYLIC ACIDS AND PERFLUORINATED SULPHONIC ACIDS IN A SEDIMENT CORE FROM LAKE ONTATIO
R.Guo, P.Crozier, L.Yeung, E.Reiner, S.Mabury, S.Bhavsar **1618**

#123 COMPARISON OF OBSERVED AND ESTIMATED CONCENTRATIONS OF PERFLUOROOCTANE SULFONATE (PFOS) USING A FATE MODEL IN TOKYO BAY OF JAPAN
Y.Miyake, S.Managaki, Y.Zushi, T.Kobayashi, T.Kameya, Y.Yokoyama, S.Nakai, H.Hondo, A.Kimura, T.Nakarai, Y.Oka **1610**

#126 FACT-FINDING SURVEY ON PERFLUORINATED COMPOUNDS IN WASTEWATERS
A.Takahashi, T.Nishino, H.Fujinami, Y.Sasaki, Y.Takazawa, Y.Shibata, Y.Takashima, T.Omata, M.Kitano **1361**

#129 NOVEL SOURCE APPORTIONMENT METHOD BASED ON GIS RECEPTOR MODEL FOR AQUATIC PERFLUORINATED COMPOUND (PFC) POLLUTION -A CASE STUDY IN THE BASIN OF TOKYO BAY, JAPAN-
Y.Zushi, S.Masunaga **1321**

#132 CHARACTERISTICS OF DIOXIN-LIKE COMPOUNDS IN LEACHATES FROMLANDFILLS CONTAINING INCINERATION RESIDUES IN TAIWAN
T.Chang-Lan, H.Chi-Ying, L.Yan-Yui, W.Ying-Minh **1243**

#134 OCTANOL-WATER-PARTITION COEFFICIENTS OF INDIVIDUAL CHLORO n-ALKANES
M.Coelhan, B.Hilger, H.Fromme **1330**

#137 COMPARISON OF PERSISTENT ORGANOHALOGENATED POLLUTANTS IN FEATHERS FROM NESTLING AND ADULT PREDATORY BIRDS FROM NORTHERN NORWAY
I.Eulaers, V.Jaspers, A.Covaci, D.Halley, T.Johnsen, M.Eens, J.Bustnes **1347**

#140 POP FINGERPRINTS IN ALPINE SPRING WATER
B.Henkelmann, N.Fischer, K.Schramm **1050**

#143 PHOTOCHEMISTRY OF DIBENZYL KETONES TO STUDY BIMOLECULAR REACTIONS IN SNOW
R.Kurkova, P.Klan **1058**

#146 THE SEA WATER CONCENTRATION AND ENANTIOMERIC FRACTION OF HCHs IN THE SEAS AROUND JAPAN
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CHARACTERISTICS OF DIOXIN-LIKE COMPOUNDS IN LEACHATES FROMLANDFILLS CONTAINING INCINERATION RESIDUES IN TAIWAN

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Abstract

Total contents of PCDD/Fs and dioxin-like -PCBs in soluble phase and suspended particulate matter (SPM) of leachate, before and after the leachate treatment process from landfills containing incineration residues in Taiwan were determined. The total contents of PCDD/Fs and dioxin-like -PCBs ranged from 0.0585 to 3.23 pg TEQ/L and 0.00300 to 0.431 pg TEQ/L, respectively. Levels of PCDD/Fs and dioxin-like PCBs in treated leachate were much less than that in raw leachate, with the exception of the sample collected from landfill A. The results obtained from this study indicated that dioxin-like compounds can be removed through the process such as coagulation, aeration, sedimentation, filtration, biological treatment and activated carbon absorption in selected landfills. The dominated PCDD/Fs in leachate was 1,2,3,4,6,7,8-HpCDD and the removal rate for leachate liquid was 5.70～95.6% and 41.2～97.6% for leachate solid. As for the dioxin-like PCBs, the most dominated PCB congeners in leachate liquid and solid were PCB 126, 169 and 118. The removing rate of PCBs for leachate liquid ranged from of 39.5 to 99.1% for landfills C, D and E whereas 34.1～99.6% for leachate solid in landfills B,C,D,E, and F. The results obtained from this study confirmed that the concentrations of PCDD/Fs in selected landfill sites for co-treated solidified fly ash and bottom ash were not particularly higher than the other landfills, furthermore, it was lower than the Taiwan PCDD/Fs TCLP regulation of solidified monoliths. Nevertheless, the potential source of dioxins from the solidified fly ash that leaks into the surrounding soil environment need to be further addressed.

