

## 出國報告(出國類別：其他-科學競賽研討會)

### 參加神奈川縣厚木國際科學論壇活動

服務機關：國立南科國際實驗高級中學

姓名職稱：秦文智/校長，李錡峰/化學教師

派赴國家：日本神奈川縣

出國期間：108 年 03 月 11 日至 03 月 15 日

報告日期：108 年 03 月 18 日

## 摘要

- 一、經科技部高瞻計畫補助，為增進學生專題研究發表之能力，並提升國際視野，經高中部教務處進行校內專題研究作品遴選後，由本校校長與作品指導教師於 108 年 03 月 11 日至 03 月 15 日，前往日本神奈川縣，參與神奈川縣厚木國際科學論壇活動(Atsugi International Science Fair 2019, AISF2019)
- 二、本次交流活動包含了學生文化交流及學術交流，各國學生以活潑開朗的一面，來進行文化交流，並以全英文的方式進行 Poster 作品發表與問答，此外，部分作品也以 Oral presentation 方式進行。
- 三、本次赴日本目的除了發表學生專題研究作品之外，也藉此讓師生瞭解國外專題研究的發展風氣以及他校的科學研究情形，在專題研究課程設計方面，有助於進行適當的課程調整。

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## 壹、目的

國立南科國際實驗高級中學是一所學術活動、社團活動非常盛行的中學，為增進學生專題研究之能力，提升學生科學素養，經高中部自然科與教評會共同規劃，學生均會在高一修習「專題研究」課程。此外，在自然科教師與教務處同仁的努力之下，為引進校外資源，本校向科技部申請：中學自然科「探究與實作」之跨學科課程研發與實驗研究計畫，藉以開發多元化的科學課程。

為有效拓展學生國際視野，經本次科技部計劃相關主持人，義守大學楊智惠、黃耿祥教授召集，帶領國內各高中學生與教師，一同參與參與神奈川縣厚木國際科學論壇活動(Atsugi International Science Fair 2019, AISF2019)。

## 貳、過程

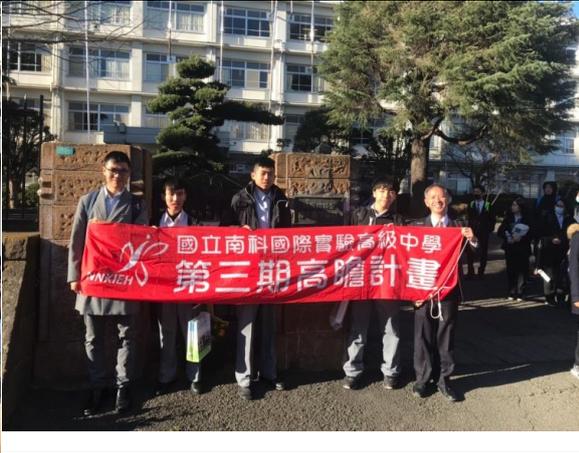
### 一、3月12日(二)厚木高校台日文化交流會議

神奈川縣厚木國際科學論壇以交流活動揭開序幕，本次活動台灣共有 21 所學校共襄盛舉，由義守大學黃耿祥教授擔任總領隊，28 位教師、120 位學生，共計 148 位師生共同參與。本校由秦文智校長領軍，本人擔任指導老師，指導 3 位高一學生參與海報競賽。

開幕歡迎活動在厚木高校體育館舉行，先由厚木高校校長致歡迎詞，並由厚木高校學生以表演揭開序幕，學生以流利的英文、活潑的方式進行開幕，並以該校的社團——合唱團來做為開幕的表演。歡迎活動結束之後，學生們被分散至各班，本人也一同前往，觀察學生們如何進行自主交流。先以大團康活動打破尷尬，再分組、每一組 5 至 6 位學生，學生們以禮物相贈、互相交換名片，並互相了解各國、各校的不同文化，增進認識、加深情誼，以期未來再相見。



