國立臺灣大學公衛學院學生出席國際學術活動報告書

環職所 碩二 R12852020 陳孝桐

一、 會議資訊

會議時間：2025/06/22-2025/06/25 (2025/06/21 下午 YSF 活動)

會議地點：日本沖繩縣石垣市

會議名稱：

(中文)第 10 屆亞太質譜年會

(英文) The 10th Asia-Oceania Mass Spectrometry Conference

發表論文題目：

(中文) UPLC-MS/MS 分析顆粒活性碳對飲用水中 PFAS 去除效率之評估

(英文) UPLC-MS/MS Analysis of PFAS for Evaluation of its Removal from Drinking Water with Granular Activated Carbon

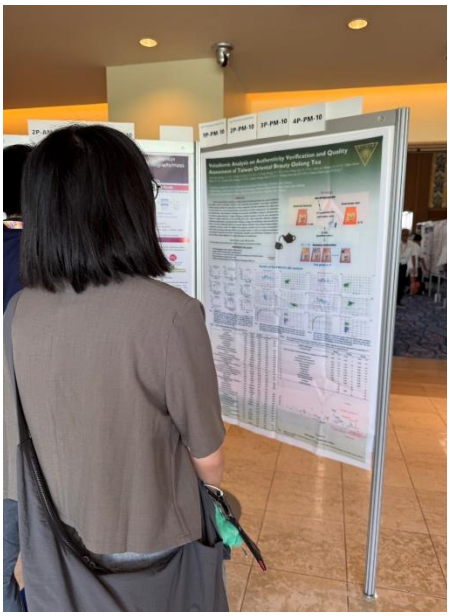
二、 本人參與會議相關資料

1. 參加會議經過

2025 年第十屆 Asia-Oceania Mass Spectrometry Conference（AOMSC 2025）為亞太地區質譜領域最具代表性的國際性學術會議，由日本質譜學會（The Mass Spectrometry Society of Japan, MSSJ）主辦。首先我們於 2025 年 6 月 20 日自台灣出發飛抵沖繩，21 日從沖繩轉機飛至石垣島，下午有 Young Scientists Forum (YSF)的 net working 前導活動，這是 AOMSC 的子活動，YSF 分為兩日進行。而正式的研討會議是在 22 日下午開幕，會議正式開幕的上午我一樣參與了 YSF 的 main session，讓年輕的產業以及學術界中質譜相關人員共同免費參與，總共有 15 位來自世界各國的年輕學者，上台進行初步的分享，主要是介紹的自己研究的主題，而總計參與人員約 40 人。在短暫的分享中，我對於來自香港科技大學的 Anna Mae Vorwerk 印象特別深刻，她結合這次研討會的主題進行分享，這次主打“From Bench to Beach”，而她提出的是“From Beach to Bench”，因為她的研究是來自於香港周遭大陸或海洋環境中移動往香港內陸的空氣汙染物的研究。

而整場會議中，我對其中一個 oral session 特別有印象，是關於農業和食品科學研究和質譜分析技術結合內容，發表者分別有來自泰國、韓國、新加坡與台灣。部分研究的主題都恰好與當地氣候條件適宜種植的特定植物相關，了解到質譜技術的應用，其實與生活環境中的飲食息息相關。這次也聽到體學分析、代謝生化或是特定疾病標的物等質譜分析應用的討論，這些主題都是我比較陌生但覺得很特別的題目。