Introduction

Although the distribution of dioxin-like compounds such as polychlorinated dibenzo-p-dioxins/ dibenzofurans (PCDD/Fs) and polychlorinated biphenyls (PCBs) in various environmental media produced from different emission sources had been widely discussed. The survey on PCDD/Fs leaching concentrations and characteristics of co-existing compounds on PCDD/Fs and PCBs in landfills treating incineration residues are currently very limited in Taiwan[1]. Many of the studies indicated that the municipal solid waste incinerator (MSWI) has been considered as the main MSW treatments which are accounted for the major dioxin like chemicals emission sources[2]. The fly ash generated from MSWI must be stabilized or solidified before disposed to the landfill sites due to its high contents of dioxin-like compounds, heavy metals and other possible potential carcinogens. Therefore, the leaching characteristics of these incineration residues have become an important issue. The first survey of the concentrations of PCDD/Fs and dioxin-like PCBs in leachate samples before and after leachate treatment plant from six landfill sites in Taiwan was conducted in this study. The objectives of the current investigation were to reveal the concentrations of PCDD/Fs and dioxin-like PCBs in raw and treated leachates and to examine the removing efficiency of PCDD/Fs and dioxin-like PCBs in selected landfills.

Materials and Methods

Twelve samples were collected from six landfill sites throughout Taiwan. Landfill Shulin (A), Shanzhuku (B) and Bali (C) landfills, Taichung City (D), Tainan City (E) and Kuoshiung City (F), are distributed in northern, central and southern part of Taiwan, respectively (Fig 1). The descriptions of the selected six landfills are summarized in Table 1. All the landfills are still in operation and mainly treating bottom ash or co-treated solidified fly ash, however, municipal solid wastes were dumped into the landfills in the initial stages. The samples composed of liquid and suspended solid phase were collected before and after the leachate treatment process. In order to obtain sufficient amount of analytes, the leachate samples (20-48L) were collected using the on-site large volume pre-concentration system (Fig. 2). The system was equipped with fiber filter (0.5μm pore size) /case for collecting particle-bound PCDD/Fs, polyurethane foam (PUF) /holder to retain the target compounds in the liquid phase, an air bubble removal device, vacuum pressure sensor and computer panel. The PUF and filter samples were then soxhlet extracted (24h, extracted by toluene) and silica gel clean-up procedure. The samples were fortified with internal standards (6 ^{13}C-PCDDs, 9 ^{13}C- PCDFs and 12 ^{13}C-dioxin-like PCBs) before extraction. A CAPE carbon column was used to separate interferences, PCDDs/Fs and dioxin-like PCBs. Dioxin-like PCBs portion were eluted from carbon column in forward direction with 6 mL of hexane/toluene, and then PCDDs/PCDFs fraction was eluted from carbon column in reverse direction with 35 mL toluene. Before instrument analysis, ^{13}C-labeled standards were added and the vials were vortexed to mix completely. All analyses were performed with the isotope dilution method. Finally, the PCDD/Fs and DL-PCBs were analyzed by high-resolution gas chromatography/high-resolution mass spectrometry (HRGC/HRMS, HP 6890/JEOL JMS-700), equipped with positive electron impact (EI+) source. A DB-5 MS column (L=60m, i.d.=0.25mm, film thickness=0.25μm, carrier gas helium, J＆W Scientific) was employed with the following temperature program: 150°C for 3 mins, increased to 210°C at a rate of 30°C /min for 15 mins and then increased to 230°C at 1.5°C /min and finally to 310°C at 15°C /min. All measurements were made in selective ion recording (SIR) mode had a resolving power of 10,000 and two most intense ions of the molecular ion cluster. The details of the quality control were as described in the EPA method 1613B and 1668A. Toxicity equivalent (TEQ) concentrations were calculated by using the WHO2005 equivalency factors (WHO-TEFs).

