ICCE 2024
Pattaya, THAILAND

The 27th IUPAC International Conference on Chemistry Education

Royal Cliff Grand Hotel, Pattaya, Thailand

15-19 July, 2024

"The Power of Chemistry Education for Advancing SDGs"

Abstract Book

Welcome Message from Chair of 27th IUPAC International Conference on Chemistry Education (ICCE2024)

Dear Colleagues

On behalf of the organizing committee of the 27th IUPAC International Conference on Chemistry Education (ICCE2024), it is my great pleasure to invite you to participate in ICCE2024 during July 15-19, 2024, in Pattaya, THAILAND - The land of smile and a hub of ASEAN.

With the theme of this conference, "Power of Chemistry Education for Advancing SDGs", it aims to provide a platform for educators, practitioners, teachers, chemists, and scientists around the world to interface with pioneers & leaders in sustainable development. It is the moment for us to learn from the present and past while we are charting our future.

We strongly believe that ICCE2024 will create a remarkable impact and legacy across the region and the world in tackling the global challenges in chemistry education and paving our way to achieve Sustainable Development Goals.

We are looking forward to giving a warm welcome to you, your family, and colleagues at ICCE2024 in Pattaya, a city at the center of Thailand's Eastern Economic Corridor which is full of life and excitement. We hope that you will find the conference both enjoyable and valuable. We thank you in advance for participating and contributing to the success of the event. Please mark your calendar on July 15-19, 2024.

With best wishes

Prof. Dr. Supawan Tantayanon
Chair, 27th IUPAC International Conference on Chemistry Education (ICCE2024)

Welcome Message from President of Chemical Society of Thailand

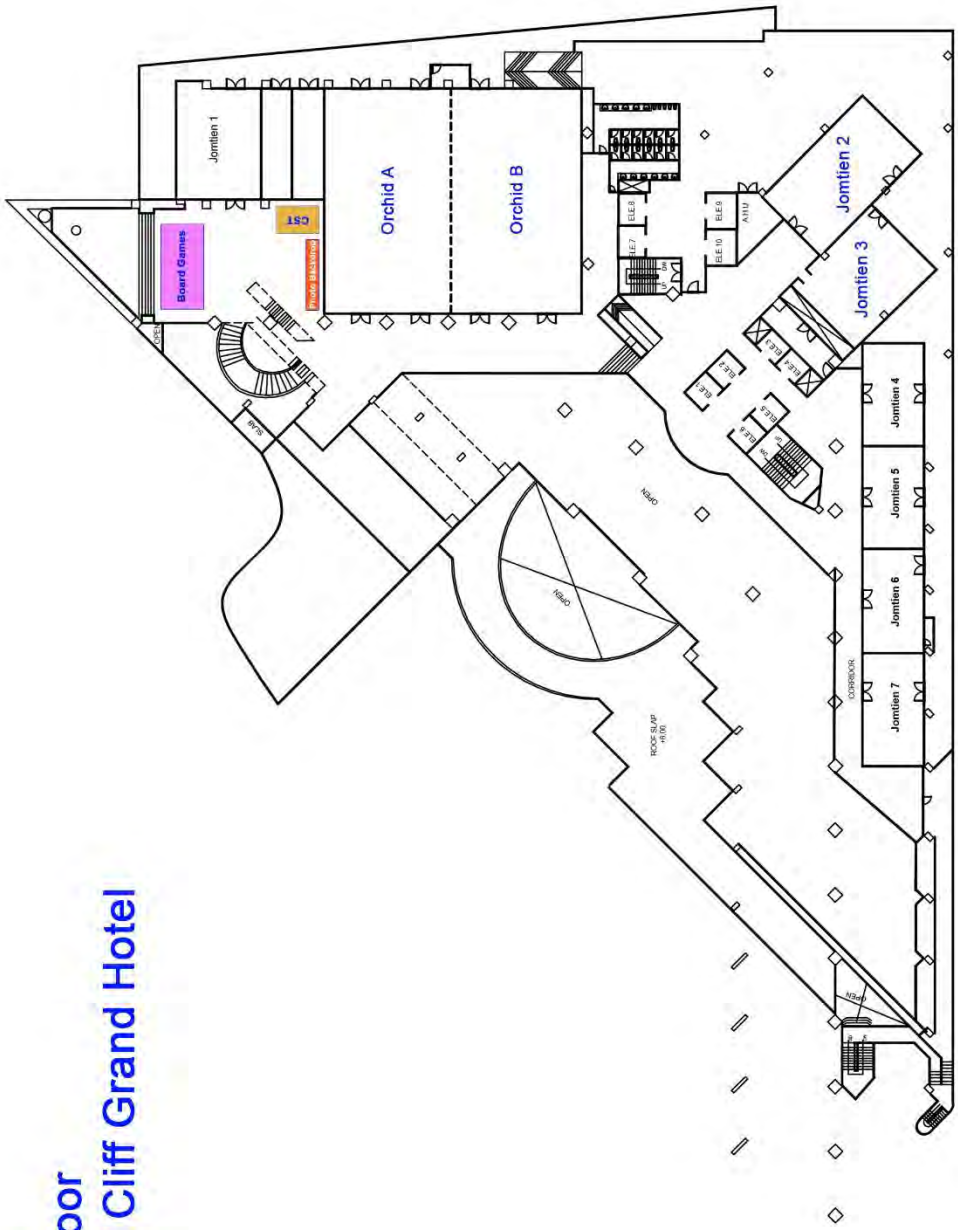
It is our pleasure to invite you to the **27th International Conference on Chemistry Education (ICCE 2024)** which will be held at **Royal Cliff Grand Hotel, Pattaya, Chon Buri, Thailand** during **July 15-19, 2024**. The scientific program will extend to full five-days program under the theme **"Power of Chemistry Education for Advancing SDGs"**. Not only overseas experts are invited to give their lectures during the conference, we also create several sessions to cover the latest innovation and knowledge. With the state-of-the-art lectures as well as Free Paper presentation, we expect the highest satisfaction from all participants.