圖一、AOMSC 2025 報到前看板合照

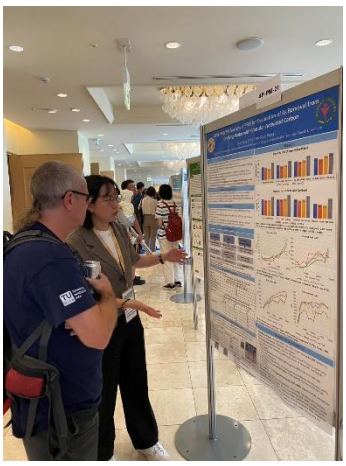


圖二、其他與會者 poster 展示

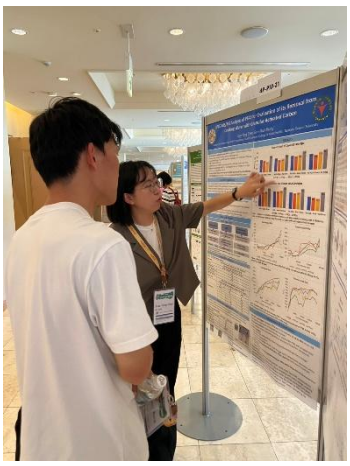
2. 本人發表過程

我於 6 月 25 日參與了海報展示 (Poster presentation) ，發表編號為 4P-PM-21，發表過程如圖三至圖六。展示了我的研究成果，主題為“UPLC-MS/MS Analysis of PFAS for Evaluation of its Removal from Drinking Water with Granular Activated Carbon”，很榮幸和多位與會人員、學者進行深入討論，也獲得了寶貴的建議和反饋。很感謝他們對我研究的領域感興趣，同時也讓我練習如何和外國學者溝通討論。也了解到不同領與的研究學者在跨領域溝通上，需要更進一步的對話說明，單純看 poster 內容可以獲得研究的初步結果，但若是要進一步釐清實驗過程或更細一部討論結果呈現的原因的話，就需要更多的討論，才得以取得資訊上的對等，也能讓關注研究議題的學者，從中有所收穫。

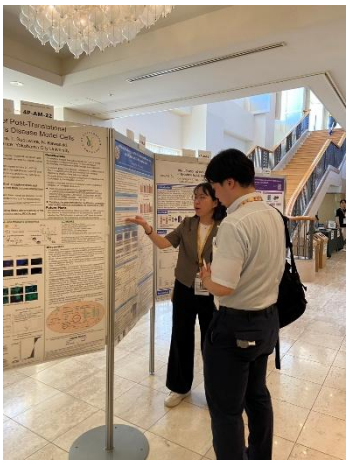
這次能夠參與 AOMSC 2025，是我碩士班學習階段中十分難得的學習經驗，也是我本人首次出國參與研討會。有幸能夠和許多國際學者交流質譜相關的資訊和互相學習，對我來說是相當難得的機會，也讓我反思我個人研究的細節。我會將這次寶貴的學習經驗轉換成在學術學習上的動力與養分，持續精進自身能力。



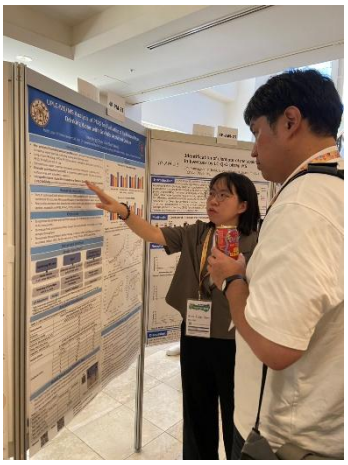
圖三、本人與學者交流 1



圖四、本人與學者交流 2



圖五、本人與學者交流 3



圖六、本人與學者交流 4

三、 其他資料

1. 國際學術活動主辦單位致申請者本人之正式邀請函，或論文被接受發表之證明文件(信函或電子郵件)等影本(圖七)
2. 研討會名牌發表之海報(圖八)
3. 報名會議收據(圖九)
4. 研討會議程資料、名牌(圖十、圖十一)
5. 擷取自研討會網站之摘要(圖十二)
6. 研討會日程表(本人報告時間為 Day 4)(圖十三)
7. 6/21、22 YSF 活動簡介(圖十四)
8. 擬發表之論文摘要及論文全文(英文版)影本

   *論文口試預計安排於 2025/07/22，後續以電子檔補件論文全文

Presentation at the AOMSC2025, Ishigaki, Japan, 2025

1 封郵件

The 10th AOMSC Registration Help Desk <aomsc10-desk@conf.bunken.co.jp> 2025年4月17日 下午4:00

回覆: aomsc10-desk@conf.bunken.co.jp

收件者: ritachen0816@gmail.com

Title: UPLC-MS/MS Analysis of PFAS for Evaluation of its Removal from Drinking Water with Granular Activated Carbon
Presenting Author: Siao Tong Chen

Dear Ms. Siao Tong Chen,

Your paper indicated above has been accepted for a poster presentation at the 10th Asia-Oceania Mass Spectrometry Conference (AOMSC2025), Ishigaki, Japan, 2025.
We would like to thank the more than 500 registrations and 450 presentations from more than 20 countries.
Due to the unexpectedly large number of participants, please note that the presentation times and other details have been changed from the initial announcement.

Presentation Number: 4P-PM-21

* The number before "P" indicates the date for your poster presentation.
1P: Sun., June 22, 2P: Mon., June 23, 3P: Tue., June 24, 4P: Wed., June 25
* The second letter, AM/PM, indicates your poster presentation is in morning or afternoon.
* The third number is your poster number.

[Poster Set-up]
The size of the poster board is 86 cm wide and 120 cm high (for A0 size).
Please provide your own supplies, including Velcro Tape, to mount your poster.
Posters must be in place throughout the scheduled day. The poster number will be attached at the top of the boards.
Afternoon poster sessions may be held outside in the 1F Garden, weather and time permitting.

Sunday, June 22 (Day1): 13:00-18:15
(For welcome mixer participants, the poster removal time is preferably at 20:00.)
Monday, June 23 (Day2): 8:15-19:00
Tuesday, June 24 (Day3): 8:15-19:00
(For banquet participants, the poster removal time is preferably at 21:00.)
Wednesday, June 25 (Day4): 8:15-17:15

After the closing time, the organizing committee may dispose of the posters that remained on the board.

[Poster Core time]
Presenters should attend the designated core times listed below
1P-PM, Sunday, June 22 (Day1) 16:15-17:15 (Odd), 17:15-18:15 (Even)
2P-AM, Monday, June 23 (Day2) 9:30-10:30 (Odd), 10:30-11:30 (Even)
2P-PM, Monday, June 23 (Day2) 17:00-18:00 (Odd), 18:00-19:00 (Even)
3P-AM, Tuesday, June 24 (Day3) 9:15-10:15 (Odd), 10:15-11:15 (Even)
3P-PM, Tuesday, June 23 (Day3) 17:00-18:00 (Odd), 18:00-19:00 (Even)
4P-AM, Wednesday, June 25 (Day4) 9:15-10:15 (Odd), 10:15-11:15 (Even)
4P-PM, Wednesday, June 25 (Day4) 15:15-16:15 (Odd), 16:15-17:15 (Even)

[Awarding Ceremony for the Best Presentation Award]
The award ceremony will be held at 17:15 on June 25 (Wed.), the last day of the conference. All entrants are required to attend the ceremony.

For further information on the presentation, please visit the following website.
https://www.mssj.jp/conf/73/call.html

Thank you for your participation in the AOMSC2025, Ishigaki, Japan.

Sincerely,

Yasushi Ishihama
Chair
The organizing committee
The 10th Asia-Oceania Mass Spectrometry Conference (AOMSC2025)

圖七、投稿 AOMSC 2025 被接受憑證

UPLC-MS/MS Analysis of PFAS for Evaluation of its Removal from Drinking Water with Granular Activated Carbon

Siao-Tong Chen, Gen-Shuh Wang*
Institute of Environmental and Occupational Health Sciences, College of Public Health, National Taiwan University

Introduction

- **Per- and polyfluoroalkyl substances (PFAS)** are persistent "forever chemicals" found in various water sources, including surface and drinking water.
- Long-chain PFAS (e.g., PFOA, PFOS) have been phased out, but short-chain PFAS (e.g., PFBS, PFHxS) are still in use.
- Conventional water treatment processes are often ineffective in removing PFAS.
- **Granular activated carbon (GAC)** is a promising adsorbent for PFAS due to its large surface area and adsorption capacity.
- **Ultraperformance Liquid Chromatography-Tandem Quadrupole Mass Spectrometer (UPLC-MS/MS)** provides accurate and sensitive analysis of trace PFAS in water.

Research Motivations

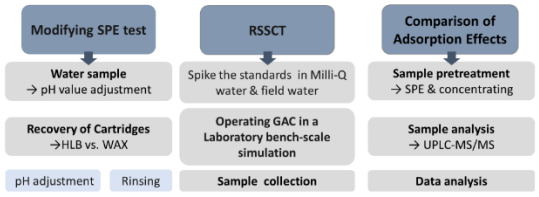
- Rare of optimized Solid phase extraction (SPE) conditions and adapted analytical conditions for accurate PFAS quantification in low-concentration water samples.
- Few studies compare coal-based and coconut shell GAC adsorption for different PFAS species, especially on PFBS, PFHxS, PFOS, and PFOA.

Objectives

- To optimize the sample pretreatment process for improving the recovery of target PFAS compounds.
- To reduce total analysis time from Taiwan EPA method NIEA W542.52B and increase sample throughput.
- To evaluate the adsorption performance of coconut shell and coal-based granular activated carbon (GAC) for the removal of PFBS, PFHxS, PFOS, and PFOA.

Material & Method

Study flow chart



*SPE: Solid phase extraction; HLB: Hydrophilic-Lipophilic Balance; WAX: Weak Anion eXchange
*RSSCT: Rapid Small Scale Column Test
*Spiked the standards (PFBS, PFHxS, PFOS, and PFOA) in Milli-Q water with an initial concentration of **100 ng/L**.

Analytical Conditions

Table 1. UPLC-MS/MS Analytical Conditions

Instruments	Liquid Chromatograph: Waters Acquity UPLC I-Class PLUS Mass Spectrometer: Waters Xevo® TQ-XS		
Column	ACQUITY UPLC HSS T3 (100 x 2.1 mm, 1.8 µm)		
Ionization mode	ESI-		
Column temperature (℃)	40		
Flow rate (mL/min)	0.4		
Injection volume (µL)	5		
Mobile phase	A: Milli-Q water containing 5-mM ammonium acetate B: 100%(v/v) Methanol containing 5-mM ammonium acetate		
Gradient (min)	Time	A (%)	B (%)
	Initial (0)	80	20
	1	60	40
	2	20	80
	5	5	95
	6	80	20
	8	80	20

Rapid Small Scale Column Test

- The RSSCT system simulates the fixed-bed adsorption unit based on the ratio of diameters of GAC, empty bed contact time (EBCT), and volume of water treated (shown as number of bed volumes) of the full-scale water treatments.

Table 2. The parameters of RSSCT

Activated carbon	Coconut-shell	Coal-based
Empty Bed Contact Time (min)	1.6	
Bed diameter (cm)	0.4	
Bed height (cm)	5	
Bed volume (cm^3)	0.62832	
Flow rate (mL/min)	1	

Video

Figure 1. The RSSCT column

Abstract

Poster

E-mail contact:
Gen-Shuh Wang: gswang@ntu.edu.tw
Siao-Tong Chen: r12852020@ntu.edu.tw/ritachen0816@gmail.com

Results

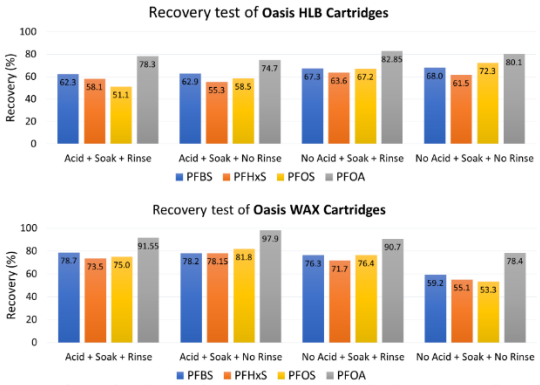


Figure 2. Influence of pH adjustment (pH=3 versus no pH adjustment) and rinsing with 0.1% formic acid, on the recovery obtained using Oasis HLB and Oasis WAX cartridges in Milli-Q water.

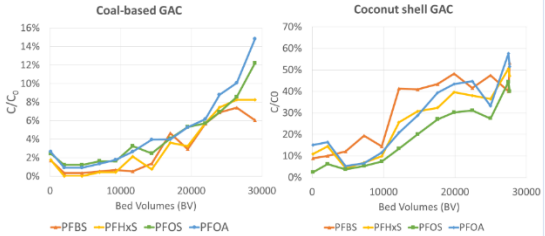


Figure 3. Breakthrough curves from 2 weeks RSSCT simulating the removal of PFBS, PFHxS, PFOS, and PFOA in **Milli-Q water**.

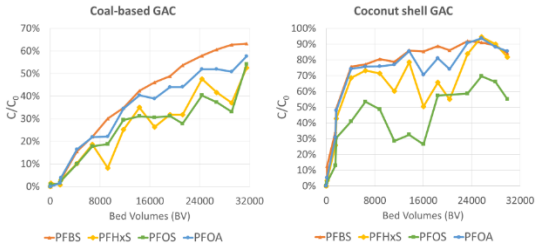


Figure 4. Breakthrough curves from 2 weeks RSSCT simulating the removal of PFBS, PFHxS, PFOS, and PFOA by coal-based and coconut shell GAC in **field water**.

Discussion & Conclusion

- **WAX SPE cartridges** improved PFOA and PFOS recovery by **up to 20%** versus HLB, showing the importance of method optimization.
- **Analytical Condition** improved retention of short-chain PFAS with a higher initial aqueous phase while maintaining effective elution of long-chain compounds.
- **In Milli-Q water:**
  - Long-chain PFAS (PFOA/PFOS) showed delayed breakthrough due to stronger hydrophobic interactions.
  - Short-chain PFAS (PFBS/PFHxS) broke through early, indicating low adsorption affinity.
  - **Coal-based GAC** had **around 30% higher PFOS capacity** than coconut-based GAC.
- **In field water:**
  - Coal-based GAC provided **approximately 30–50% better long-chain PFAS removal** than coconut GAC.
- This study fills a key gap by providing RSSCT data under low PFAS concentrations. These findings offer a foundation for future modeling and system design, enabling parameter adjustments tailored to different water qualities and treatment goals.
- Minor inconsistencies in adsorption behavior may be caused by PFAS competition, variations in GAC properties, or matrix effects in field water, highlighting the complexity of PFAS removal in practical applications.

圖八、本人報告海報

No. AOMSC10-RC0364R Date: May 29, 2025

RECEIPT

Received from: Siao Tong Chen

Received By: Yasushi Ishihama
Chair of the 10th Asia-Oceania Mass Spectrometry Conference (AOMSC 2025),
organized by the Mass Spectrometry Society of Japan

Registration Number T8011105006782

JPY14,500 -

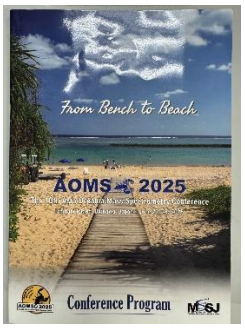
for: the 10th Asia-Oceania Mass Spectrometry Conference (AOMSC 2025)

Description	Qty	Amount	Note
Registration fee (Applicant)	1	JPY14,500	Tax rate 10%
Untaxable subtotal		JPY0	(Tax JPY0)
10% Taxable subtotal		JPY14,500	(Tax JPY1,318)
Total Payment		JPY14,500	

Transaction date : Mar 13, 2025

Signed by:

圖九、報名 AOMSC 2025 收據



圖十、AOMSC 2025 議程資料

圖十一、AOMSC 2025 名牌

Day 4, June 25 (Wed.)

Room P (Maesato East, Foyer, Ocean Wing)

4P-PM-21 PDF

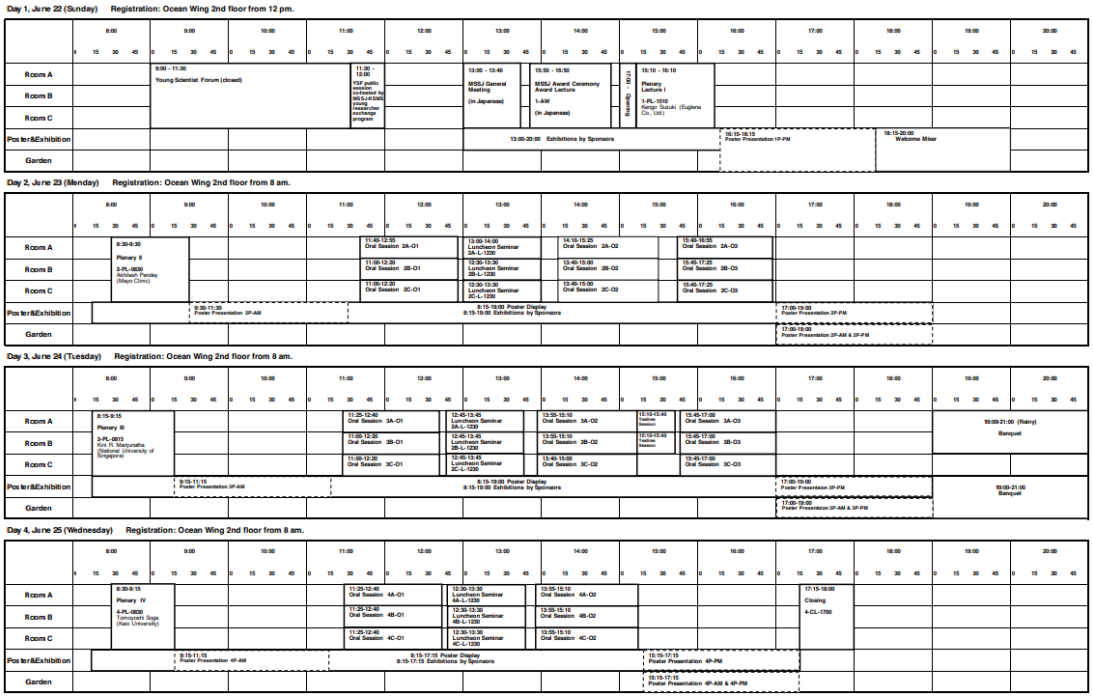
UPLC-MS/MS Analysis of PFAS for Evaluation of its Removal from Drinking Water with Granular Activated Carbon

(NTU EOHS)
°Siao-Tong Chen, Gen Shuh Wang

Per- and polyfluoroalkyl substances (PFAS) are persistent pollutants found in water, raising concerns about potential health risks. Conventional water treatment methods often struggle to effectively remove PFAS. This study investigates the use of granular activated carbon (GAC) to reduce PFAS concentrations in water treatment plants. Laboratory-scale simulations evaluated coconut shell- and coal-based GAC for their effectiveness in removing PFBS, PFHxS, PFOA, and PFOS.

The sample pretreatment step compared two solid-phase extraction (SPE) cartridges: HLB and WAX. Additionally, the study examined the effects of acidification, rinsing, and soaking on analyte recovery rates. Significant differences in recovery rates were observed based on these conditions, which facilitated the identification of optimal pretreatment strategies to enhance the accuracy and reliability of the analysis. Water samples were analyzed following Taiwan's LC-MS/MS Method (NIEA W542.52B), referencing U.S. EPA Methods 533 and 537.1. Sample pretreatment utilized an Oasis WAX 150 mg SPE cartridge, followed by UPLC-MS/MS analysis. This study integrates adsorption kinetics, isotherms, and Rapid Small Scale Column Tests (RSSCT) to optimize the efficiency of PFAS removal.

圖十二、擷取自研討會網站之摘要



圖十三、研討會總時間表

圖十四、6/21、22 YSF 活動簡介