Results and Discussion

We collected the raw and treated leachates from the landfills in order to determine the levels of PCDD/Fs and dioxin-like PCBs and examine the removal efficiency of leachate treatment process in Taiwan. The results showed that the total PCDD/Fs concentration in collected samples ranged from 0.0585 to 3.23 pg TEQ/L. The highest PCDD/Fs concentration in raw leachate was found at landfill B (3.23 pg TEQ/L) followed by landfill E (1.48 pg TEQ/L). However, the relationships of the size between landfills and PCDD/Fs concentrations were not significant. Fig 3 and 4 illustrated the concentrations of 17 PCDD/Fs congeners in raw leachate between liquid and solid phases were ranged from 0.0348～1.24 and 0.0549～3.17 pg TEQ/L with the highest concentration was 1,2,3,4,6,7,8-HpCDD. In addition, Fig 5 and 6 demonstrated the highest concentrations of PCDD/Fs in treated leachate liquid and solid phases was 2,3,4,7,8-PeCDF, respectively. It was obvious that the solid phases PCDD/Fs in leachate played a major role as expected. The removal efficiency of PCDD/Fs for leachate between liquid and solid phases were varied among 5.70～95.6% and 41.2～97.6%, respectively, except landfill A exhibited minus removal efficiency. The results also indicated that over 90% of hepta- (landfills B,C,D,E) and penta-(landfill F) substituted PCDD/Fs in solid-phase were effectively removed by the leachate treatment process in landfill leachates whereas the levels of 17 PCDD/Fs were increased in landfill A. Total PCDD/F concentrations measured in six landfill sites in Taiwan were significantly lower than those reported in Korea leachates [3,4] (11.34; 4.1~6.22 pg TEQ/L) but similar to those of Japan landfills (3.83 pg TEQ/L)[5]. As for the dioxin-like PCBs, the total concentrations were in the range of 0.00300 to 0.431 pg TEQ/L. The concentrations of 12 dioxin-like PCBs in raw leachate between liquids and solids phase were ranged from 0.00273-0.271 and 0.00452~0.342 pg TEQ/L, respectively, and PCB 126 and 77 were the dominated congener in landfills E and B, as shown in Fig. 7 and Fig. 8. Furthermore, the concentrations of 12 dioxin-like PCBs in treated leachate between liquid and solid phases were ranged from 0.00148~0.0169 pg TEQ/L and 0.000589~0.0441 pg TEQ/L, respectively. The data shown in Fig.9 and Fig. 10 described the concentration of PCB 126 was the highest in landfills A and C. The removing efficiency (efficiencies?) of PCBs for leachate liquid were in the range of 39.5 ～99.1% for landfills C,D and E while 34.1 ～99.6% for leachate solid for landfills B,C,D,E, and F. The three most dominated PCBs detected were PCB126, 169 and 118 in both leachate liquid and solid samples. The current investigation identifies the *non-ortho* PCBs comprising up to 90.3% in leachate liquid from landfill F and 96.7% in leachate solid sample collected from landfill D, respectively. However, among these three PCB congeners, the highest removal efficiency was found in PCB118 which represented 25.3～99.6% in the leachate liquid and 30.9～99.9% in the leachate solid. In conclusions, the results provided thoroughly information regarding the proper MSW treatment for the safety of the incineration residue disposal to the landfill.

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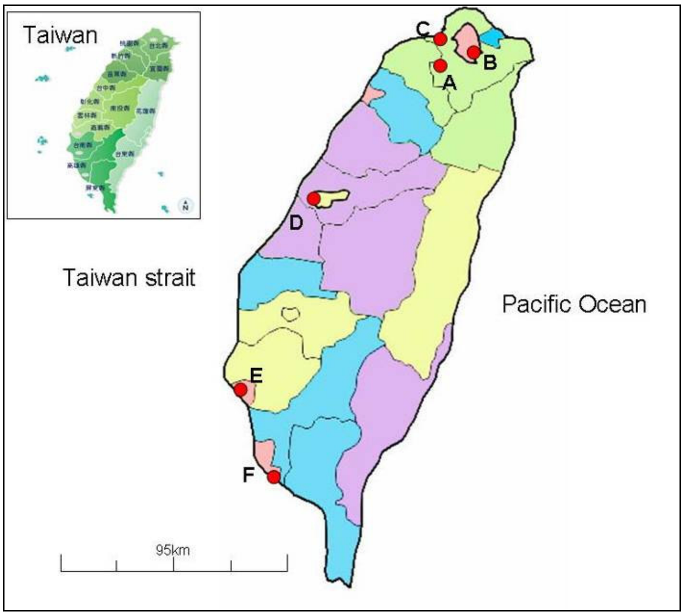

Fig 1. Sampling sites from six landfills in Taiwan (A: Shulin Landfill; B: Shanzhuku Landfill; C: Bali Landfill; D: Taichung City Landfill; E: Tainan City Landfill; F: Kaohsiung City Landfill).

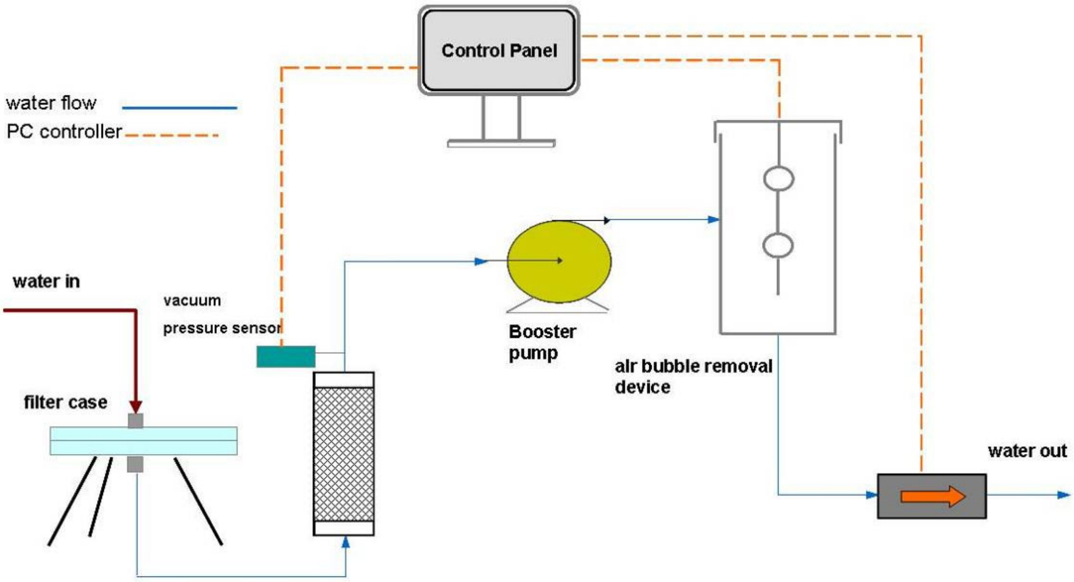

Fig 2. Diagram of the large volume on-site pre-concentration system.

Table 1. Descriptions of selected landfills in Taiwan

Landfills	A	B	C	D	E	F
Operation Year	1996/3~	1994/6~	2000/1~	1998/12~	2002/1~	1999/2~
Condition	Open	Open	Open	Open	Open	Open
Area (ha)	36.4	30	27.6	12.07	53.5	20
Available Capacity (M^3)	217373	280000	387046	23000	30000	400000
Designed Leachate Volume (CMD)	500	1000	800	450	800	130
Accepted waste type	1. bottom ash 2. solidified fly ash	bottom ash	bottom ash	bottom ash	bottom ash	1. bottom ash 2. solidified fly ash

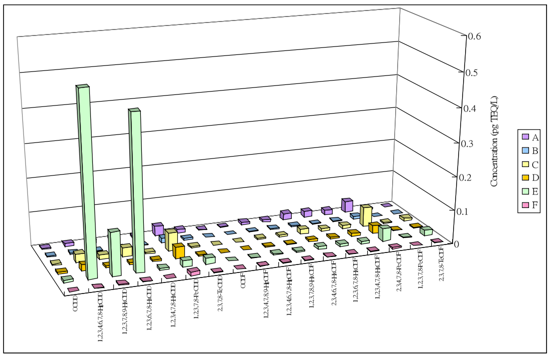

Fig 3. Congener profiles of 17 PCDD/Fs in raw leachate liquid phase.

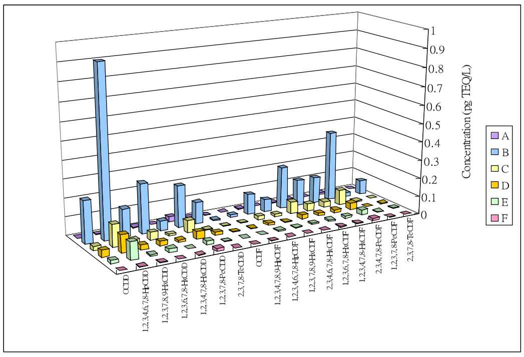

Fig 4. Congener profiles of 17 PCDD/Fs in raw leachate solid phase.

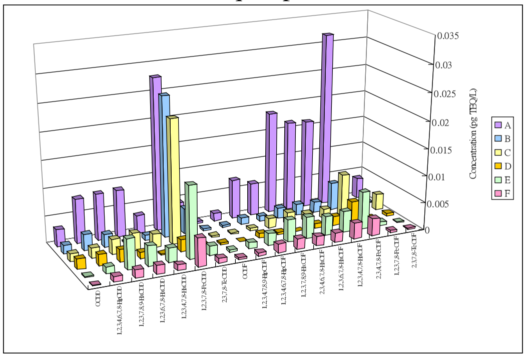

Fig 5. Congener profiles of 17 PCDD/Fs in treated leachate liquid phase.

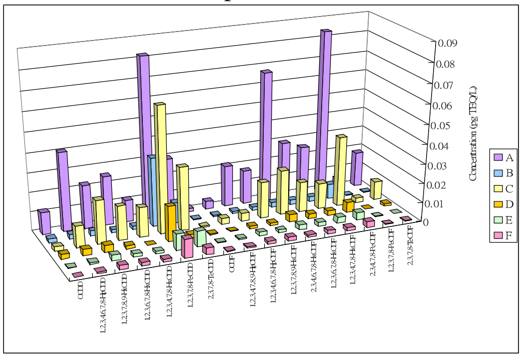

Fig 6. Congener profiles of 17 PCDD/Fs in treated leachate solid phase.

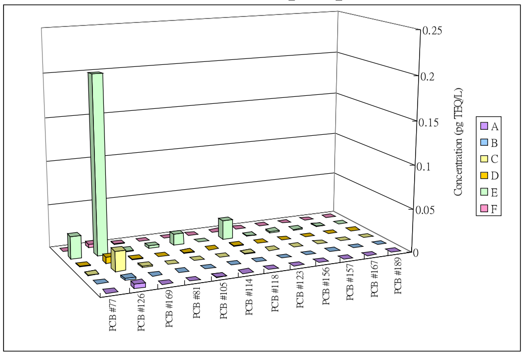

Fig 7. Congener profiles of 12 dl-PCBs in raw leachate liquid phase.

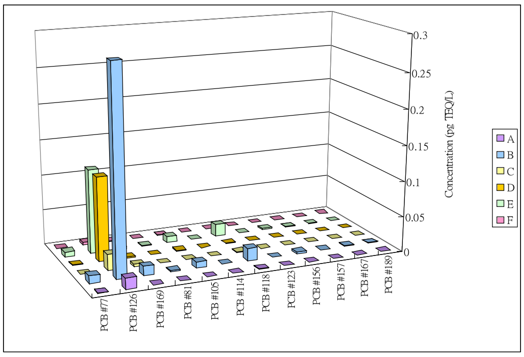

Fig 8. Congener profiles of 12 dl-PCBs in of raw leachate solid phase.

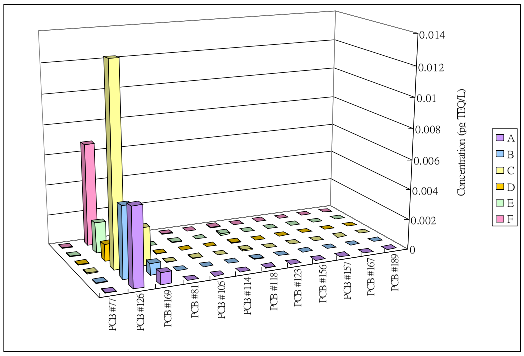

Fig 9. Congener profiles of 12 dl-PCBs in treated leachate liquid phase.

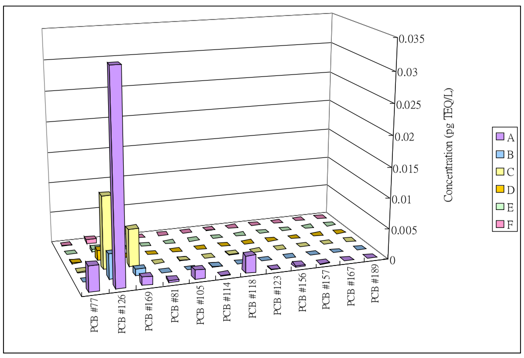

Fig 10. Congener profiles of 12 dl-PCBs in treated leachate solid phase.