參與 AISF 學校師生大合照，中間上為本校校旗。



在厚木高校校門前合影留念，左為本人、中間為 3 位學生、右為校長。



校際文化交流表演。



班際交流學生大合照留念。



學生進行交流。



班際交流大團康活動。



學生進行交流。

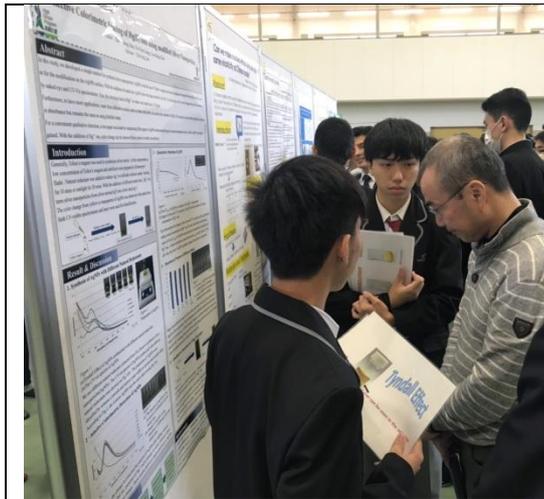


學生進行交流。

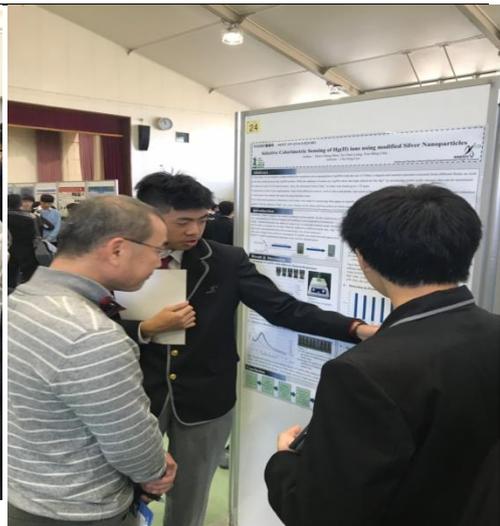
## 二、3月13日(三) 2019 AISF 科學論壇

本次參加 2019 AISF 活動的人數及學校，台灣共計 21 所學校，人數共 148 人，共有 2 件 Oral 及 43 組 Poster。本校參加的同學為高中部一年級學生，分別為邱宥茗、沈昭成、梁祐禎，主要研究「天然物合成銀奈米例子與應用」。由於科技的發達，帶與社會許多的方便，不過，同時也產生了許多汙染，位於科學園區的南科實驗中學，對於環境汙染的議題特別重視，故以此為研究動機，發展「汞離子偵測器」，以在地為出發、解決生活中的問題，從做中學，除了養成學生的科學探究精神，也盡到身為地球公民的責任。

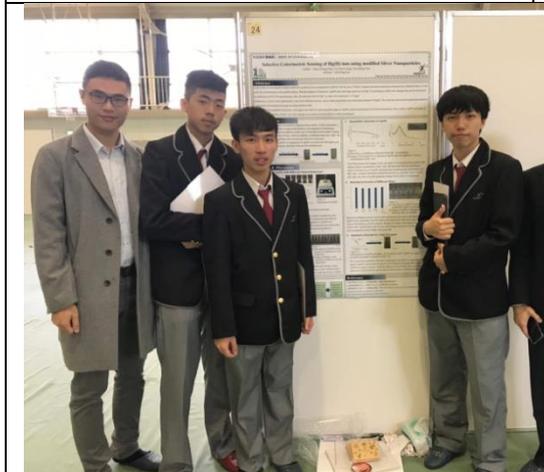
| 議程          |        |
|-------------|--------|
| 10：00-10：50 | 海報作品競賽 |
| 10：50-11：40 | 海報作品競賽 |
| 11：40-12：50 | 午休     |
| 13：00-14：45 | 口說發表競賽 |
| 15：00-15：15 | 頒獎與閉幕  |



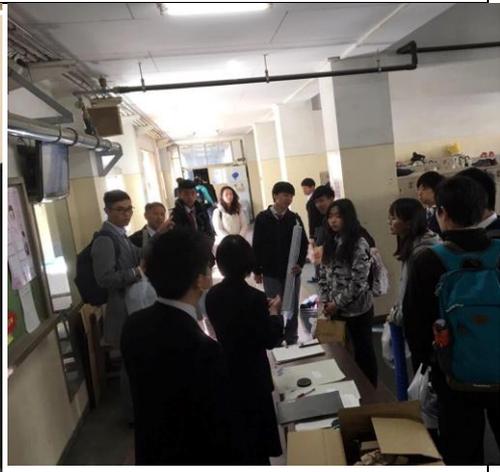
評審委員口試。



評審委員口試。



與參賽海報合影紀念。



參賽前海報佈置準備。

### 參、心得與建議

- 一、建議科技部可以提供更多的機會，補助校內高中職教師參與國際性研討會，或參與國際性的學術交流，以增加國際視野。
- 二、建請科技部可以多舉辦國內交流性質的科學展覽，除英語發表外，也鼓勵多語言發表，讓學生及老師們可以與國際接軌，並提升學生口語表達、肢體語言及多語言能力。
- 三、針對這次參與 2019AISF 台日科學論壇交流，實屬難得經驗。在研究的歷程方面，過程中在 108 年 1 月到國立國光中學參與高瞻計畫舉辦的科學發表，與國內一同好手一起交流成長。在日本交流的過程中，我看見來自於不同地方的學生以不同的方式表達自我的文化以及研究主題，不論研究邏輯的縝密度，從這些學生的研究成果可見他們積極研究態度、圓融的處事態度、對未知事物所抱持的好奇心以及勇於發表的勇氣。身為老師，陪伴學生們點點滴滴，看見學生在國際學術研討中盡情發揮，內心頗受感動，學生們點點滴滴的成長也讓我欣慰。感謝科技部高瞻計畫的補助，讓我有機會帶著學生參與盛大的國際學術研討會，使我獲益良多。

# 附件一：AISF 會議議程



Kanagawa Prefectural Atsugi High School offers an opportunity for students to make a presentation on their research. The aims of this fair are to enhance presentation skills, to motivate students to do their scientific research and to improve their international attitude through cultural exchange.

## Atsugi International Science Fair 2019 PROGRAM

- 10:00-10:50 Poster Presentation Part 1  
Competition Presentation (Group A)  
Standard Presentation (Group A)
- 10:50-11:40 Poster Presentation Part 2  
Competition Presentation (Group B)  
Standard Presentation (Group B)
- 11:40-12:50 Lunch Break
- 13:00-14:45 Oral Presentation
  1. Reopen Magnet Repel Tomatoes
  2. Reuse of Inedible Part of Vegetables and Fruits
  3. Volvox Shows the Environment of 50 Million Years Ago
  4. Suppress Spiciness!
  5. The Study of Garbage Sorting and Recycling Device with Neural Network
  6. Somaphorin7a: investigate a new immune and neurodegenerative therapeutic target for neurodegenerative disease
- 15:00-15:15 Closing Ceremony

## 2019 AISF 議程

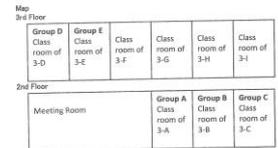
### Atsugi International Science Fair 2019 Welcome Reception

1. Date  
Tuesday, March 12<sup>th</sup>, 2019 13:00~15:30
2. Place  
Kanagawa Prefectural Atsugi High School
3. Participant School  
From Abroad : Taiwan  
From Japan : Atsugi High School

| 4. Schedule |  |
|-------------|--|
| 13:30       | Checking Attendance @ School Gym<br>- Participants are guided to school Gym.   |
| 14:00       | Opening Ceremony @ School Gym<br>① Welcome Address by Principal of Atsugi High School<br>② Welcome Address by a representative of Atsugi High School |
| 14:30       | Presentation (10 min each)<br>- Japanese Culture by Atsugi International Club<br>Music Performance by Atsugi High School students                    |
| 14:45       | Talk session @ Class 5 A ~ 9 F @ classrooms<br>- Participants are to be separated into 5 groups  |
| 15:30       | Closing @ each classroom<br>- Photo Session (close at 15:30)   |