This conference will provide a wonderful event for sharing and refreshing your knowledge and we wish you can enjoy this familiar place, meet your old friends and have a good time together in Pattaya.
Look forward to seeing you, July 15-19, 2024

Prof. Dr. Vudhichai Parasuk
President of Chemical Society of Thailand

Conference Venue and Floor Plan

Royal Cliff Grand Hotel, Pattaya



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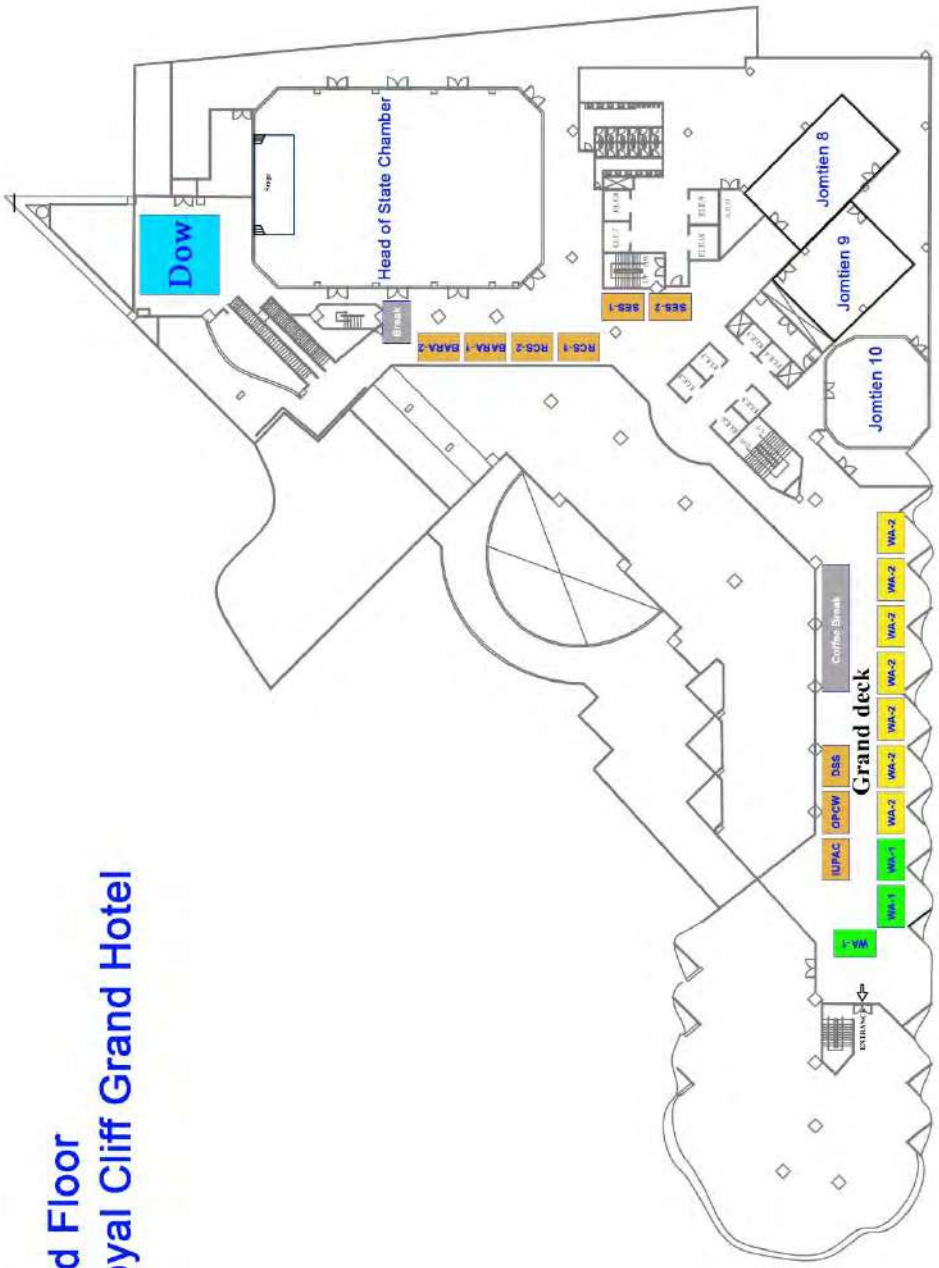

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2. Redesigning Chemistry Laboratory Teaching
3. Innovative Technology for Chemistry Education
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Abstracts of
Poster Presentations

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RC-P-043

STEM Activity
Citric Acid CSI: Design Your Own Eco-friendly Paper-Based Test Kit!

Vitavas Jumpathong*
Angthongpatthamarotwitthayakhom School,
Singburi-Angthong Secondary Educational Service Area Office, Thailand
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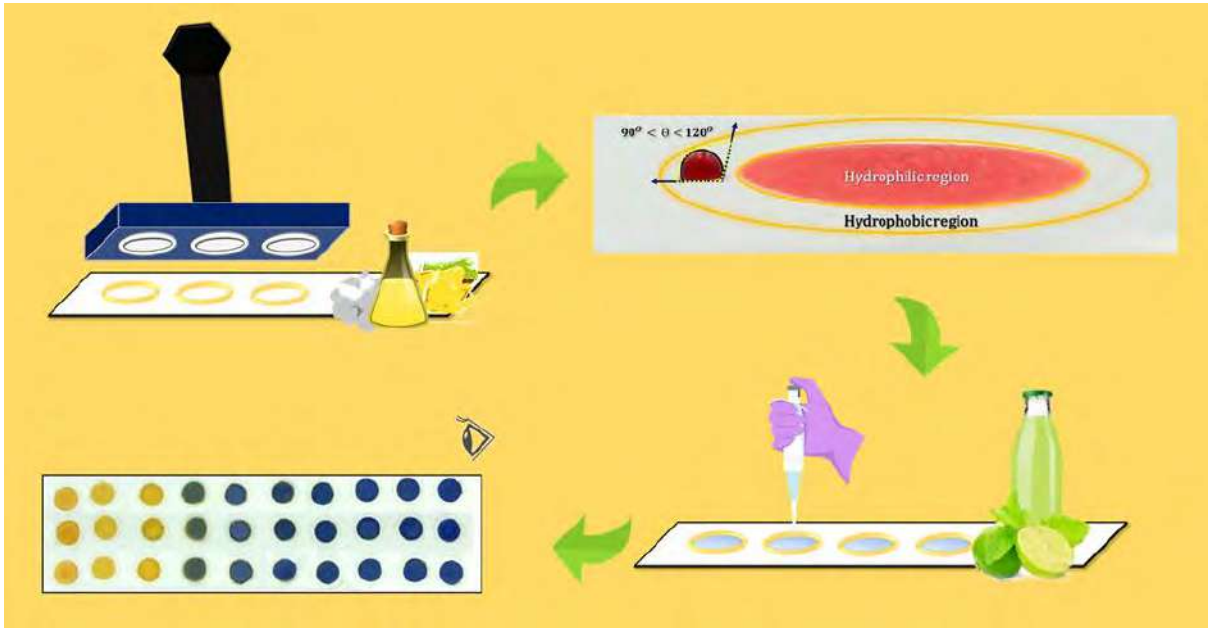
This STEM activity is tailored for high school students to develop and utilize Eco-friendly Microfluidic Paper-based Analytical Devices (Eco-µPADs), fabricated from a natural rosin and alum mixed solution on filter paper (shown schematically below). These Eco-µPADs incorporate patterned hydrophobic barriers created through a simple stamping method. In this activity, students will design and create a stamping mold to produce Eco-µPADs aimed at determining the citric acid content in juice, relying on naked-eye color changes of indicator solutions. Their mission will involve selecting the correct indicator, choosing the type of standard reagent, and calculating suitable concentrations and volumes of solutions for microscale titrations on Eco-µPADs. The results indicate that the majority of students achieved comparable results to the traditional volumetric titration method, with minimal errors and significantly reduced chemical usage (almost 1,000 times less). Upon completion of the experiment, students will reflect on their learning outcomes and explore practical applications of acid-base titration concepts using their low-cost, portable, biodegradable, and user-friendly Eco-µPADs. Furthermore, this activity fosters students' creative and innovative skills through design and problem-solving, essential competencies for thriving in the 21st century.



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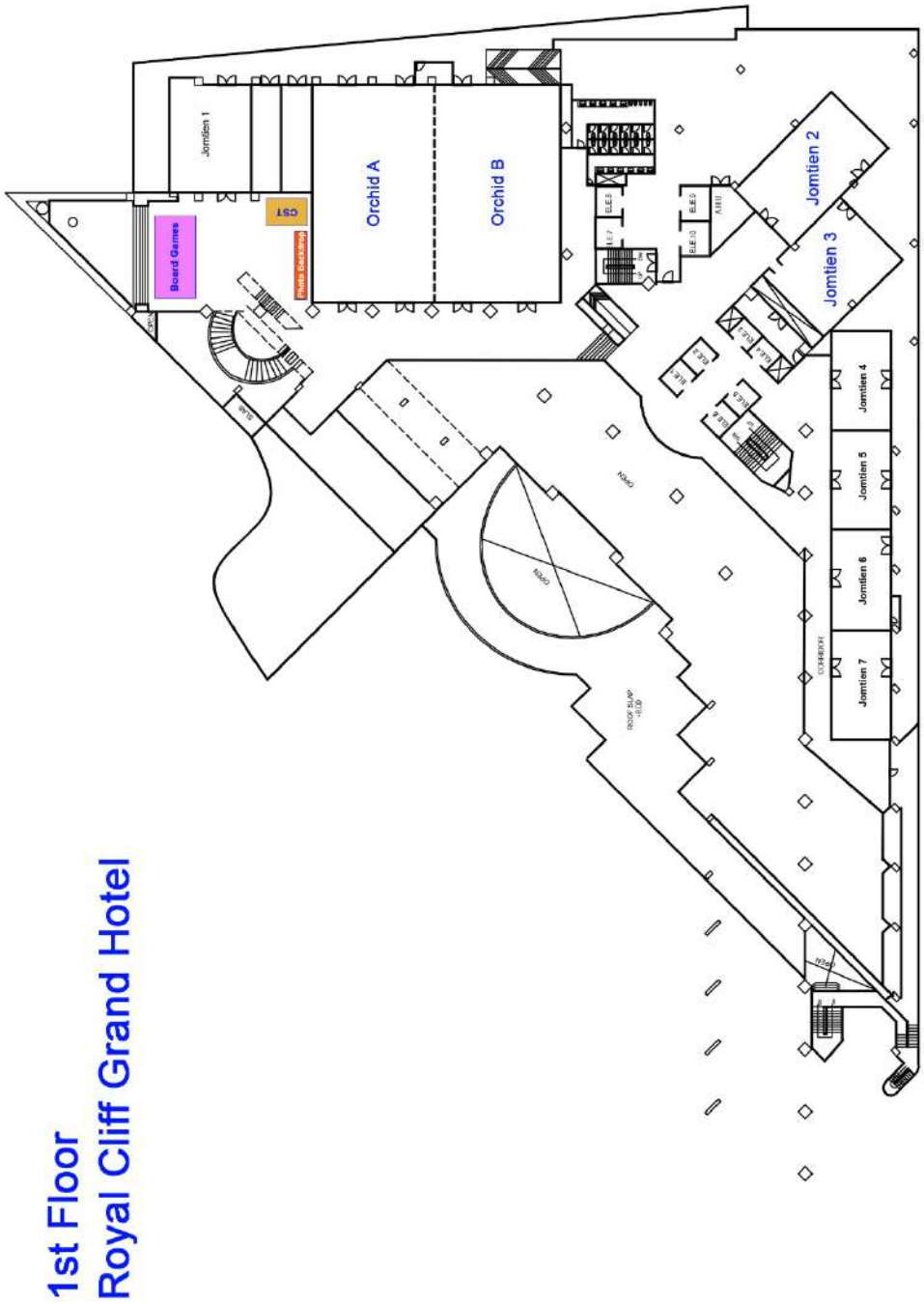

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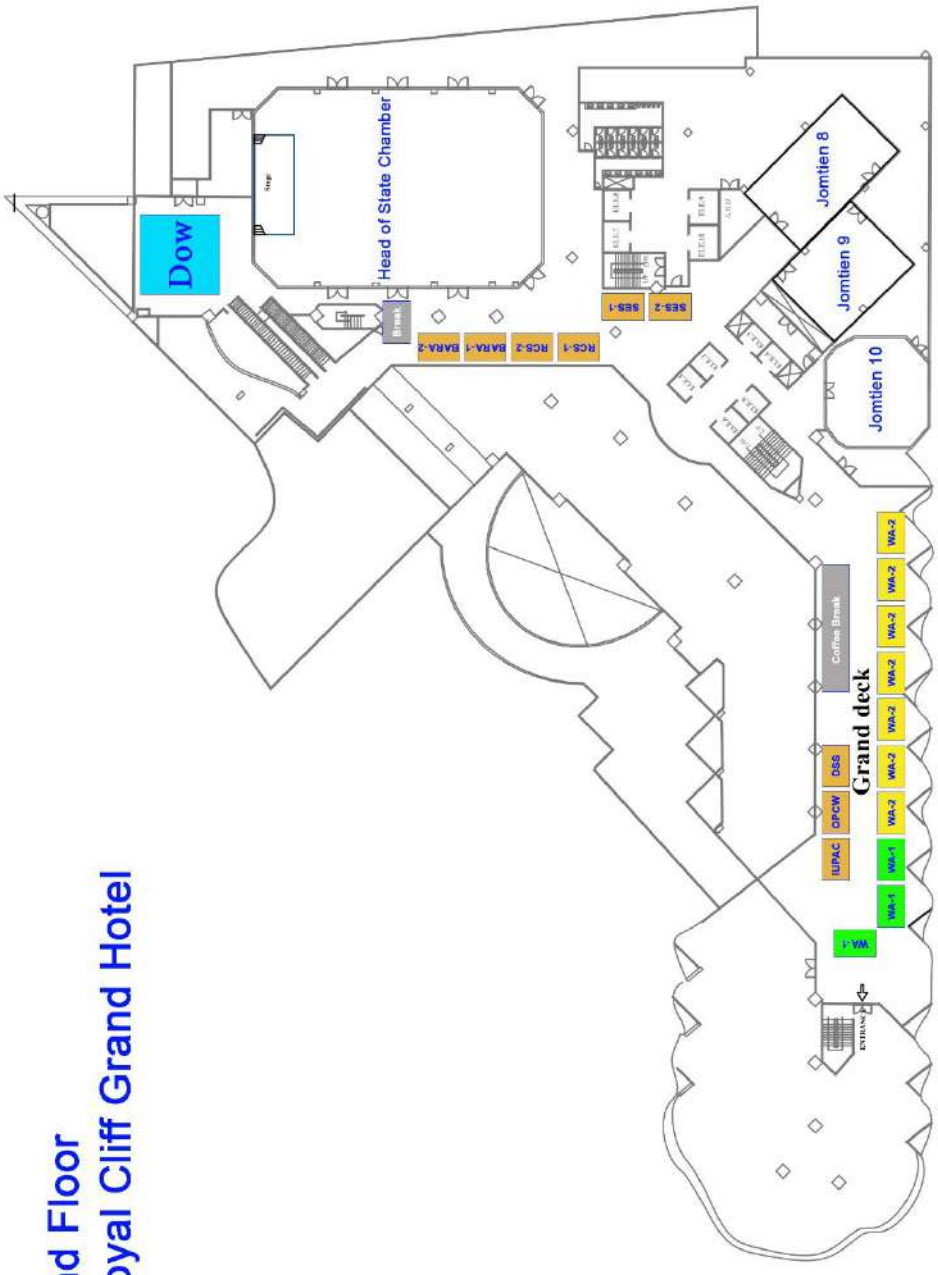

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1. Introduction

STEM education is an important tool for developing a creative and innovative workforce. Countries that have been successful in using STEM education often have strong and competitive economies. Thailand should prioritize the development of STEM education to develop the skills necessary for students in the 21st century and prepare for the future.[7,8]

The aforementioned education policies have led to the serious implementation of STEM education management models in educational institutions. This is in response to the limitations of traditional teaching methods that fail to produce high-quality human resources as demanded by society. In the subject of chemistry, STEM education management has been applied to develop students' creativity and understanding of learning content through problem-solving in chemistry teaching.

The concept of acid-base solutions is particularly important as it can be used to determine the quantity of substances, which is related to various concepts in chemistry, such as stoichiometry, solutions, and the selection of indicators.[2] However, teaching acid-base solutions requires laboratory experiments to allow students to engage in hands-on activities, exchange ideas through discussions, argue, provide reasoning, and solve problems encountered during experiments. When students learn through practice, they can apply their existing knowledge to real-world situations and develop a correct understanding of the subject matter. This also helps develop students' creativity and innovation.

Traditional laboratory experiments used in teaching have several limitations namely (1) High cost: They require significant resources to prepare equipment, tools, and chemicals for a large number of students. This often involves using large quantities of chemicals, which can have negative consequences for students' health and safety. (2) Safety concerns: The American Chemical Society (ACS) has published guidelines for chemical safety in university laboratories. These guidelines emphasize the importance of using appropriate amounts and concentrations of acids and bases in chemistry experiments, avoiding direct contact and inhalation, and properly disposing of chemicals to minimize environmental impact. (3) Time constraints: Traditional titration experiments can be time-consuming, limiting the number of experiments students can perform.

To address these limitations, the researcher proposes a novel approach: Microfluidic paper-based analytical devices (µPADs): These devices offer a low-cost, safe, and efficient alternative to traditional laboratory experiments. They can be easily fabricated using filter paper, a readily available and inexpensive

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material. Additionally, µPADs require significantly smaller volumes of chemicals, reducing the risk of exposure and environmental impact. Reduced experiment time: µPADs enable rapid and efficient analysis, allowing students to perform multiple experiments within a shorter timeframe.[1,6]

Overall, the proposed approach using Eco-µPADs in this STEM activity offers a promising solution to the limitations of traditional laboratory experiments, making chemistry education safer, more efficient, and more accessible. Furthermore, this activity fosters students' creative and innovative skills through design and problem-solving, essential competencies for thriving in the 21st century.

2. Methods

2.1 Define target group for the research

The target group for this research was a group of 30 Grade 11 students, selected using purposive sampling.

2.2 Create research instruments

The research instruments used in this study were as follows:

1) Experimental Tools

Redesigning acid-base titration laboratory with green chemistry concept & Integrated STEM Education lesson plan using Microfluidic Paper-Based Analytical Devices to develop creativity and innovation skills: This lesson plan was designed to teach Grade 11 students about acid-base titration using µPADs within the activity theme "Citric acid CSI: Design your own Eco-friendly Paper-Based Test Kit!"

STEM Integration

The integrated STEM education lesson plan "Citric acid CSI: Design your own Eco-friendly Paper-Based Test Kit!" effectively integrates Science, Technology, Engineering, and Mathematics (STEM) concepts to provide a comprehensive learning experience for Grade 11 students.

Science: Acid-base solutions**,** Chemical analysis**,** Natural material water resistance properties

Technology: Digital technology, Scientific instruments, Innovative test kits

Engineering: Engineering design process, Creative innovation: Students demonstrate creativity and innovation in designing and developing their test kits, considering factors such as functionality, efficiency, and sustainability.

Mathematics:

Solution preparation, Solution volume calculations, Sample concentration calculations, Chemical analysis statistics, Experimental data visualization:

2) Data Collection Tools

2.1) Group Experimentation Assessment Form: This form was used to assess students' performance on STEM Activity Citric acid CSI: Design your own Eco-friendly Paper-Based Test Kit!.

2.2) Creativity and Innovation Skills Assessment Form: This form was used to assess students' creativity and innovation skills in designing and developing their own µPAD-based test kits.

Prove all the tools by other chemistry teachers or science educators for standardized assessment tool was used to measure the students' creativity and innovation skills. This ensured consistency and reliability in the assessment process.

2.3 Data collection and data analysis

The data collection process involved implementing the developed STEM activities with the target group of students in their chemistry classes over a continuous period of three weeks, encompassing a total of nine class sessions. The researchers assessed the students' creativity and innovation skills before and after engaging in the activities. The collected data was then subjected to statistical analysis to compare the pre- and post-assessment results and determine whether there was a statistically significant difference.

Figure 1. Situation in STEM Activity.

3. Results & Discussion

3.1 Results from redesigning acid-base titration laboratory

The result from quality test of fabricated Eco-µPADs was test by dropping 15 µL of food dry solution onto 10 reaction zones to proof hydrophobicity of hydrophobic barriers from a natural rosin and alum mixed by stamping method found that, the mixture of gum rosin and alum solution of 4 : 1 was found to be suitable for

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fabricating paper-based analytical devices since it provided sharp hydrophobic barrier line and repeatable inner diameter length of circular pattern from %RSD value below 1.00% that show the performance of reproducibility of fabricated method.[5]

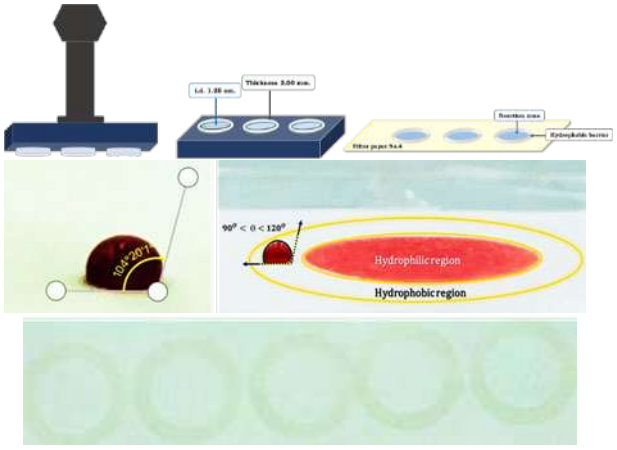

Figure 2. Fabrication of Eco-µPADs.

In part of acid-base titration experiment design, this work use concept of titration principle was adapted from volumetric variation to concentration variation since changing of volume in microscale may cause a systematic error to experimental result.

The neutralization reaction between Citric acid ($C_6H_8O_7$) and Sodium hydroxide (NaOH) is used to demonstrate Acid-base titration concept and it has advantage for daily life when students choose to consume lime juice products from local market. For chemical equation between $C_6H_8O_7$ and NaOH could be written as follow equation 1:

Citric acid (IUPAC name; 2-hydroxypropane-1,2,3-tricarboxylic acid) is a weak organic tricarboxylic acid with three different values of pKa (3.1, 4.7, and 6.4).[3] when Citric acid reacts with Sodium hydroxide to produce Trisodium citrate and water 3 molecules after reaction completed absolutely pH of product solution will equal 9.37 that can change color of thymol blue indicator from yellow to dark green-blue at the endpoint as shown in figure 3.

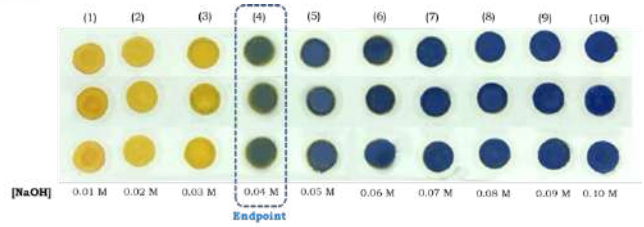

Figure 3. Digital image showing the results from reaction between Citric acid and NaOH when use thymol blue as indicator that can easily observe with naked eyes on µPAD.

After that will got the concentration of NaOH (M) at endpoint to calculate Concentration of Citric acid (%W/V) by using equation 2 as follow:

$$\text{Concentration of Citric acid (\%W/V)} = \frac{C \times V_1 \times 64.041 \times 20}{10 \times V_2}$$

From equation 2, where C is sodium hydroxide concentration (mol/dm^3) at an endpoint, V_1 and V_2 are the volume of sodium hydroxide solution (Standard solution) and sample solution, respectively. For reason to cross equation with 20, which is the amount of time was diluted sample, to calculate the real concentration of citric acid that sample content.

The results from repeat the experiment at least 5 times as 5.123 %w/v, when compare with reference value from volumetric titration is 5.150 %w/v that found percent error was 0.524 % (Accuracy) and relative standard deviation (RSD) was 0.00 % (Precision) for repeat 5 times over. For working range of this method is 1.28 – 12.80 %W/V, which is a fairly wide range and covers the concentration of actual citric acid in many products. Besides, we can change a range of Sodium hydroxide solution concentration to suit for samples their content.[4,9]

3.2 Results from group experimentation assessment and creativity and innovation skills assessment

The implementation of the STEM activity "Citric acid CSI: Design your own Eco-friendly Paper-Based Test Kit!" and subsequent data collection, both quantitative and qualitative, revealed significant positive outcomes.

Quantitative Findings:

1) Effective Group Experimentation: The majority of students demonstrated successful group experimentation, adhering to scientific principles.

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2) Strong Experimental Skills: Students exhibited well-developed experimental skills, enabling them to conduct accurate and reliable experiments.
3) Effective Teamwork: Students displayed effective teamwork, collaborating, sharing ideas, and consulting each other to reach valid conclusions.
4) High Group Assessment Scores: All groups received excellent scores on the group assessment, reflecting their overall success in the activity.

Qualitative Findings:
1) Enhanced Creativity and Innovation Skills: Students' creativity and innovation skills were significantly enhanced post-activity compared to pre-activity levels, as evidenced by statistical significance at the .05 level.
2) Real-World Problem-Solving: Students applied their problem-solving skills to real-world scenarios, employing the engineering design process to develop their own innovative test kits.
3) Functional and Eco-friendly Test Kits: Students successfully designed and created functional test kits capable of measuring citric acid concentrations in real-world samples.
4) Accessibility and Environmental Friendliness: The test kits were designed for convenient use anywhere and anytime, while also adhering to environmental sustainability principles, aligning with the Sustainable Development Goals (SDGs)

4. Conclusions

The STEM activity "Citric acid CSI: Design your own Eco-friendly Paper-Based Test Kit!" proved to be an effective tool for enhancing students' creativity, innovation, and problem-solving skills while also promoting real-world applications and environmental sustainability. The positive quantitative and qualitative findings support the activity's potential to contribute to STEM education and student development.

I have successfully developed the method and material to fabricated Eco-µPADs is very simple because the material that easy-to-find in local market that teacher can create active learning activity for their student to produce analytical device for use in real life so student will learn about Acid-base titration concept by doing. In addition, it is considered the introduction of novel materials for patterning hydrophobic barriers, which has never been seen in other's work before and a stamping method is a simple method that students can make by themselves. And the advantage of Eco-µPAD for analysis as follow, easy-to-use because it can observe the result with naked eyes, comfortable when using in the field trip, low cost since it can produce from easy-to-find and eco-friendly materials. Finally, the authors wishing those interested can apply this fabricated Eco-µPAD procedures to be used in STEM activity in high school chemistry course or further research.

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This attending this academic conference was financial support provided by IUPAC. The authors greatly appreciate and would like to say thanks to Assoc. Prof. Dr. Supakorn Boonyuen Department of Chemistry, Faculty of Science and Technology, Thammasat University, Assist Prof. Dr. Nuanlaor Ratanawimarnwong and Assist Prof. Dr. Piyarat Srivilai Department of Chemistry, Faculty of Science, Srinakharinwirot University

Research ethics / Declarations
Authors declare no conflict of interest

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About PACCON 2025

The Pure and Applied Chemistry International Conference (PACCON) is the annual conference organized by the Chemical Society of Thailand under the Patronage of Her Royal Highness Princess Chulabhorn Krom Phra Srisavangkavadhana.
Alternating annually, the conference will be co-hosted by a designated academic institution in Thailand. Suranaree University of Technology, Thailand was chosen as the co-host for PACCON 2025, which will take place in Khao Yai Convention Center (KYCC), Nakhon Ratchasima, Thailand, on February 13–15, 2025.

Under the theme "Chemistry for a Changing World," PACCON 2025 will provide a platform for exchanging knowledge, sharing the latest advancements, and fostering connections among scientists and researchers across diverse disciplines within chemistry.

We sincerely hope all participants will not only gain valuable knowledge and insights but also enjoy this enriching experience, build meaningful connections, and grow together as a thriving community in the ever-evolving field of chemistry.

Organizing Committee

Message from the Rector of Suranaree University of Technology

Dear Esteemed Participants of PACCON2025,

As both the Rector of Suranaree University of Technology and a fellow chemist myself, I would like to extend a warm welcome with great pleasure to all of you to The Pure and Applied Chemistry International Conference 2025, or PACCON2025 as we all call it.

This PACCON2025, under the theme "Chemistry for a Changing World", holds the promise of unraveling new dimensions in scientific research and innovation, particularly in the field of chemistry. The Institute of Science at Suranaree University of Technology, known for its commitment to academic excellence and applicable, cutting-edge research, is honoured to host this stimulating and inspiring event that can be an instrument to reflect and materialise our commitment to our changing world.

Our university was founded on the principles of pushing forward the frontiers of knowledge, incubating innovation, and contributing to societal well-being while fostering alliances with colleagues and friends around the world along the way. These endeavours you should find align seamlessly with the objectives of our PACCON2025.

I am confident that PACCON2025 will be not only a platform for disseminating knowledge but also a catalyst for meaningful connections and collaborations among the participants. I thus encourage all of you to engage in learning, sharing insights, keeping your discussion active and alive, as well as making the most of this opportunity to contribute to the global dialogue on the evolving landscape of chemistry and the impacts that it can bring to our world in the future.

On behalf of Suranaree University of Technology, I extend my best wishes for the success and the impact of PACCON2025. I look forward to welcoming you to the conference and trust that this conference will be a memorable episode in your academic life and an unforgettable milestone in your professional journey.

Anan Tongraar

Rector of Suranaree University of Technology

Message from the President of the Chemical Society of Thailand

Greetings,

The Pure and Applied Chemistry International Conference 2024 (PACCON 2024) has just passed with great success. I would like to welcome you to join us again at PACCON 2025. PACCON is the annual conference organized by the Chemical Society of Thailand. Every year, a selected academic institution in Thailand will alternately co-host the conference. The conference will contain plenary lectures given by world-renowned chemists, invited talks, and oral and poster presentations on topics of current interest in chemistry. The chemistry community in Thailand is huge. We have around 1,000 participants for the conference each year. The Pure and Applied Chemistry International Conference 2025 or PACCON 2025 will be held on Feb 13 – 15, 2025, and will be co-hosted by Suranaree University of Technology. The theme of the conference is "Chemistry for a Changing World." The proposed venue is Khao Yai Convention Center (KYCC) which can accommodate up to 5,000 guests. The KYCC is in the vicinity of Khao Yai National Park, the largest natural forest reserve in Thailand, where accommodations are plentiful. We hope to see you all at PACCON 2025 where you can enjoy good research discussions, communications with colleagues, research networking, etc., and last but not least the beautiful nature of Khao Yai. Please make up your schedule now for PACCON 2025. We are looking forward to seeing you there.

Vudhichai Parasuk

President of Chemical Society of Thailand

Message from Chair of PACCON2025 Organizing Committee

Dear Esteemed Participants of PACCON2025,

It is my pleasure to extend a warm welcome to PACCON 2025 – The Pure and Applied Chemistry International Conference, set against the backdrop of Khao Yai, Thailand.

Under the theme "Chemistry for a Changing World," this conference promises to be a dynamic platform for scientific exchange and collaboration. Hosted by the Institute of Science, Suranaree University of Technology, known for its commitment to academic excellence and innovation, PACCON 2025 aims to drive forward the frontiers of chemistry and its applications in our evolving world.

I invite you to engage in lively discussions, share your insights, and forge meaningful connections that will shape the future of chemistry and its impact on society. And while you are here, do not miss the opportunity to explore the natural beauty of Khao Yai National Park and immerse yourself in the rich culture of Thailand.

I look forward to welcoming you to PACCON 2025 and to an enriching conference experience.

Santi Maensiri

Chair of PACCON 2025 Organizing Committee
Dean of Institute of Science, Suranaree University of Technology

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February 13-15, 2025

Overall Program

13th -14th Feb 2025

07.00 –08.30 Registration Open*

13th Feb 2025

09.00 – 10.45	Opening Ceremony	
10.45 – 11.30	Plenary Talk PL-01 Coffee Break	Small-Scale Lab
11.30 – 13.00	Lunch	
13.00 – 13.45	Plenary Talk PL-02	
13.45 – 14.30	Plenary Talk PL-03	
14.30 – 15.30	Poster Session I Coffee break	
15.30 – 18.30	Oral Presentation	
19.00 – 22.00	Conference Banquet	

14th Feb 2025

08.30 – 12.00	Oral Presentation Coffee Break	
12.00 – 13.00	Lunch	
13.00 – 14.45	Oral Presentation	Merck-CST -TYCN
14.45 – 15.45	Poster Session II Coffee break	
15.45 – 16.30	Plenary Talk PL-04	
16.30 – 17.15	Plenary Talk PL-05	
17.15 – 18.00	Plenary Talk PL-06	
18.00 – 18.45	Award Announcement & Closing Ceremony	
18.45 – 21.00	Appreciation Dinner	

15th Feb 2025

07.30 –13.30 Excursion

Note*

1. Participants planning to attend the opening ceremony and the special keynote lecture by Professor Dr. Her Royal Highness Princess Chulabhorn Krom Phra Srisavangavadhana must finish registration before 8:00 a.m. on 13 February to guarantee access to the ceremony hall.
2. The opening ceremony and the special keynote lecture by Professor Dr. Her Royal Highness Princess Chulabhorn Krom Phra Srisavangavadhana will be broadcast in real-time within the designated waiting area for participants who complete registration after 8.00 a.m. on 13 February.

Plenary Lectures

PL-01: **Dr. Svetlana Mintova**
Director of Research 1st Class (DR1) CNRS, Laboratory of Catalysis and Spectrochemistry (LCS), ENSICAEN, Normandy University, Caen, France

PL-02: **Prof. Dr. Harry L. Anderson**
Department of Chemistry, University of Oxford, UK

PL-03: **Prof. Dr. James R.Ketudat-Cairns**
School of Chemistry, Institute of Science, Suranaree University of Technology, Thailand

PL-04: **Prof. Dr. Mas Subramanian**
Distinguished Professor and the Milton Harris Chair of Materials Science, Oregon State University, USA

PL-05: **Prof. A. Stephen K. Hashmi**
Institute of Organic Chemistry, University of Heidelberg, Germany

PL-06: **Prof. Dr. Orawon Chailapakul**
Department of Chemistry, Chulalongkorn University, Thailand

Scientific Sessions

AC: Analytical Chemistry

Chair :	Assoc. Prof. Dr. Purim Jarujamrus
Co-Chair :	Assoc. Prof. Dr. Kamonwad Ngamchuea
	Asst. Prof. Dr. Patcharin Chaisuwan
	Assoc. Prof. Dr. Sanchai Prayoonpokarach

CC: Catalytic Chemistry

Chair :	Prof. Dr. Tawan Sooknoi
Co-Chair :	Prof. Dr. Jatuporn Wittayakun
	Dr.Nattawut Osakoo

CE: Chemical Education

Chair :	Assoc. Prof. Dr. Phimphaka Harding
Co-Chair :	Asst. Prof. Dr.Parawee Rattanakit

EE: Environmental Chemistry and Renewable Energy

Chair :	Assoc. Prof. Dr. Ekasith Somsook
Co-Chair :	Assoc. Prof. Dr. Rapee Utke

FA: Food, Agriculture, and Cosmetics

Chair :	Assoc. Prof. Dr. Jirawat Yongsawatdigul
Co-Chair :	Asst. Prof. Dr. Piyanut Pinyou

IC: Inorganic Chemistry

Chair :	Prof. Dr. Thawatchai Tuntulani

Scientific Sessions

Co-Chair : Assoc. Prof. Dr. David Harding
Assoc. Prof. Dr. Phimphaka Harding

IE: Industrial and Engineering Chemistry

Chair : Prof. Dr. Sirirat Jitkarnka
Co-Chair : Assoc. Prof. Dr. Rapee Utke

MN: Materials Science and Nanotechnology

Chair : Prof. Dr. Vinich Promarak
Co-Chair : Assoc. Prof. Dr. Theeranun Siritanon

NP: Natural Products, Biological Chemistry and Chemical Biology

Chair : Prof. Dr. Vatcharin Rukachaisirikul
Co-Chair : Prof. Dr. James R. Ketudat-Cairns
Assoc. Prof. Dr. Panida Khunkaewla
Assoc. Prof. Dr. Chutima Talabnin
Assoc. Prof. Dr. Jaruwan Siritapetawee

OM: Organic Synthesis and Medicinal Chemistry

Chair : Prof. Dr. Tirayut Vilaivan
Co-Chair : Assoc. Prof. Dr. Anyanee Kamkaew
Asst. Prof. Dr. Rung-Yi Lai

PC: Polymer Chemistry and Bio-based Materials

Chair : Prof. Dr. Suwabun Chirachanchai
Co-Chair : Assoc. Prof. Dr. Tatiya Trongsatitkul
Assoc. Prof. Dr. Chaiwat Ruksakulpiwat
Assoc. Prof. Dr. Nitinat Suppakarn

PT: Physical and Theoretical Chemistry

Chair : Prof. Dr. Jumras Limtrakul
Co-Chair : Prof. Dr. Kritsana Sagarik
Prof. Dr. Siriporn Jungsuttiwong
Dr. Supawadee Namuangruk
Assoc. Prof. Dr. Suwit Suthirakun

S1: Emerging Technologies for Climate Change Solutions

Chair : Prof. Dr.Siriporn Jungsuttiwong
Co-Chair : Dr. Pinit kidkhunthod
Assoc. Prof. Dr. Theeranun Siritano

S2: Novel Materials and Technologies for Future Semiconductors

Chair : Assoc. Prof. Dr. Panomsak Meemon
Co-Chair : Dr. Wanvisa Talataisong

S3: Intersection of Chemistry and Quantum Technology

Scientific Sessions

Chair :	Assoc. Prof. Dr. David Harding
Co-Chair :	Assoc. Prof. Dr. Phimphaka Harding

S4: Advancing Healthcare through Bio-Chemistry

Chair :	Assoc. Pof. Dr. Varodom Charoensawan
Co-Chair :	Dr. Chayasith Uttamapinant
	Assoc. Prof. Dr. Anyanee Kamkaew

CST-KSIEC joint special session

Chair :	Prof. Dr. Wittawat Saenrang
Co-Chair :	Dr. Jakkarin Limwongyut

Date	Session*	Setting up time	Presentation time	Poster removal time
13 Febuary	**I**	**11.00 – 13.00**	**14.30 – 15.30**	**18.30 – 19.00**
14 Febuary	**II**	**11.00 – 13.00**	**14.45 – 15.45**	**17.30 – 17.45**

* Posters with presentation IDs are shown in the table below.

Session	Poster Session I	Poster Session II
Analytical Chemistry	**AC-P-01** to **AC-P-32**	**AC-P-33** to **AC-P-67**
Catalytic Chemistry	**CC-P-01** to **CC-P-11**	**CC-P-12** to **AC-P-22**
Chemical Education		**CE-P-01** to **CE-P-09**
Environmental chemistry and renewable energy	**EE-P-01** to **EE-P-20**	**EE-P-21** to **EE-P-40**
Food, Agriculture, and Cosmetics	**FA-P-01** to **FA-P-16**	
Inorganic chemistry	**IC-P-01** to **IC-P-15**	
Industrial and Engineering Chemistry		**IE-P-01** to **IE-P-07**
Materials Science and Nanotechnology	**MN-P-01** to **MN-P-25**	**MN-P-26** to **MN-P-45**
Natural Products, Biological Chemistry and Chemical Biology	**NP-P-01** to **NP-P-15**	**NP-P-16** to **NP-P-35**
Organic synthesis and medicinal chemistry	**OM-P-01** to **OM-P-20**	**OM-P-21** to **OM-P-36**
Polymer Chemistry and Bio-based materials	**PC-P-01** to **PC-P-15**	**PC-P-16** to **PC-P-33**
Physical and Theoretical Chemistry		**PT-P-01** to **PT-P-17**
Emerging Technologies for Climate Change Solutions		**S1-P-01** to **S1-P-03**
Novel Materials and Technologies for Future Semiconductors		
Intersection of Chemistry and Quantum Technology		
Advancing Healthcare through Bio-Chemistry	**S4-P-01** to **S4-P-07**	

Participants are expected to be present in front of their posters during their scheduled sessions. Please note that there will be judges to interview the presenters during all sessions to evaluate for the Poster Presentation Awards, which will be announced during the Closing Ceremony on Friday, February 14, 2025.

Note: The organizer will not be responsible for the posters that are left behind after the day of the poster presentation.

Plenary Lectures

PL-01

Dr. Svetlana Mintova
Director of Research 1st Class (DR1) CNRS,
Laboratory of Catalysis and
Spectrochemistry (LCS),
ENSICAEN, Normandy University, Caen, France

PL-02

Prof. Dr. Harry L. Anderson
Department of Chemistry,
University of Oxford, UK

PL-03

Prof. Dr. James R.Ketudat-Cairns
School of Chemistry, Institute of Science,
Suranaree University of Technology, Thailand

Date: **February 13, 2025** Room: **Grand Ballroom A-B**

11:15 – 12:00	PL-01: Impact of Crystal Size on Zeolite Applications
13:00 – 13:45	PL-02: Molecular Wires and Nanorings
13:45 – 14:30	PL-03: Carbohydrate-active Enzymes: from Structural & Functional Basis for Efficient & Specific Catalysis to Chemical Applications

PL-04

Prof. Dr. Mas Subramanian

Distinguished Professor and the Milton Harris Chair of Materials Science, Oregon State University, USA

PL-05

Prof. A. Stephen K. Hashmi

Institute of Organic Chemistry, University of Heidelberg, Germany

PL-06

Prof. Dr. Orawon Chailapakul

Department of Chemistry, Chulalongkorn University, Thailand

Date: **February 14, 2025** Room: **Grand Ballroom A-B**

15:45 – 16:30	PL-04: Reimagining Inorganic Color Pigments via Trigonal Bipyramidal Coordination: Challenges and Opportunities
16:30 – 17:15	PL-05: Gold Catalysis – New Reactivity Patterns for Organic Synthesis
17:15 – 18:00	PL-06: The Evolution of Electrochemical Innovation: From Transformative Beginnings to New Frontiers

Keynote & Invited Speakers

AC: Analytical Chemistry

Prof. Dr. Daniel Citterio
Department of Applied Chemistry, Faculty of Science and Technology, Keio University, JAPAN

Keynote Speaker

Prof. Dr. Yan Xu
Department of Chemical Engineering, Graduate School of Engineering, Osaka Metropolitan University, JAPAN

Keynote Speaker

Assoc. Prof. Dr. Duangjai Nacapricha
Department of Chemistry, Faculty of Science, Mahidol University, THAILAND

Keynote Speaker

Assoc. Prof. Dr. Atitaya Siripinyanond
Department of Chemistry, Faculty of Science, Mahidol University, THAILAND

Keynote Speaker

Prof. Uday Maitra

Department of Organic Chemistry, Indian Institute of Science, Bangalore

Invited Speaker

Prof. Dr. Wittaya Ngeontae

Department of Chemistry, Faculty of Science, KhonKaen University, THAILAND

Invited Speaker

Assoc. Prof. Dr. Rodjana Burakham

Department of Chemistry, Faculty of Science, KhonKaen University, THAILAND

Invited Speaker

Assoc. Prof. Dr. Weena Siangproh

Department of Chemistry, Faculty of Science, Srinakharinwirot University, THAILAND

Invited Speaker

Assoc. Prof. Dr. Prompong Pienpinijtham

Department of Chemistry, Faculty of Science, Chulalongkorn University, THAILAND

Invited Speaker

Assoc. Prof. Dr. Jaroon Jakmunee

Department of Chemistry, Faculty of Science, Chiang Mai University, THAILAND

Invited Speaker

CC: Catalytic Chemistry

Dr. Kajornsak Faungnawakij
National Nanotechnology Center, National Science and Technology Development Agency, THAILAND

Keynote Speaker

Prof. Joongjai Panpranot
Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, THAILAND

Keynote Speaker

Assoc. Prof. ChM. Dr. NG Eng Poh
School of Chemical Sciences, Universiti Sains Malaysia, MALAYSIA

Keynote Speaker

Prof. Steven Bull
Department of Chemistry, The University of Leicester, United Kingdom

Keynote Speaker

Prof. Valentin Valtchev

Laboratoire Catalyse et Spectrochimie, ENSICAEN, Université de Caen, CNRS

Keynote Speaker

Assoc. Prof. Dr. Atthapon Srifa

Department of Chemical Engineering, Faculty of Engineering, Mahidol University, THAILAND

Invited Speaker

Assoc. Prof. Dr. Kittisak Choojun

Department of Chemistry, School of Science, King Mongkut's Institute of Technology Ladkrabang, THAILAND

Invited Speaker

Assoc. Prof. Anita Pati

Department of Chemistry, School of Applied Sciences, Kalinga Institute of Industrial Technology

Invited Speaker

CE: Chemical Education

Prof. Jung Sun Kim
Executive Vice President, Dongseo University, