行政院所屬各機關因公出國人員出國報告書

（出國類別：國際會議）

赴日本參加「平成 28 年室內環境學會學術大會」

服務機關： 行政院環境保護署

姓名職稱： 空氣品質保護及噪音管制處王弟文薦任技士

空氣品質保護及噪音管制處林渤原薦任技士

派赴國家： 日本茨城

出國期間： 105 年 12 月 14 日至 12 月 17 日

報告日期： 106 年 3 月 15 日

摘要

本次「平成 28 年室內環境學會學術大會」，係由日本一般社團法人室內環境學會於 105 年 12 月 15 日至 12 月 16 日在日本茨城縣筑波市先進工業科技筑波中央研究所舉行，本次會議有國際研討會、口頭發表會及海報展示共計有 134 篇文章發表。其文章內容涵蓋各國對於室內環境品質調查技術、室內環境污染物來源成因分析及物理化學反應特性研究、抽菸對室內環境品質影響、評估室內環境技術開發、室內環境控制技術（空氣淨化）研究、室內環境實際調查成果、環境中微生物及控制對策、室內環境對於污染物對心理、生理、及健康影響等相關室內環境議題。

目　　錄

壹、 前言

因為社會型態的轉變與民眾生活習慣的改變，每日約有 19 小時以上的時間，一般民眾處於室內的不同環境內，因此室內空氣品質的好壞與民眾身體健康之間關係逐漸被重視。依據我國室內空氣品質管理法第三條定義：室內空氣污染物係指室內空氣中常態逸散，經長期性暴露足以直接或間接妨害國民健康或生活環境之物質，包括二氧化碳、一氧化碳、甲醛、總揮發性有機化合物、細菌、真菌、粒徑小於等於十微米之懸浮微粒(PM_{10})、粒徑小於等於二．五微米之懸浮微粒($PM_{2.5}$)、臭氧及其他經中央主管機關指定公告之物質。

常見室內空氣品質的污染物的分成三類：氣狀污染物、粒狀污染物及生物性污染物。氣狀污染物的來源：二氧化碳來自於人類活動的呼吸、燃燒行為；一氧化碳亦來自於人類行為之燃燒不完全之行為；甲醛來自於建材、油漆塗料、清潔用品；揮發性有機物(volatile organic compounds,VOCs)來自於家具、櫥櫃、油漆，操作影印機或列表機所釋放；臭氧來自於辦公室事務機或懸浮微粒。粒狀污染物的來源：人類活動或動植物所產生，如花粉、毛髮、體垢、皮屑或活動產生之揚塵。生物性污染物來源：真菌類來自於空調系統或其他相關污染源所傳播之生物氣膠(bioaerosols)，且此類污染物的暴露均已被證實會增加室內人員的健康危害風險。

為保障室內人員的健康，許多國家皆已訂定室內空氣品質標準或管制策略。由於室內環境特性的差異及空氣污染物的來源及組成不同，所需著關注污染物種類亦有所差異，又各國的民俗風情不同，室內設備的使用特性亦不相同，因此制訂室外空氣品質標準的考量及相關研究成果不盡然適用於室內空氣品質標準的研擬。有鑑於此，臺灣於 1989 年開始著手室內空氣品質相關研究，包含調查國內公共場所空氣污染物種類及濃度、健康風險評估、醫療成本估算、相關法令的擬訂等，並於 2005 年公告室內空氣品質建議值，歷經數年的研究後，再於 2011 年通過室內空氣品質管理法，並於 2012 年正式實施。

為利室內空氣品質管理法之推動與執行，本署依室內空氣品質管理法第 6 條規定，綜合考量公私場所之公眾聚集量、進出量、室內空氣污染物危害風險程度及場所之特殊需求，採循序漸進方式逐批公告列管，於 103 年 1 月 23 日公告應符合室內空氣品質管理法之第一批公告場所並自 103 年 7 月 1 日生效。為強化室內空氣品質管制工作，擴大納管場所之範圍及對象，提升更多場所室內空氣品質，保障民眾健康，本署亦於 106 年 1 月 11 日公告應符合室內空氣品質管理法之第二批公告場所。

本次赴日本茨城縣參加「平成 28 年室內環境學會學術大會」，旨在蒐集各國對於室內環境品質調查技術、室內環境污染物來源成因分析及物理化學反應特性研究、抽菸對室內環境品質影響、評估室內環境技術開發、室內環境控制

技術（空氣淨化）研究、室內環境實際調查成果、環境中微生物及控制對策、室內環境對於污染物對心理、生理、及健康影響，掌握最新國際室內空氣品質管理規範與策略，可作為後續研擬我國室內空品質管理相關規定之參考。

貳、 出國人員與行程

一、出國人員：

本次赴日本茨城縣參加「平成 28 年室內環境學會學術大會」人員係由本署空氣品質保護及噪音管制處派兩名代表與會。

服務單位		姓名	職稱
行政院環境保護署	空氣品質保護及噪音管制處	王弟文	薦任技士
	空氣品質保護及噪音管制處	林渤原	薦任技士

二、出國日期：105 年 12 月 14 日至 12 月 17 日

三、出國行程紀要：

日期	行程規劃
12 月 14 日	• 啟程，臺北出發至日本東京
12 月 15 日	• 從日本東京前往茨城 • 參加「平成 28 年室內環境學會學術大會」-國際研討會 • 參加「平成 28 年室內環境學會學術大會」-研究發表(海報展示)

12 月 16 日	• 參加「平成 28 年室內環境學會學術大會」-研究發表(海報展示) • 參加「平成 28 年室內環境學會學術大會」-研究發表(口頭發表會) • 從日本茨城前往東京
12 月 17 日	• 返程，日本東京出發至臺北

參、 與會目的

一、藉由參與本次會議，掌握國際間對室內空氣品質管理策略與技術，可提供本署後續室內空氣品質管理策略訂定之參考。

二、本處正辦理逐批納管應符合室內空氣品質管理法公告場所事宜，藉由參與本次會議，將有助於瞭解國際室內空氣品質管理規範，掌握最新國際室內空氣品質管理規範與策略，可作為後續研擬我國室內空品質管理相關規定之參考。

肆、 會議內容及成果說明

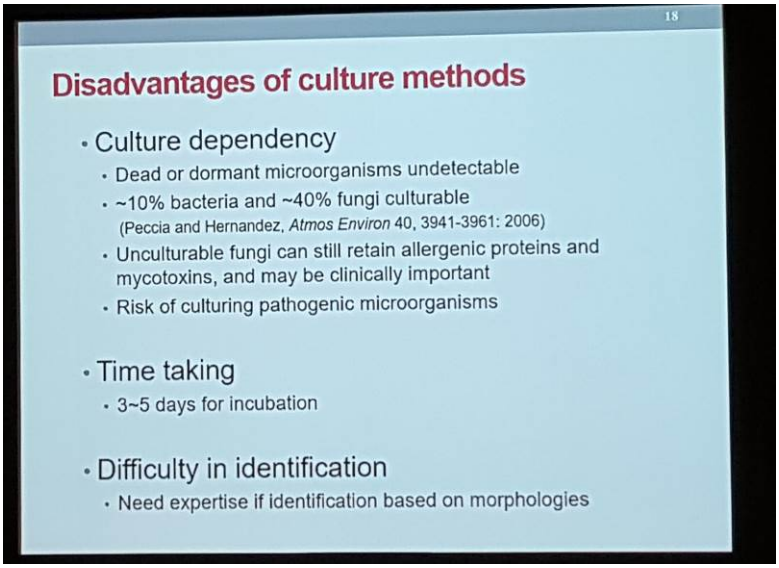
本次赴日本茨城縣參加「平成 28 年室內環境學會學術大會」，主要工作任務包括：參加本次會議國際研討會、日本室內環境學術大會之口頭發表會及海報展示，以蒐集各國對於室內環境品質調查技術、室內環境污染物來源成因分析及物理化學反應特性研究、抽菸對室內環境品質影響、評估室內環境技術開發、室內環境控制技術（空氣淨化）研究、室內環境實際調查成果、環境中微生物及控制對策、室內環境對於污染物對心理、生理、及健康影響。

在國際研討會部分：

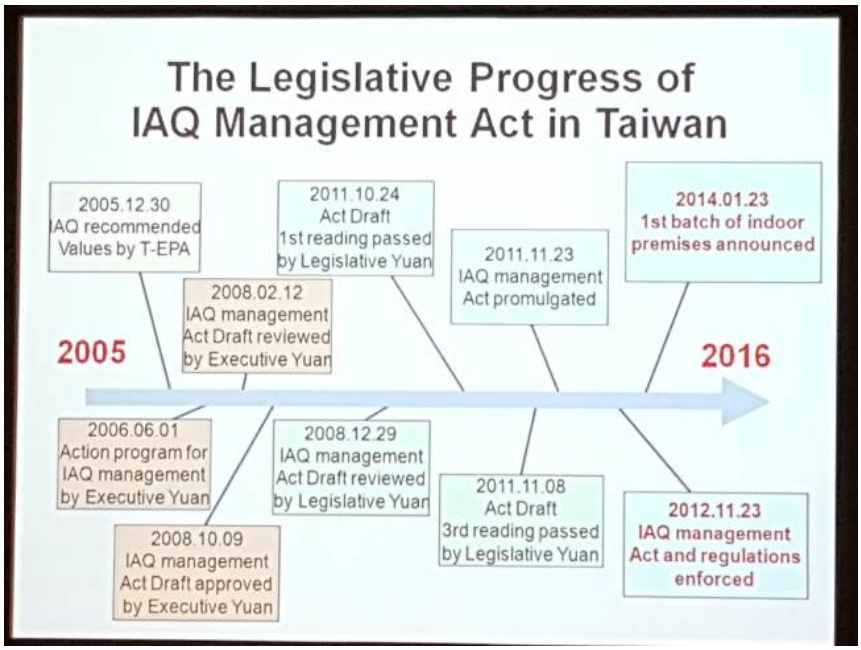
第一篇發表的論文為「對於太空艙污染物的控制」，經由日本宇宙航空研究開發機構宮崎英治研究員說明，太空艙密閉空間屬於室內環境，室內污染物控制是大空艙研發重要項目；其污染物依特性，可分兩種：粒狀物及氣狀物。粒狀污染物可藉由無塵室的技術控制，氣狀污染物則需要源頭管控（少用易揮發性材料）及光化學降解方式處理。

第二篇發表的論文為「通風、室內空氣品質及人類行為」，報告人為韓國漢陽大學朴俊錫教授，朴教授調查研究 1,689 個家庭能源效率的案例中，結果顯示，建築物的物理特性(絕緣、樓層、氣密程度、面積及其他)影響較大，但是居住者使用行為也是不容小覷。另一個研究重點，機械式過濾換氣方式可以減少室內空氣中細懸浮微粒 26%，而打開窗戶通風換氣方式則可減少室內空氣中細懸浮微粒 65%。

第三篇發表的論文為「室內細菌：為何困難控制？」，報告人為韓國首爾大學環境健康科學系山本美子博士，山本博士說明傳統細菌培養方法及限制，例如：有一些有害或具過敏性的微生物是無法被培養及量測的、空氣中細菌組成是多樣性，經採樣所培養的微生物是無法完全表現整體空氣中的微生物。



第四篇發表的論文為「導向一個永續及健康環境—臺灣的綠建築、綠建材及室內空氣品質管理規範」，報告人為臺灣國立成功大學建築系蔡耀賢副教授，蔡副教授說明為面對全球環境問題（如氣候變遷、城市熱島效應），在我國內政部建築研究所於 1999 年及 2004 年分別訂定綠建築標章及綠建材標章。為改善室內空氣品質及維護國民健康及生活品質，我國行政院環境保護署於 2012 年公布室內空氣品管理法。



本次學術大會共計有 134 篇文章發表，其中：

物聯網(Internet of Things, IoT)應用於室內環境檢驗測定的優勢，預測後續將廣泛運用於室內空氣品管理。傳統的室內環境檢驗測定方式往往需花費大量時間才能獲得監測成果，且對於即時監控(real-time monitoring)室內空氣品質並非是有效的方式，因此，新快速監測方法之需求也因應而生。對於即時監測(real-time measurement)室內空氣品質而言，利用物聯網(IoT)設備是最有效的方法之一，並且透過該設備之學習能力(machine learning)，將使得室內空氣品質之預測(prediction)與即時管理(real-time management)變得更有可能，未來的挑戰則是不斷改善技術，如卷積神經網絡（Convolutional Neural Network, CNN）之深層學習(deep learning)，以強化數據之間的相關性及預測之準確度。

針對全建築搭載空氣清淨機系統(the Air-Cleaning System)對於改善室內環境，去除室內過敏原(indoor allergen)進行驗證，發現空氣清淨機系統對於懸浮微粒、真菌、細菌等過敏原之去除是有效果的。

在「辦公室室內 $PM_{2.5}$的特性調查」的研究中顯示，在調查 11 間辦公室室內 $PM_{2.5}$的粒狀物濃度與粒徑，有獨立空調的(Individual air condirioning)因為沒有安裝空氣過濾器導致細懸浮微粒濃度較高，而中央空調的(Central air conditioning)因為有安裝空氣過濾器，細懸浮微粒濃度較低。

Table 1 Building information

ID	City	AC*	2015Summer	2015Autumn	2015Winter	2016Summer
T05	Tokyo	C	○	○	–	○
T06		I	○	○	○	○
T17		C	○	○	○	○
T18	Yokohama	I	○	○	–	○
T19	Tokyo	C	–	○	○	○
O02	Osaka	I	–	–	○	○
O03		C	–	○	○	○
O04		I	○	○	○	○
O05		C	–	○	○	○
O06		C	○	○	○	–
O08		I	–	○	○	○

* C: Central air conditioning, I: Individual air conditioning

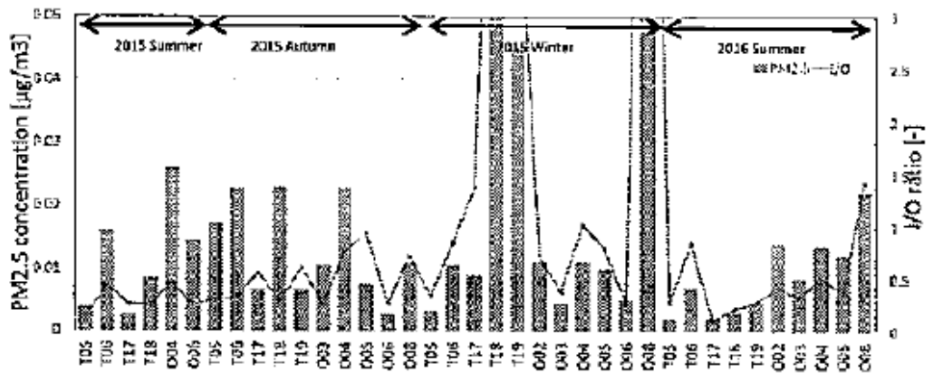


Fig. 1 $PM_{2.5}$ concentration and I/O ratio for each building

(ORena KOMATS U et. al, 2016)

在「辦公室使用混和動力通風系統對於室內空氣品質影響研究」研究顯示，當辦公室內混和動力通風系統開啟後，室內空氣品質生物性污染物與粒狀污染物 $PM_{2.5}$ 濃度皆上升，顯示室內空氣品質生物性污染物隨著粒狀污染物一起藉由混和動力通風系統一起從外部空氣進入室內空間。

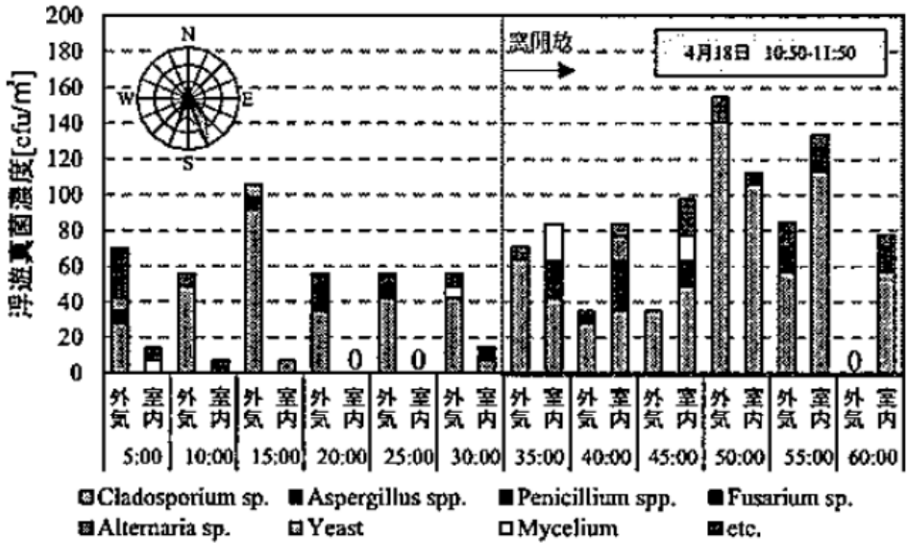


図 2 浮遊微生物濃度

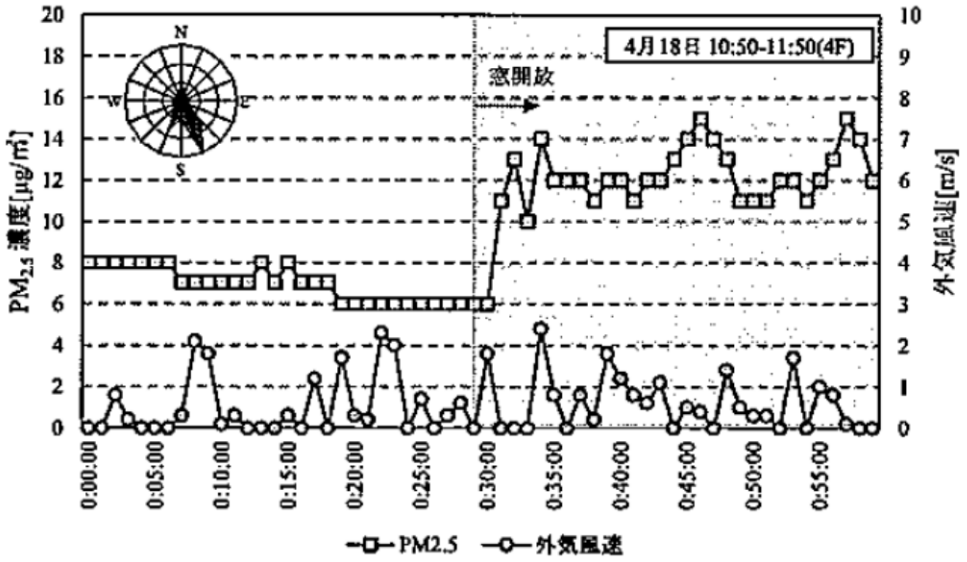


図 3 $PM_{2.5}$ 濃度

(Oriku Watanabe et. al, 2016)

本次於日本茨城縣筑波市公車站旁發現有稱作「綠牆」的空氣淨化設施。該設施功能與我國營建工程常見「植生牆」相同，主要係作為空氣淨化功能，但該設施特別強調對於 NO_2 及 $PM_{2.5}$ 具有一定的處理能力。

伍、 心得與建議

一、 為因應各國陸續重視室內環境品質，透過本次參與大型國際會議，建議本署主動參與國際會議與活動，拓展視野，以利蒐集國內外相關經驗，藉由管理政策與技術交流，以解決國內室內空氣品質管理方面問題。

二、 我國室內空氣品質管理法於 100 年 11 月 23 日公布，是繼韓國之後，第二位將室內空氣品質管理立法推動的國家。於 101 年 11 月 23 日室內空氣品質管理法及相關子法正式施行，其後為有效管控公私場所室內空氣品質，考量公眾聚集量、進出量、室內空氣污染物危害風險程度及場所之特殊需求，採循序漸進方式逐批公告列管場所，並於 103 年 1 月 23 日公告第一批公告納管場所，106 年 1 月 11 日公告第二批公告納管場所。建議針對納管之公告場所開始進行相關室內空氣品質查核輔導工作，包括名單調查、執行場所內之室內空氣品質巡查檢驗、宣導說明室內空氣品質管理法與子法之相關規定並輔導室內空氣品質改善方式等；針對尚未納管之場所加強溝通輔導工作，包括宣導室內空氣品質管理法與子法之相關規定、輔導室內空氣品質改善方式等，以避免未來正式公告納管公告場所時，相關場所表示本署未先進行溝通輔導即強制納管，引發反彈。

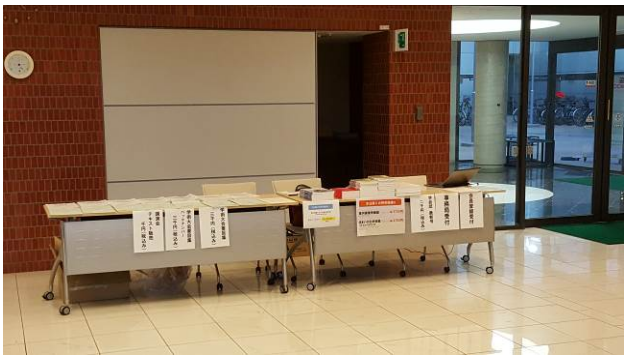
三、 室內空氣品質管理涉及許多部門，依據室內空氣品質管理法第 4 條，本署應整合規劃及推動室內空氣品質管理相關工作，該條並賦予各級目的事業主管機關之權責，包括建築主管機關之建築物通風設施、裝修與建材管理相關事項、經濟主管機關之裝修材料與商品及空氣清淨機國家標準、衛生主管機關之傳染性病原防護管理與醫療機構空調標準及菸害防制、交通主

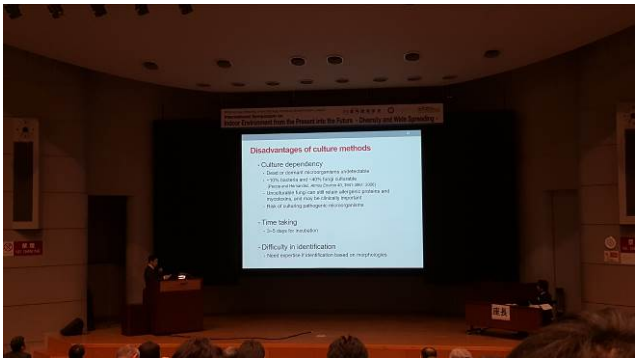
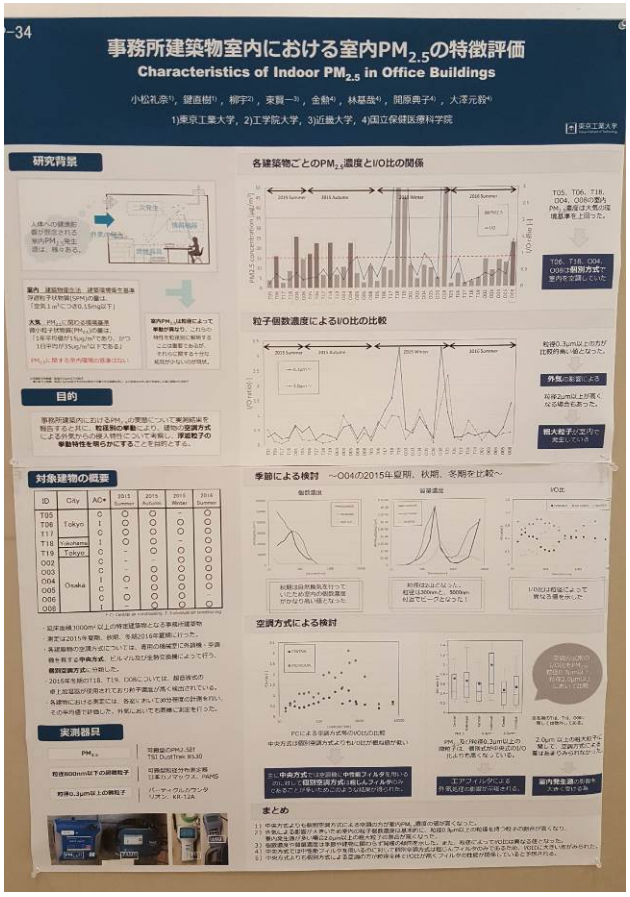
管機關之大眾運輸工具之空調設備通風量與維護管理等，並應輔導其主管場所改善其室內空氣品質。本次國際研討會主題包含通風、室內空氣品質、綠建築、綠建材等，因其探討內容涉及建築主管機關及經濟主管機關，建議後續強化整合相關部會共同推動室內空氣品質管理，加強與營建署、經濟部、交通部、衛福部等部會之橫向合作溝通。

四、 國人對於室外空氣品質尤其是細懸浮微粒濃度相當關注，對於空氣品質指標及相關活動建議亦相當熟悉，於空氣品質不良時會調整室外活動時間，增加室內活動時間。室內空氣品質不良會影響室內活動民眾健康，就室內空氣品質不良的改善方式，建議加強宣導室內空氣品質管理法觀念及室內空氣品質管理方式。

五、 另外，其他小型場所例如燒烤店、幼兒園等，考量其規模小，強制納入公告場所予以管制恐造成該類場所很大衝擊，因此建議以輔導取代納管，執行相關輔導維護管理計畫，推動輔導小型場所之室內空氣品質維護管理，保障民眾健康。

附件一：「平成 28 年室內環境學會學術大會」會議相關活動照片

<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>平成 28 年室內環境學會學術大會相關文宣(1)</td><td>平成 28 年室內環境學會學術大會相關文宣(2)</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>平成 28 年室內環境學會學術大會--會場布置</td><td>國際研討會大會主席開幕致辭--日本產驗技術綜合研究所安全科學研究部門主任研究員 篠原直秀</td></tr>
</table>

<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>韓國室內環境學會，韓國漢陽大學教授 朴俊錫就通風、室內環境品質及行為進行報告</td><td>臺灣室內環境品質學會，成功大學教授 蔡耀賢就臺灣的綠建築、綠建材及室內空氣品質法規進行報告</td></tr>
<tr><td rowspan="2"> 
</td><td>  </td></tr>
<tr><td>研究發表(海報展示(1))</td></tr>
<tr><td rowspan="2">  </td></tr>
<tr><td>海報展示一辦公室室內 PM2.5特徵，東京工業大學小松禮奈</td><td>研究發表(海報展示(2))</td></tr>
</table>

附件二：會議議程資料

タイムテーブル

<table>
<tr><th>12月</th><th>会場</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th></tr>
<tr><td>14日(水)</td><td>1階 中会議室 (B会場)</td><td colspan="8"></td><td>評議員会</td><td colspan="3"></td></tr>
<tr><td rowspan="4">15日(木)</td><td>1階 講堂 (A会場)</td><td colspan="3"></td><td colspan="2">ポスター発表(口頭)</td><td>総会</td><td colspan="2">国際シンポジウム</td><td colspan="2"></td><td rowspan="4">懇親会
(厚生センター1階
食堂)</td></tr>
<tr><td>1階 中会議室 (B会場)</td><td colspan="3"></td><td colspan="3">微生物分科会セミナー</td><td colspan="5"></td></tr>
<tr><td>2階 ロビー</td><td colspan="6"></td><td>学生懇談会</td><td colspan="4"></td></tr>
<tr><td rowspan="2">1階 ホワイエ・
多目的室</td><td colspan="2"></td><td>ポスター
展示準備</td><td colspan="2">ポスター展示</td><td>ポスター説明</td><td colspan="3">ポスター展示</td><td colspan="2"></td></tr>
<tr><td colspan="2"></td><td colspan="7">機器・NPO展示</td><td colspan="2"></td></tr>
<tr><td rowspan="4">16日(金)</td><td>1階 講堂 (A会場)</td><td colspan="2"></td><td colspan="3">研究発表</td><td>研究発表</td><td colspan="6"></td></tr>
<tr><td>1階 中会議室 (B会場)</td><td colspan="2"></td><td colspan="3">研究発表</td><td colspan="3">研究発表</td><td colspan="5"></td></tr>
<tr><td>2階 大会議室 (C会場)</td><td colspan="2"></td><td colspan="3">研究発表</td><td colspan="3">研究発表</td><td colspan="5"></td></tr>
<tr><td>1階 ホワイエ・
多目的室</td><td colspan="2"></td><td colspan="4">ポスター展示</td><td>ポスター説明</td><td>ポスター展示</td><td>ポスター撤去</td><td colspan="5"></td></tr>
<tr><td colspan="2"></td><td colspan="6">機器・NPO展示</td><td>機器撤去</td><td colspan="5"></td></tr>
</table>

【国際シンポジウム】

日時: 12 月 15 日（木） 14:50～17:40

会場: １階　講堂　（A 会場）

テーマ: "Indoor environment from the present into the future
～ diversity and wide spreading～"

司会: 篠原 直秀（産業技術総合研究所）

プログラム:

14:50～14:55　開会の辞
篠原 直秀（産業技術総合研究所）

14:55～15:25　Contamination control for spacecraft
－phenomena in orbit, techniques on the ground－
宮崎 英治（宇宙航空研究開発機構）

15:25～15:55　Ventilation, IAQ, and human behavior.
朴 俊錫（漢陽大學、韓国室内環境学会）

15:55～16:10　休憩

16:10～16:40　Indoor molds: Why it is difficult to regulate them
山本 尚理（ソウル大学）

16:40～17:10　Toward a sustainable and healthy built environment
－green building, green material and IAQ regulation in Taiwan－
蔡 耀賢（国立成功大学、台湾室内環境品質学会）

17:10～17:40 パネルディスカッション

【International Symposium】

Date: Thursday, December 15, 2016, 14:50–17:40

Room: 1F Auditorium (Room A)

Theme: "Indoor environment from the present into the future
~ diversity and wide spreading~"

Chair: Naohide Shinohara
(National Institute of Advanced Industrial Science and Technology (AIST))

Program:

14:50–14:55 Opening remarks
Dr. Naohide Shinohara
(National Institute of Advanced Industrial Science and Technology (AIST))

14:55–15:25 Contamination control for spacecraft
—phenomena in orbit, techniques on the ground—
Dr. Eiji MIYAZAKI (Japan Aerospace Exploration Agency (JAXA))

15:25–15:55 Ventilation, IAQ, and human behavior.
Prof. Jun Seok Park (Hanyang University)
(Korean Society for Indoor Environment (KOSIE))

15:55–16:10 Rest

16:10–16:40 Indoor molds: Why it is difficult to regulate them
Dr. Naomichi Yamamoto (Seoul National University)

16:40–17:10 Toward a sustainable and healthy built environment
—green building, green material and IAQ regulation in Taiwan
Dr. Yaw-Shyan Tsay (National Cheng Kung University)
(Taiwan Society of Indoor Environmental Quality (TSIEQ))

17:10–17:40 Panel discussion

【Student Meeting】

Date: Thursday, December 15, 2016, 13:30–14:30

Room: 2F Lobby

Theme: Question and Answer

Chair: Naoko Ouchida (Student member, Nagasaki International University)
Koki Oura (Student member, Nagasaki International University)
Hiroki Hayashi (Student member, Graduate School of Science, Tokai University)
Kazuhiro Misawa (Student member, Graduate School of Science, Tokai University)

Program:
1. Opening remarks by chair
2. Self-Introduction and activities by participants and grouping
3. Quiz game on Indoor Environment
4. Concluding remarks

* This is a luncheon style meeting. No registration is required in advance.

【Seminar by Subcommittee of Microbe】

Date: Thursday, December 15, 2016, 10:00–12:00

Room: 1F Meeting room (Room B)

lecturer: Koichi Makimura
(Laboratory of Space and Environmental Medicine,Graduate School of Medicine, Teikyo University)

Theme: "Micro-biota in space environment and the possible risk of health disorders"

Chair: Yuji Kawakami
(Laboratory of Environmental Science, FCG Research Institute, Inc.)

【Seminar by Subcommittee of Microbe】

Date: Thursday, December 15, 2016, 10:00–12:00

Room: 1F Meeting room (Room B)

lecturer: Koichi Makimura
(Laboratory of Space and Environmental Medicine,Graduate School of Medicine, Teikyo University)

Theme: "Micro-biota in space environment and the possible risk of health disorders"

Chair: Yuji Kawakami
(Laboratory of Environmental Science, FCG Research Institute, Inc.)

【Scientific Program】

Poster Session (Room A: December 15, 10:00～12:30)

Chair Atsushi Mizukoshi (Kindai University) (10:00～10:55)

P-01 Determination of acrolein in air using a sorbent cartridge followed by the derivatization with 2,4-dinitrophenylhydrazine
○Yui Senoo[1)], Shigehisa Uchiyama[2)], Hideki Hayashida[1)], Kanae Bekki[2)], Yohei Inaba[2)], Naoki Kunugita[2)], Hironao Ogura[1)]
1) Graduate School of Engineering, Chiba University, 2) National Institute of Public Health

P-02 A study on the measurement method of Glyoxal indoors
○Yunhao Ruan, Qi Wang, Yuichi Miyake, Takashi Amagai
University of Shizuoka

P-03 Study of indoor air quality research method using a passive sampler for Total Volatile Organic Compounds (TVOCs) - part2
○Takahiro Ishizaka, Ayato Kawashima, Naoki Hishida, Noriaki Hamada
Graduate School of Agriculture Ehime University

P-04 Development of the chamber for evaluating the passive sampler
○Zhiwei Wang[1)], Qi Wang[1)], Masahiro Tokumura[1)], Yuichi Miyake[1)], Takashi Amagai[1)], Yasuhiro Fukushima[2)], Yoshihiro Suzuki[2)], Takanori Enomoto[2)]
1) University of Shizuoka, 2) Sibata scientific Technology LTD

P-05 Emission characteristics of microbial volatile organic compounds by small chamber
○Chisato Harada[1)], Naoki Kagi[1)], Mayumi Yamamoto[1)], U Yanagi[2)]
1) Tokyo Institute of Technology, 2) Kogakuin University

P-06 Studies on the diffusion of trans-2-nonenal and diacetyl which is human body odor component.
○Miku Shimada[1)], Yoshimi Sunohara[1)], Daisuke Oikawa[1)], Keita Kimura[2)], Yoshika Sekine[2)]
1) AIREX INC., 2) Graduate school of science, Tokai University

P-07 Determination of volatile anesthetics including isoflurane, sevoflurane and desflurane in the animal operating rooms using a diffusive sampling device
○Hideki Hayashida[2)], Shigehisa Uchiyama[1)], Akira Ushiyama[1)], Yui Senoo[2)], Kanae Bekki[1)], Youhei Inaba[1)], Hironao Ogura[2)], Naoki Kunugita[1)]
1) National Institute of Public Health, 2) Graduate School of Engineering, Chiba University

P-08 SPME-GCMS Analysis of Chemical Compounds Eluted from Consumer Products to Artificial Sweat
○Yukio Aoki
Hyogo Prefectural Institute of Public Health and Consumer Sciences

P-09 VOC emission characteristics from wood-based materials on effect of moisture
○Fumi Nishioka[1)], Naoki Kagi[1)], Haruki Osawa[2)], U Yanagi[3)], Kenichi Azuma[4)], Kenichi Hasegawa[5)], Hoon Kim[2)]
1) Tokyo Institute of Technology, 2) National Institute of Public Health, 3) Kogakuin University, 4) Kindai University, 5) Akita Prefectural University

P-10 Survey of 2-Ethyl-1-hexanol in Indoor Air at Newly Built Building
○Aya Onuki, Tokuko Tsunoda, Mayu Hishiki, Ikue Saito, Toshinari Suzuki, Mitsugu Hosaka
Tokyo Metropolitan Institute of Public Health

P-11 Survey of Organic Acids and Aldehydes in Indoor Air at Newly Constructed Building
○Tokuko Tsunoda, Aya Onuki, Tomoko Okubo, Ikue Saito, Toshinari Suzuki, Mitsugu Hosaka
Tokyo Metropolitan Institute of Public Health

P-12 Assessment of exposure to indoor air of newly built houses (1) - By using European guidelines –
○Hiroko Nakaoka[1)], Norimichi Suzuki[1)], Michiko Shimoda[1)], Tomomi Yamada[1)], Masamichi Hanazato[1)], Emiko Todaka[1)], Chisato Mori[1,2)]
1) Center for preventive medical sciences, Chiba University,
2) Department of Bioenvironmental Medicine, Graduate School of Medicine, Chiba University

P-13 Indoor air exposure assessment in newly built houses - questionnaire study-
○ Michiko Shimoda[1)], Hiroko Nakaoka[1)], Norimichi Suzuki[1)], Tomomi Yamada[1)], Masamichi Hanazato[1)],
Emiko Todaka[1)], Chisato Mori[1,2)]
1) Center for Preventive Medical Sciences, Chiba University,
2) Department of Bioenvironmental Medicine, Graduate School of Medicine, Chiba University

P-14 Time-dependent change of the indoor chemical concentrations
○Norimichi Suzuki[1)], Hiroko Nakaoka[1)], Michiko Shimoda[1)], Masamichi Hanazato[1)], Chisato Mori[1,2)]
1) Center for Preventive Medical Sciences, Chiba University,
2) Department of Bioenvironmental Medicine, Graduate School of Medicine, Chiba University

P-15 Two year follow-up survey of subjective symptoms among medical students associated with low-level formaldehyde exposure during gross anatomy dissection courses
○Mihoko Mori[1)], Tsuyoshi Saga[2)], Koh-ichi Yamaki[2)], Tatsuya Ishitake[1)]
1) Kurume University School of Medicine, Department of Environmental Medicine,
2) Kurume University School of Medicine, Department of Anatomy

P-16 Species differences in the nociceptor activation by components of environmental tobacco smoke
○Hideto Jinno[1)], Rika Asai[1)], Shiho Nonaka[1)], Takao Tobe[1)], Akira Aoki[1)], Yoshinori Okamoto[1)], Koji Ueda[1)], Susumu Ohkawara[2)], Takashi Isobe[2)], Nobumitsu Hanioka[2)], Toshiko Tanaka-Kagawa[2)]
1) Meijo University, 2) Yokohama University of Pharmacy

P-17 Measurement of human skin gases originated from tobacco smoke
○Shodai Sato[1)], Yoshika Sekine[2)], Keita Kimura[2)]
1) School of Science, Tokai University, 2) Graduate School of Science, Tokai University

P-18 Determination of basic compounds in mainstream cigarette smoke using a sorbent cartridge
○Kanae Bekki[1)], Shigehisa Uchiyama[1)], Hideki Hayashida[2)], Yui Senoo[2)], Yohei Inaba[1)], Naoki Kunugita[1)]
1) National Institute of Public Health, 2) Graduate School of Engineering, Chiba University

P-19 Studies of malodorous compounds from tobacco smoke

○Naoko Ouchida[1)], Miyako Adachi[1)], Kanako Baba[1)], Yukio Akiyama[2)], Keiichi Arashidani[2)], Miyuki Noguchi[3)], Yoshika Sekine[4)], Hiroshi Sato[1)]

1) Faculty of Pharmaceutical Sciences, Nagasaki International University,

2) University of Occupational and Environmental Health, 3) Seikei University,

4) Tokai University, School of Science

P-20 Examination of the ETS exposure with the questionnaire under the everyday life environment.

○Hideaki Matsuki[1)], Satoshi Nakai[2)], Yuki Matsuki[3)], Miki Maruta[4)], Takashi Amagai[5)], Miyuki Noguchi[6)], Yukio Akiyama[7)], Yoshihiro Suzuki[8)], Yoshika Sekine[9)], Hiroshi Sato[10)], Keiichi Arashidani[7)], Yukio Yanagisawa[11)]

1) Tokai University, School of Health Sciences, 2) Graduate School of Yokohama National University,

3) Tokai University Oiso Hospital, 4) Tokai University Hospital,

5) Graduate School of University of Shizuoka, 6) Seikei University,

7) University of Occupational and Environmental Health, 8) Sibata Scientific Technology LTD,

9) School of Sciences, Tokai University, 10) Nagasaki International University,

11) The University of Tokyo

P-21 Indoor environment measurement using IoT devices

○Hiroyuki Aoyama[1,2)], Yoji Yamaguchi[1,2)]

1) Kankyo Research Co., Ltd., 2) Keio Research Institute at SFC

P-22 Characteristics of fresh-air distribution in a Multi-Tenant Office Building with Natural Ventilation by Wind and Buoyancy Force

○Eunsu Lim[1)], Hisashi Kotani[2)], Natsuko Ochiai[3)], Akihiro Matsumoto[3)], Iwao Hasegawa[3)]

1) Toyo University Department of Architecture, 2) Osaka University, 3) Nikken Sekkei Ltd.

P-23 Performance evaluation of airborne particles for portable air cleaner in an occupied zone by air age

○Ruriko Iijima[1)], Naoki Kagi[1)], Yoshihide Suwa[2)], Makoto Koizumi[3)]

1) Tokyo Institute of Technology, 2) Shibaura Institute of Technology, 3) Shimizu Corporation

P-24 A Study on Chronological Characteristics of Living and Indoor Environment -Measurement Results on Dwellers' Behavior and CO_2 Concentrations in a House-

○Motoya Hayashi

National Institute of Pubric Health

P-25 Measurement of indoor nitrogen dioxide concentration in the winter of Sendai

○Yoshifumi Suzuki[1)], Kenta Tachibana[2)], Yasuko Maruo[1,2)]

1) Tohoku Institute of Technology, 2) Graduate schools of Tohoku Institute of Technology

Chair Shoichi Morimoto (Shinryo Corporation) (10:55～11:40)

P-26 Risk Assessment of Brominated and Phosphorus Flame Retardants via Indoor Dust

○Masahiro Tokumura[1)], Yuichi Miyake[1)], Qi Wang[1)], Yoko Kai[1)], Takashi Amagai[1)], Sayaka Ogo[2)], Kazunari Kume[3)], Takeshi Kobayashi[4)], Shinji Takasu[5)], Kumiko Ogawa[5)]

1) University of Shizuoka, 2) Shizuoka Institute of Environment and Hygiene, 3) Tokyo City University,

4) Yokohama National University, 5) National Institute of Health Sciences

P-27 Indoor behavior of flame retardants from curtain

○Sayaka Ogo[1)], Kazunari Kume[2)]

1) Shizuoka Institute of Environment and Hygiene, 2) Tokyo City University

P-28 Analytical Method for Urinary Metabolites as Biomarkers for Monitoring Exposure to Phthalates by Gas Chromatography/Mass Spectrometry

○Toshiaki Yoshida

Osaka Prefectural Institute of Public Health

P-29 Risk Screening of the Product Component Chemicals at Ingestion Exposure from food and drink in Indoor Environment

○Mayuka Tomizawa, Takeshi Kobayashi, Xiaowei Tian, Takashi Kameya, Koichi Fujie

Yokohama National University

P-30 Development of a qualitative analytical method for unidentified flame retardants in flame-retardant-treated curtain by complete dissolution method followed by high resolution mass spectroscopy

○Qi Wang[1)], Yuichi Miyake[1)], Masahiro Tokumura[1)], Yoko Kai[1)], Takashi Amagai[1)], Yasuhiro Takegawa[2)],

Yoko Yamagishi[2)]

1) University of Shizuoka, 2) Thermo Fisher Scientific K.K.

P-31 Development of new device for large collection of semi volatile organic compounds

○Suguru Mochizuki[1)], Ikuo Ueta[2)], Moe Onikata[2)], Koji Fujimura[3)], Tomotaka Yoshimura[1)],

Shoji Narukami[1)], Tomohiro Sasaki[1)], Tsuneaki Maeda[4)]

1) HORIBA STEC, Co., Ltd., 2) University of Yamanashi, Department of Applied Chemistry,

3) Shinwa Chemical Industries Ltd., 4) National Institute of Advanced Industrial Science and Technology

P-32 Influence of humidity and existing seed particles on the formation of indoor secondary nano-sized organic aerosols (ISOAs) from VOCs derived from mothballs

○Ikumi Furuya[1)], Miki Nishimura[1)], Norikazu Namiki[1)], Ryoichi Nakayama[1)], Shuji Fujii[2)], Naoki Kagi[3)],

Kazuhiko Sekiguchi[4)], Kenichi Azuma[5)], Hajime Tamura[6)], Yoshihide Suwa[7)]

1) Kogakuin University, 2) Kanazawa Institute of University, 3) Tokyo Institute of University,

4) Saitama University, 5) Kindai University, 6) Techno Ryowa Ltd., 7) Shibaura Institute of University

P-33 Insecticide Residues in House Dust and Polished Rice Stored in Houses as an Indicator of Indoor Pollution

○Misaki Watanabe[1)], Mikako Noguchi[1)], Shoko Fukuda[1)], Seisaku Yoshida[1)], Tamiko Hashimoto[2)]

1) Graduate School, Mukogawa Women's University, 2) Mukogawa Women's University

P-34 Characteristics of Indoor $PM_{2.5}$ in Office Buildings

○Rena Komatsu[1)], Naoki Kagi[1)], U Yanagi[2)], Kenichi Azuma[3)], Hoon Kim[4)], Motoya Hayashi[4)],

Noriko Kaihara[4)], Haruki Osawa[4)]

1) Tokyo Institute of Technology, 2) Kogakuin University, 3) Kindai University,

4) National Institute of Public Health

P-35 Simple and rapid measurement of oxidative potential of $PM_{2.5}$ by DTT assay employing Flow Injection Analysis

○Yuki Kumai, Kazuhiro Misawa, Yoshika Sekine
Graduate school of Science, Tokai University

P-36 Micorfabricated, Bluetooth-enabled Direct-reading $PM_{2.5}$ Sensor for Wearable and Cellular Applications
○Igor Paprotony[1)], Dorsa Fahimi[1)], Nobuhiko Fukushima[2)], Richard M. White[3)]
1) University of Illinois, Chicago, 2) Kanomax Japan Inc., 3) University of California, Berkeley

P-37 Acetylcholinesterase inhibition activity of the household dust
○Mikako Noguchi, Misaki Watanabe, Shoko Fukuda, Seisaku Yoshida
Mukogawa Women's University

P-38 Investigation of fungi in a room of railway facilities where moldy odors exist (No. 1)
○Tamami Kawasaki[1)], Tomoyoshi Ushiogi[1)], Takashi Kyotani[1)], Sachiko Yoshie[1)], Yoshiki Ikeda[2)], Masayoshi Sasazawa[2)], Keiko Abe[3)]
1) Railway Technical Research Institute, Biotechnology, 2) East Japan Railway Company,
3) Institute of Environmental Biology

P-39 Investigation of fungi in a room of railway facilities where moldy odors exist (No. 2)
○Tamami Kawasaki[1)], Tomoyoshi Ushiogi[1)], Takashi Kyotani[1)], Sachiko Yoshie[1)], Yoshiki Ikeda[2)], Masayoshi Sasazawa[2)], Keiko Abe[3)]
1) Railway Technical Research Institute, Biotechnology, 2) East Japan Railway Company,
3) Institute of Environmental Biology

P-40 Investigation of the Odor Causing Compounds in the Room Which Has the Moldy Odors in the Railroad Facilities
○Takashi Kyotani[1)], Tomoyoshi Ushiogi[1)], Tamami Kawasaki[1)], Sachiko Yoshie[1)], Yoshiki Ikeda[2)], Masayoshi Sasazawa[2)]
1) Railway Technical Research Institute, 2) East Japan Railway Company

P-41 Characterization of fungal compositions and diversities in buildings in China, Korea, and Mongolia
Siyu Xu, Kiyoung Lee, ○Naomichi Yamamoto
Department of Environmental Health Sciences, Seoul National University

P-42 Evaluation of microclimates in a semi-underground room using a fungal index
○Keiko Abe
Institute of Environmental Biology

P-43 The actual condition of Microbiome in hospital M waiting rooms
○Machiko Mitsuoka[1)], U Yanagi[1)], Yuina Fujii[1)], Hideaki Nagano[2)], Hiroshi Ida[3)], Shinsuke Kato[4)]
1) Kogakuin University, 2) Tokyo City University, 3) NIHON SEKKEI, INC., 4) The University of Tokyo

P-44 The effect of bathroom environment on microbial contamination
○Hiroshi Yamagishi[1)], Satomi Yanaso[1)], Atsushi Naito[1)], Ryouji Yasue[1)], Hunjun Lee[2)], Shinichi Lee[2)]
1) Living Care Research Laboratories, LION Corporation,
2) Hygiene and Microbiology Research Center Corporation

P-45 Investigation about adhesion to a body of pollen
○Hitomi Shimada[1)], Yuji Kawakami[1)]
1) Wellness & Beauty Science Laboratory, FCG Research Institute, Inc.,
2) Laboratory of Environmental Science, FCG Research Institute, Inc.

Chair Naoki Kagi (Tokyo Institute of Technology) (11:40～12:30)

P-46 Odor intensity and impression of essential oil in thermally hot and neutral conditions
○Sachiko Yoshie[1)], Fumitoshi Kikuchi[1)], Takashi Kyotani[1)], Tomoyoshi Ushiogi[1)], Tamami Kawasaki[1)], Hiroharu Endo[1)], Sohei Tsujimura[1)], Yoshiki Ikeda[2)], Masayoshi Sasazawa[2)]
1) Railway Technical Research Institute, 2) East Japan Railway Company

P-47 Physiological and psychological effect of the favored or unfavored herb aroma on operations handling information
○Susumu Sekiguchi, Kayo Saitoh, Riho Matsuoka, Ai Yamaguchi
Koriyama Women's University

P-48 A study on airway chemosensation by fragrance allergens.
○Toshiko Tanaka-Kagawa[1)], Susumu Ohkawara[1)], Takashi Isobe[1)], Nobumitsu Hanioka[1)], Hideto Jinno[2)]
1) Yokohama University of Pharmacy, 2) Meijo University

P-49 Effects of luminous environment on sleep-wake rhythm in the living rooms of the special elderly nursing home
○Masae Nakamoto[1)], Kazuaki Maeda[2)], Akihiko Okumura[3)], Shuji Kagawa[4)], Kanako Hanyu[5)], Hiroko Kubo[6)]
1) Graduate School of Humanities and Sciences, Nara Women's University,
2) Department of Intelligence and Informatics, KONAN University,
3) R&D DEPT. IRIS OHYAMA INC., 4) R&D DEPT. IRIS OHYAMA INC.,
5) MUSASHIMURAYAMAEN, Special nursing home for the elderly,
6) Faculty of Human Life and Environment, Nara Woman's University

P-50 Study on the housing thermal environment and thermoregulation of residents in intermediate season
-Subjective experiments for the effects clothing condition-
○Ryuichi Komi[1)], Atsushi Sato[1)], Yoshitaka Ishizuka[2)]
1) National Institute of Technology, Oyama College, 2) Tokyo Metropolitan University

P-51 Verification for Indoor Environment Improvement Effect in the House Equipped with the Air-Cleaning System -For the Improvement of Indoor Allergen and the Allergic Symptoms before and after the Moving-
○Takumi Shima[1)], Teruaki Mitamura[2)], Kunio Dobashi[3)], Hiroki Harasawa[4)]
1) Maebashi Institute of Technology, 2) Maebashi Institute of Technology, 3) Gunma University,
4) Harasawa Homes Co., Ltd.

P-52 Study on the Environmental Performance of the Mud Wall Building -Evaluation of the Moisture Buffering Effect in the Test House-
○Yusuke Yanagishita[1)], Teruaki Mitamura[2)]
1) Division of Architecture, Maebashi Institute of Technology, 2) Maebashi Institute of Technology

P-53 Influence of temperature difference between backside and surface of gypsum boards to water content in gypsum boards
○Tamami Kawasaki[1)], Tomoyoshi Ushiogi[1)], Keiko Abe[2)]
1) Railway Technical Research Institute, 2) Institute of environmental biology

P-54 Evaluation of the function for TATAMI

○Mariko Era[1)], Hiroshi Morita[2)]

1) Graduate School of Environmental Engineering. The University of Kitakyushu,

2) Faculty of Environmental Engineering, The University of Kitakyushu

P-55 Human Health Risk Assessment of Aggregate Exposure to Parabens in Personal Care Products by Probabilistic Risk Assessment Tool

○Shiori Nitta[1)], Tomomi Hayashi[1)], Rina Yamaguchi[1)], Masahiro Tokumura[2)], Yuichi Miyake[2)], Takashi Amagai[2)]

1) Toyo University, 2) University of Shizuoka

P-56 Deodorization effect of ozone and its application to indoor air environment

○Gaku Sakai, Yuya Fukuda, Toshiki Takahashi

School of Science and Technology, Gunma University

P-57 Evaluation of ozone reactions with α-pinene and d-limonene by the react constant of second order reaction rate

○Toshiaki Harada[1)], Naoki Kagi[1)], Mio Arai[1)], Norikazu Namiki[2)], Yoshihide Suwa[3)]

1) Tokyo Institute of Technology, 2) Kogakuin University, 3) Shibaura Institute of Technology

P-58 Influence of environmental conditions on oxidative decomposition of formaldehyde by manganese dioxide blended with cerium oxide

○Hiroki Hayashi, Yoshika Sekine

Graduate School of Science, Tokai University

P-59 Cedar pollen removal efficiency of air purifier estimated by numerical analysis

○Yuya Fukuda, Gaku Sakai, Toshiki Takahashi

School of Science and Technology, Gunma University

P-60 Evaluation of air filter which shows a high antibacterial performance in one minute

○Hidetoshi Fujino, Yoshinobu Oka

CenturyArks Co., Ltd.

P-61 Development of a particle collection device using droplets generated by ultrasonic atomization

○Wataru Karatsu[1)], Kimito Nishishita[1)], Norikazu Namiki[1)], Ryoichi Nakayama[1)], Kazuhhiko Sekiguti[2)], Susumu Nii[3)]

1) Kogakuin University, 2) Saitama University, 3) Kagoshima University

P-62 Verification of reduction in re-entrainment of particles captured on air filter media using atomized APA solution

○Kazuma Yoshimura[1)], Shohei Mizuguchi[1)], Norikazu Namiki[1)], Ryoichi Nakayama[1)], Shunsuke Kobayashi[2)], Hideo Kunitomo[2)]

1) Kogakuin University, 2) ESPO Chemical Co., Ltd.

P-63 The removal of indoor airborne fungi with air purifier

○Kazuhiro Hashimoto[1)], Taeko Nojiri[1)], Eriko Uchida[1)], Hisayuki Oda[1)], Noriko Kohyama[2)], Fumi Yamazaki [2)], Ayumi Trucco[2)], Nobuhiro Asano[2)], Yuji Kawakami[1)]

1) Laboratory of Environmental Science, FCG Research Institute, Inc., 2) Dyson Limited

P-64 The contamination control of indoor fungi by coumarin and coumaric acid

○Shohei Matsuo[1)], Mariko Era[1)], Hiroshi Morita[2)]

1) Graduate School, the University of Kitakyushu, 2) The University of Kitakyushu

P-65 Control of indigenous bacteria in skin by coumarin and coumaric acid

○Takashi Hamaishi[1)], Mariko Era[1)], Hiroshi Morita[2)]

1) Graduate School of Environmental Engineering, The University of Kitakyushu,

2) Factulty of Environmental Engineering, The University of Kitakyushu

P-66 Enhanced the antimicrobial functionality of the *Igusa* foam materials for building materials

○Nanako I[1)], Mariko Era[1)], Hiroshi Morita[2)]

1) Graduate School of Environmental Engineering, The University of Kitakyushu,

2) Faculty of Environmental Engineering, The University of Kitakyusyu

P-67 Study of Antimicrobial Ingredients Emitted from Strain TM-N5 under severe conditions

○Koki Oura[1)], Miku Matsumoto[1)], Chihiro Usui[1)], Tatsuya Yamaguchi[1)], Shinji Urakawa[2)], Yukihiko Nakashima[3)], Shinji Mitsuiki[4)], Masaki Nagaishi[5)], Hiroshi Sato[1)]

1) Faculty of Pharmaceutical Sciences, Nagasaki International University,

2) T.M Enterprise, 3) Faculty of Pharmaceutical Sciences, Fukuoka University,

4) Kyushu Sangyo University, 5) Ceramic Research Center of Nagasaki

Oral Session (Room A: December 16, 9:30～12:30, 13:30～15:30)

[Analytical method]

Chair　Atsuo Nozaki (Graduate School of Tohoku Bunka Gakuen Univ.) (9:30～11:15)

A-01　Development of the Passive Tube Using a Petroleum Charcoal "Low Blank Type"
○Yasuhiro Fukushima, Wataru Marushima, Yoshihiro Suzuki, Kouichi Shimomura, Takanori Enomoto, Sibata Scientific Technoogy LTD

A-02　Determination method of aldehydes in breath sample using SPME-GC/MS method
○Akinobu Oguchi[1)], Toshiro Matsumura[1)], Kenji Yoshikawa[1)], Yukitoki Morita[1)], Akio Sakuragawa[1)], Tsutoshi Imanaka[2)]
1) College of Science and Technology, Nihon University, 2) GL Science Inc.

A-03　GC, GC/MS analysis of Alpinia speciosa grown in Nagasaki Prefecture
○Kazutoshi Takahara[1)], Natsumi Iwamego[1)], Tatsuya Yamaguchi[1)], Tadao Emura[2)], Shinji Mitsuiki[3)], Hidetaka Matsubara[4)], Hiroshi Sato[1)]
1) Nagasaki International University, Department of Pharmacy, 2) IBC Corporation,
3) Kyushu Sangyo University, 4) Chuken Laboratory for Life and Environment

A-04　Analysis of isocyanate emitted from urethane products
○Maiko Tahara[1)], Shinobu Sakai[1)], Toshiko Tanaka-Kagawa[2)], Hideto Jinno[3)], Yoshiaki Ikarashi[1)]
1) National Institute of Health Sciences, 2) Yokohama University of Pharmacy, 3) Meijo University

A-05　Influence of indoor air quality and life behavior on VOCs emanating from human skin
○Keita Kimura[1)], Shota Furukawa[1)], Minami Takahashi[1)], Yoshika Sekine[1)], Kazuo Umewzawa[2)], Satomi Asai[2)], Hayato Miyachi[2)], Daisuke Oikawa[3)]
1) Graduate of Science, Tokai University, 2) School of Medicine, Tokai University, 3) AIREX INC.

A-06　Influence of mental stress on the emission flux of ammonia from human skin
○Shota Furukawa[1)], Keita Kimura[1)], Minami Takahashi[1)], Yoshika Sekine[1)], Kazuo Umezawa[2)], Satomi Asai[2)], Hayato Miyachi[2)]
1) Graduate School of Science, Tokai University, 2) School of Medicine, Tokai University

A-07　A study on behavior of acetic acid emanating from human skin during thermal and mental sweating
○Minami Takahashi[1)], Keita Kimura[1)], Shota Furukawa[1)], Yoshika Sekine[1)], Kazuo Umewzawa[2)], Satomi Asai[2)], Hayato Miyachi[2)]
1) Graduate School of Science, Tokai University, 2) School of Medicine, Tokai University

[Chemical reaction]

Chair　Koichi Ikeda (Nihon University) (11:15～12:30)

A-08　Composition Analysis of Secondary Organic Aerosol Formed from Ozone/Limonene Reactions in Indoor Air
○Mio Arai[1)], Naoki Kagi[1)], Norikazu Namiki[2)], Yoshihide Suwa[3)], Toshiaki Harada[1)]
1) Tokyo Institute of Technology, 2) Kogakuin University, 3) Shibaura Institute of Technology

A-09 Reaction analysis of products in an aircraft cabin and ozone gas
○Atsushi Mizukoshi[1)], Kenichi Azuma[1)], Shigehiro Sugiyama[2)], Daisuke Tanaka[2)], Masashi Inoue[3)], Masahiro Tokumura[4)], Jiro Okumura[1)]
1) Kindai University, 2) Mitsubishi Heavy Industries, Ltd., 3) Mitsubishi Aircraft Corporation, 4) University of Shizuoka

A-10 Measurement of SVOC emission with Passive Flux Sampler and adsorption on house dust
○Kaori Nomura[1)], Naoki Kagi[1)], Naohide Shinohara[2)]
1) Tokyo Institute of Technology, 2) National Institute of Advanced Industrial Science and Technology

A-11 Relationship between particle collection efficiency of quartz fiber filter and particle size distribution of phthalates
○Ikue Saito[1)], Aya Onuki[1)], Tokuko Tsunoda[1)], Toshiko Tanaka-Kagawa[2)], Masahiro Chiba[3)], Hitoshi Uemura[4)], Hideto Jinno[5)], Shinobu Sakai[6)], Toshinari Suzuki[1)], Mitsugu Hosaka[1)]
1) Tokyo Metropolitan Institute of Public Health, 2) Yokohama University of Pharmacy, 3) Hokkaido Institute of Public Health, 4) Kanagawa Prefectural Institute of Public Health, 5) Meijo University, 6) National Institute of Health Sciences

A-12 Relationship between Mechanism of SVOC Adsorption onto Airborne Particles and Airborne Particle Concentration in Indoor Air
○Kosuke Kondo[1)], Naoki Kagi[2)], Norikazu Namiki[3)]
1) Shimizu Corporation, 2) Tokyo Institute of Technology, 3) Kogakuin University

[Emission mechanism]

Chair Yoshika Sekine (Tokai University) (13:30～14:30)

A-13 A study on the indoor air pollution caused by unvented kerosene space heaters (part1), The change of indoor temperature, relative humidity, carbon monoxide, carbon dioxides and oxygen
○Atsuo Nozaki[1)], Daisuke Shoji[1)], Takahiro Tsuchiya[1)], Hisato Nishina[2)], Yasunori Narita[3)], Toshiki Sakuma[3)]
1) Graduate School of Tohoku Bunka Gakuen Univ., 2) Tohoku Bunka Gakuen Univ., 3) Life science research laboratory Co., Ltd.

A-14 A study on the indoor air pollution caused by unvented kerosene space heaters (part 2), The change of concentration of aldehydes and VOCs
Atsuo Nozaki[1)], Daisuke Shoji[1)], Takahiro Tsuchiya[1)], ○Hisato Nishina[2)], Yasunori Narita[3)], Toshiki Sakuma[3)]
1) Graduate School of Tohoku Bunka Gakuen Univ., 2) Tohoku Bunka Gakuen Univ., 3) Life science research laboratory Co., Ltd.

A-15 A study on the indoor air pollution caused by unvented kerosene space heaters (part 3), The change of concentration of NOx
Atsuo Nozaki[1)], ○Daisuke Shoji[1)], Takahiro Tsuchiya[1)], Hisato Nishina[2)], Yasunori Narita[3)], Toshiki Sakuma[3)]
1) Graduate School of Tohoku Bunka Gakuen Univ., 2) Tohoku Bunka Gakuen Univ., 3) Life Science Research Laboratory

A-16 Analysis of nano particles emitted from color laser multiple function printer
○Toshiyuki Kabata[1)], Hiroyuki Shimada[1)], Norikazu Namiki[2)], Naoki Kagi[3)]
1) Ricoh Company, Ltd., 2) Kogakuin University, 3) Tokyo Institute of Technology

[Pollutant phenomena]

Chair Atsushi Mizukoshi (Kindai University) (14:30～15:30)

A-17 Rapid measurement of hygroscopic capacity in humidity conditioned architectural materials
○Saori Ikeda, Kazuhiko Hirai, Hidemi Koyama
Tokyo Metropolitan Industrial Technology Research Institute

A-18 Particle Deposition on Interior Materials with Surface Roughness
○Naoki Kagi[1)], Mami Aikawa[2)]
1) Tokyo Institute of Technology, 2) Obayashi Corporation

A-19 Measurements of Human Exposure Concentration to Formaldehyde at the Anatomical Operations
○Koichi Ikeda[1)], Hiroki Iwama[2)], Torahiko Saeki[2)], Toshihiro Anai[2)], Huaipeng Tang[2)]
1) Department of Architecture, College of Science and Technology, Nihon University,
2) IAQ Research Group, Researchand Development Center, Shinryo Corporation

A-20 Passive sampling for Total Volatile Organic Compounds (TVOCs) in indoor air (part2)
○Takahiro Ishizaka, Ayato Kawashima, Naoki Hishida, Noriaki Hamada
Graduate School of Agriculture Ehime University

Oral Session (Room B: December 16, 9:30～12:30, 13:30～16:00)

[Environmental tobacco smoke]

Chair Hoon Kim (National Institute of Public Health) (9:30～10:45)

B-01 Effective smoke isolation by evaluation of dynamic behaviors of particles and odors in ETS at the interface between the non-smoking and smoking zones
○Hiroki Konno[1)], Norikazu Namiki[1)], Ryoichi Nakayama[1)], Naoki Kagi[2)]
1) Kogakuin University, 2) Tokyo Institute of Technology

B-02 Development of ETS and Odor Removal System V Long-term Continuous Measurement of Smoking Booth in an Office Building
○Torahiko Saeki[1)], Hiroki Iwama[1)], Toshihiro Anai[1)], Huaipeng Tang[1)], Takeshi Tsushima[1)],
Miyuki Noguchi[2)], Atsushi Mizukoshi[3)], Yukio Yanagisawa[4)]
1) Shinryo Corporation, 2) Seikei University, 3) Kindai University, 4) The University of Tokyo

B-03 Study for solanesol sampling and analyzing for contained ETS particles
○Yoshihiro Suzuki[1)], Miyuki Noguchi[2)], Takashi Amagai[3)], Satoshi Nakai[4)], Yukio Akiyama[5)],
Yukio Yanagisawa[6)], Keiichi Arashitani[5)], Yasuhiro Fukushima[1)], Takanori Enomoto[1)]
1) SIBATA Scientific Technology Ltd., 2) Seikei University, 3) University of Sizuoka,
4) Yokohama National University, 5) University of Occupational and Environmental Health,
6) The University of Tokyo

B-04 Measurement of Nicotine emitted from third hand smoke with PFS
○Miyuki Noguchi[1)], Takashi Amagai[2)], Keiichi Arashidani[3)], Yukio Akiyama[3)], Yoshihiro Suzuki[4)], Satoshi Nakai[5)], Yukio Yanagisawa[6)], Akihiro Yamasaki[1)]
1) Seikei University, 2) University of Shizuoka, 3) University of Occupational and Environmental Health,
4) Sibata Scientific Technology, Ltd., 5) Yokohama National University, 6) The University of Tokyo

B-05 ETS Exposure Assessment by using a Passive Sampler and a Questionnaire
○Satoshi Nakai[1)], Miyuki Noguchi[2)], Yukio Akiyama[3)], Keiichi Arashidani[3)], Takashi Amagai[4)], Yoshika Sekine[5)], Hiroshi Satoh[6)], Hideaki Matsuki[5)], Yoshihiro Suzuki[7)], Yukio Yanagisawa[8)]
1) Yokohama National University, 2) Seikei University,
3) University of Occupational and Environmental Health, 4) University of Shizuoka, 5) Tokai University,
6) Nagasaki International University, 7) Sibata Scientific Technology, Ltd., 8) The Kaisei Academy

[Environment evaluation]
Chair Satoshi Nakai (Yokohama National University) (10:45～12:30)

B-06 Global trend of Indoor Air Quality certification and new horizon in domestic residential Indoor Air Quality
○Kokoro Iwasawa, Masashi Shigesato, Taketoshi Oitani
UL Japan, Inc.

B-07 The development of indoor consumer exposure assessment tool (ICET)
○Haruyuki Higashino, Hideo Kajihara
National Institute of Advanced Industiral Science and Technology

B-08 The development of the spray model mounted on indoor consumer exposure assessment tool (ICET)
○Hideo Kajihara, Haruyuki Higashino
National Institute of Advanced Industiral Science and Technology

B-09 Development of the new calibration system which realizes the traceability to the international system of units for the formaldehyde calibration gas
○Suguru Mochizuki[1)], Tomotaka Yoshimura[1)], Tomohiro Sasaki[1)], Tsuneaki Maeda[2)]
1) HORIBA STEC, Co., Ltd., 2) National Institute of Advanced Industrial Science and Technology

B-10 Recommendations to the future Society for the Indoor Environment, Japan - Safe and secure life and disaster response for children -
○Shinobu Segawa
Information Media Center, Kanazawa University

B-11 A cross-sectional association between indoor cold exposure and prevalence of obesity: HEIJO-KYO cohort study.
○Keigo Saeki[1)], Kenji Obayashi[1)], Nobuhiro Tone[2)], Syoichi Takamiya[3)], Norio Kurumatani[1)]
1) Department of Epidemiology and Preventive medicine, Nara Medical University,
2) Takatori Corporation, 3) DAISEKI Inc.

B-12 Questionnaire Survey on Sensation of Dryness and Indoor Temperature and Humidity
○Noriko Kaihara

National Institute of Public Health

[Air cleaning]

Chair Haruki Osawa (National Institute of Public Health) (13:30～15:00)

B-13 Study on downsizing of the two-stage type electrostatic precipitator
○Kentaro Nagayoshi, Kanae Kurita
Fujitsu General Laboratories Limited

B-14 Improving the working Environment of the Medical Equipment Factory to Use an Organic Solvent
○Eizo Murakami, Yojiro Goto, Toyoharu Okubo
Asahi Kogyosha Co., Ltd.

B-15 Study of indoor air PM cause material removal by microplasma
○Saho Muramatsu[1)], Jaroslav Kristof[2)], Marius Blajan[3)], Kazuo Shimizu[1,2,3)]
1) Graduate School of Integrated Science and Technology, Shizuoka University,
2) Graduate School of Science and Technology, Shizuoka University,
3) Organization for Innovation and Social Collaboration, Shizuoka University

B-16 Field Survey for the Improvement Effect of Indoor Air Quality by Visible Light Responsive Photocatalytic -Measurement Results in the Complex Facility-
○Teruaki Mitamura[1)], Sei Fujisawa[2)], Yusuke Yanagishita[3)]
1) Maebashi Institute of Technology, 2) FUJISAWA Co., Ltd.,
3) Graduate School of Engineering, Maebashi Institute of Technology

B-17 Studies on the deterioration of contaminants removal performance of room air cleaners (part 3)
Atsuo Nozaki[1)], ○Kentaro Yamashita[1)], Yusuke Ichijo[2)]
1) Graduate School of Tohoku Bunka Gakuen Univesity, 2) Tohoku Bunka Gakuen University

B-18 Detoxification of Particulate Matter 2.5 ($PM_{2.5}$) by photocatalyst supported on quartz fiber filter
○Kazuhiro Misawa, Yuki Kumai, Yoshika Sekine
Graduate School of Science, Tokai University

[Field study (IAQ)]

Chair Kazuhiro Hashimoto (FCG Research Institute, Inc.) (15:00～16:00)

B-19 Indoor Air Quality Investigation on General Housing ---- Using the Typical Common Housing in Taiwan as an Example
○Huang Lin Lin, Zhang Yu Ting, Peng Ting Yi, Liu Tzu Yin, Lin Ping Yang, Wei Horng Ru, Xu Shi Xun
Cheng Shiu University Department of Architecture and Interior Design, TAIWAN

B-20 A research survey on spatial radiation dose rates in the general house of Koriyama city in Fukushima
Atsuo Nozaki[1)], Hikaru Kobayashi[2)], ○Yusuke Ichijo[1)], Yasunori Narita[3)], Hiroshi Yoshino[2)]
1) Tohoku Bunka Gakuen Univ., 2) Tohoku Univ., 3) Life Science Research Laboratory Co., Ltd.

B-21 Survey on Indoor Environment in Facilities of the Elderly - Part.1 Indoor Air Quality in Facilities of Cold Region –

○Hoon Kim[1)], Motoya Hayashi[1)], Haruki Osawa[1)], Noriko Kaihara[1)], Michiko Bando[1)], Koki Kikuta[2)], Hirofumi Hayama[2)], Yoshinori Honma[3)]
1) National Institute of Public Health, 2) Hokkaido University, 3) Miyagigakuin Women's University

B-22 Survey on Indoor Environment in Facilities of the Elderly Part.2 Measurement of Indoor Temperature and Humidity of Cold Region in Summer

○Haruki Osawa[1)], Motoya Hayashi[1)], Noriko Kaihara[1)], Hoon Kim[1)], Michiko Bando[1)], Kenichi Kobayashi[1)], Koki Kikuta[2)], Hirofumi Hayama[2)], Yoshinori Honma[3)], Shuang Yan[3)]
1) National Institute of Public Health, 2) Hokkaido University, 3) Miyagigakuin Women's University

Oral Session (Room C: December 16, 9:30～12:30, 13:30～15:45)

[Environmental bioaerosol]

Chair Makoto Yamaguchi (Shimizu Corporation) (9:30～11:15)

C-01 Familial cases of summertype hypersensitivity pneumonitis as a sick building syndrome

○Kouko Hidaka
National Hospital Organization Kokura Medical Center, Department of Respiratory Medicine

C-02 The study of indoor air quality and energy saving in the office building using hybrid ventilation system

○Riku Watanabe, U Yanagi, Yuhei Ogaki
Kogakuin University

C-03 Investigation of energy consumption and indoor air quality of underground shopping centers and underground walkway in Sapporo

○Yoonkyung Kang, Katsunori Nagano
Hokkaido University

C-04 A Survey on Seasonal Transition of Indoor Airborne Fungi and *Aspergillus fumigatus* population in Campus <2>

○Hisayuki Oda[1,2)], Kazuhiro Hashimoto[1)], Yuji Kawakami[1)], Koichi Makimura[2)]
1) Laboratory of Environmental Science, FCG Research Institute, Inc.,
2) Laboratory of Space and Environmental Medicine, Teikyo University

C-05 How to control fungal contamination in wind instruments

○Nobuo Hamada
Osaka Museum of Natural History

C-06 Relationship among indoor, outdoor, and personal air fungal compositions and diversities

Choa An, Cheolwoon Woo, ○Naomichi Yamamoto
Department of Environmental Health Sciences, Seoul National University

C-07 Validation of a fungal index and sensor fungi encapsulated in a fungal detector

○Keiko Abe
Institute of Environmental Biology

[Bioaerosol countermeasure]

Chair Keiko Abe (Institute of Environmental Biology) (11:15～12:30)

C-08 Study of Antimicrobial Ingredients Emitted from *Bacillus* Strain TM-I-3

○Chihiro Usui[1)], Kouki Oura[1)], Miku Matsumoto[1)], Miwa Sohda[1)], Shinji Urakawa[2)], Yukiko Ogawa[1)], Yukihiko Nakashima[3)], Shinji Mitsuiki[4)], Hidetaka Matsubara[5)], Masaki Nagaishi[6)], Hiroshi Sato[1)]

1) Faculty of Pharmaceutical Sciences, Nagasaki International University, 2) T.M Enterprise,

3) Faculty of Pharmaceutical Sciences, Fukuoka University, 4) Kyusyu Sangyo University,

5) Chuken Laboratory for Life and Environment, 6) Ceramic Research Center of Nagasaki

C-09 Fundamental experiments on sterilization performance to the adhesion microbe on a filter media by ozone

○U Yanagi[1)], Fusako Yamatani[1)], Yoshitsugu Uchida[2)], Hirotaka Shigeno[2)], Tadashi Machida[2)], Keiji Maruhashi[2)], Li Bao[3)], Makoto Kobayashi[3)]

1) Kogakuin University, 2) TANASHIN DENKI CO., LTD., 3) NIPPON MUKI CO., LTD.

C-10 Examination of the Anti-microbe Measure with the Chlorine-based Chemicals (Part 16) Evaluation of the Case of *Bacillus sebtilis* and *Pseudomonas aeruginosa*

○Makoto Yamaguchi, Kazuyuki Tomioka

Shimizu Corporation

C-11 Anti-amoeba activity of fatty acid salts against different forms of the amoeba

○Aya Tanaka[1)], Mariko Era[1)], Manami Masuda[1)], Takayoshi Kawahara[2)], Takahide Kanyama[2)], Hiroshi Morita[3)]

1) Graduate School of Environmental Engineering, The University of Kitakyushu,

2) Shabondama Soap Co., Ltd., 3) Faculty of Environment Engineering, The University of Kitakyushu

C-12 Effect of leaves of cherry tree on House Dust Mite

○Yumeho Obata[1)], Mariko Era[1)], Hiroshi Morita[2)]

1) Graduate School of Environmental Engineering, The University of Kitakyusyu,

2) Faculty of Environment Engineering, The University of Kitakyusyu

[Psychophysiology]

Chair Kenichi Azuma (Kindai University) (13:30～15:00)

C-13 Discoveries of the Topic of Indoor Lighting Environment in Taiwan --- Using the Field Survey of 8 Common Housing as an Example

○Linlin Huang, Yu Wen Hong, Wen Long Lian

Cheng Shiu University Department of Architecture and Interior Design, TAIWAN

C-14 Study of energy-saving office lighting based on brightness sensation

○Yuta Hamada[1)], Etsuko Mochizuki[2)], Yukitada Murae[3)], Kaori Oshima[3)]

1) Graduate school of Chiba Institute of Technology, 2) Chiba Institute of Technology, 3) Toda Corporation

C-15 Measurement of Odor Concentration by Odor Bag Method and Odor Intensity Evaluation

○Kaoru Ikeda[1)], Toshio Yamanaka[1)], Akihisa Takemura[2)], Hisashi Kotani[1)], Yoshihisa Momoi[1)], Kazunobu Sagara[1)]

1) Osaka University, 2) Setsunan University

C-16 Effect of fragrance on relationship between mental workload and stress
○Akihisa Takemura
Setsunan University

C-17 Study on Evaluation of Odor Intensity by Cross Modality Matching (Part 2) Adaptation of Language rating Scale, length scale, ME Method, Sound Pitch, Loudness in Adaptation process
○Toshio Yamanaka[1)], Akihisa Takemura[2)], Hisashi Kotani[1)], Yoshihisa Momoi[1)], Kazunobu Sagara[1)], Ryota Takahashi[3)], Shin Takeuchi[3)]
1) Osaka University, 2) Setsunan University, 3) The Kansai Electric Power Company, Inc.

C-18 A study on indoor air quality control using air fresheners (part 1)
Atsuo Nozaki[1)], ○Takahiro Tsuchiya[1)], Yusuke Ichijo[2)]
1) Graduate School of Tohoku Bunka Gakuen University, 2) Tohoku Bunka Gakuen Univ.

[Health effect]

Chair Toshio Yamanaka (Osaka University) (15:00～15:45)

C-19 Strengthening of investigating technology for accident by emission VOCs from products
○Hiroyuki Kawasaki, Takeshi Harada, Jun Kohzaki
National Institute of Technology and Evaluation

C-20 Effects of exposure to water damage on homes after flooding in Fukuchiyama-area downpours: indoor environment and human health
○Kenichi Azuma[1)], Naoki Kagi[2)], U Yanagi[3)], Hoon Kim[4)], Kenichi Hasegawa[5)], Haruki Osawa[4)]
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C-21 Association of short-wavelength light exposure at night with melatonin secretion and sleep quality: cross-sectional analysis of the HEIJO-KYO cohort
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