## 2019 AISF 議程

| Group for Talk session |  |       |
|------------------------|--|-------|
| No.                    | School Name  | Group |
| 1                      | Japan Municipal Daiky High School                                | A     |
| 11                     | Shizu International School                                       | A     |
| 21                     | Shizu Municipal Yuzawa High School                               | A     |
| 31                     | Shizu Municipal Yuzawa High School                               | B     |
| 41                     | Shizu Municipal Yuzawa High School                               | B     |
| 51                     | The Affiliated High School of National Chengchi University       | C     |
| 61                     | New Taipei Municipal Lu-Yao Senior High School                   | C     |
| 71                     | Shanghai Fudan Univ. Senior High School                          | C     |
| 81                     | National Experimental High School At Central Taiwan Science Park | D     |
| 91                     | Japan Municipal Lohsen High School                               | D     |
| 101                    | Japan Municipal No-Na Vocational High School                     | D     |
| 111                    | National Taichung Educational Experimental High School           | E     |
| 121                    | Japan Municipal Yama-Ming High School                            | E     |
| 131                    | The Affiliated Senior High School of National Chi-Nan University | E     |

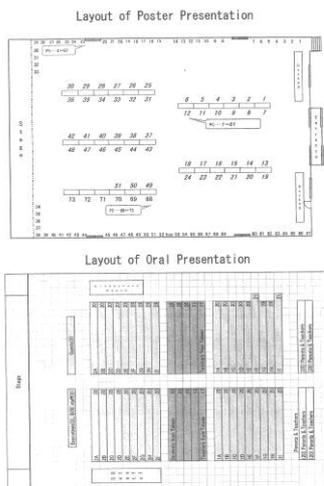


For teachers from Taiwan, a meeting is scheduled during the Talk session @ the Meeting Room

## 2019 AISF 議程

## 2019 AISF 議程





2019 AISF 議程



學生參賽獎狀

# 附件二：學生研究海報

科技部計畫編號：MOST 107-2514-S-825-001

## Selective Colorimetric Sensing of Hg(II) ions using modified Silver Nanoparticles

Author : Zhao-Cheng Shen, Yu-Chen Liang, You-Ming Chiu  
Advisor : Chi-Feng Lee

National Nanke International Experimental High School

**Abstract**

In this study, we developed a simple method for synthesis silver nanoparticle (AgNPs) with the use of Tollens' reagent and natural reductant extracted from different fruits, as well as for the modification on the AgNPs surface. With the addition of metal ion, AgNPs shows the high selectivity for Hg<sup>2+</sup> by producing visible color changes that can be monitored by naked eye and UV-Vis spectrometer. Also, the detection limit of Hg<sup>2+</sup> in water was found up to 1.35 ppm. Furthermore, to have more applications, water from different sources, such as lakes and ponds, was used as the substrate of Hg(II). The result has showed that significant reduction in absorbance but remains the same as using distilled water. For a convenient qualitative detection, a test paper was made by immersing filter paper in AgNPs solution and drying it in normal temperature, then a yellow AgNPs test paper is gained. With the addition of Hg<sup>2+</sup> ion, color change can be observed from yellow to white immediately.

**Introduction**

Generally, Tollens' reagent was used to synthesize silver mirror. In this experiment, a low concentration of Tollens' reagent and stabilizer were prepared in Erlenmeyer flasks. Natural reductant was added to reduce Ag<sup>+</sup> to colloidal solution under heating for 10 mins or sunlight for 20 mins. With the addition of different metal ions, Hg<sup>2+</sup> ion turns silver nanoparticles from silver atom(Ag<sup>+</sup>) into silver ion(Ag<sup>+</sup>). The color change from yellow to transparent of AgNPs was observed with naked eyes. Both UV-Vis (visible spectrometer and laser were used for identification.

**Result & Discussion**

**1. Synthesis of AgNPs with Different Natural Reductants**

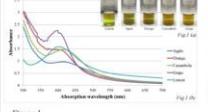


Figure 1. (a) Tyndall effect of AgNPs synthesized with different natural reductants. (b) The UV-vis spectra of AgNPs.

We use different natural reductant extracted from five fruits to synthesize silver nanoparticles (AgNPs). The UV-vis spectra of AgNPs synthesized with different natural reductants was showed on Fig.1(b). The properties of AgNPs were identified by witness a smooth and narrow peak width on spectra and tyndall effect. According to Fig. 1, the Lemon-AgNPs was the most ideal among the five.

**2. Selective Colorimetric Detection of AgNPs**

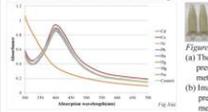


Figure 2. (a) The spectra of AgNPs in the presence of different 0.01 M metal ions. (b) Image of AgNPs in the presence of different 0.01 M metal ions.

Fig.3 displays the change in color and the spectra of AgNPs after adding various metals. We found that the presence of Hg<sup>2+</sup> led to change in color, whereas others ions caused no significant change. These results showed a high selectivity of AgNPs.

**3. Quantitative Detection of AgNPs**

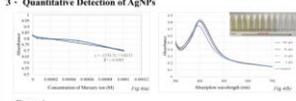


Figure 4. (a) Plot of A<sub>410</sub> of AgNPs as a function of the Hg<sup>2+</sup> concentration. (b) Image of color and UV-vis spectra of AgNPs after the addition of various concentration of Hg<sup>2+</sup> ions.

Fig.4 demonstrates the changes in the color and UV-vis spectra of the AgNPs after adding various concentration of Hg<sup>2+</sup> ions. We also found that the absorbance value at 410 nm (A<sub>410</sub>) of AgNPs increased upon increasing the concentration of Hg<sup>2+</sup> ions. A linear correlation existed between the A<sub>410</sub> and Hg<sup>2+</sup> ions of 5-100 µM. Also, the color of AgNPs gradually changes from yellow to transparent.

**4. Detection in Presence of Different Water**

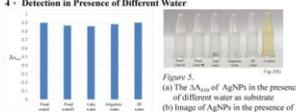


Figure 5. (a) The A<sub>410</sub> of AgNPs in the presence of different water as substrate. (b) Image of AgNPs in the presence of different water as substrate.

Water from different sources, such as lakes and ponds, was used as the substrate of Hg(II) in this experiment. Fig.5(a) displays the significant reduction in absorbance value at 410 nm (A<sub>410</sub>) of five samples. Besides, no matter what kind of water was used for Hg<sup>2+</sup> sensing, there was obvious color change showed on Fig.5(b). Therefore, silver nanoparticles can be widely used in our life.

**5. Qualitative Detection by Using Test paper**



Figure 6. (a) Preparation of AgNPs test paper. (b) Prepared yellow AgNPs test paper. (c) AgNPs test paper in presence of Hg<sup>2+</sup> ion.

For a convenient qualitative detection, a test paper was made by immersing filter paper in AgNPs solution and drying it in 25°C showed in Fig.6(a), then a yellow AgNPs test paper is gained. With the addition of 0.01 M Hg<sup>2+</sup> ion, color change showed on Fig.6(b) and (c) can be observed from yellow to white immediately.

**Conclusion**

Simple and environmentally friendly to synthesize

High selectivity and rapid to sensing

Detection limit is 1.35 ppm in the lowest [Hg<sup>2+</sup>]

Detection in presence of different substrates is practicable

Convenient qualitative detection by using test paper

**Reference**

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參與海報口說競賽海報。

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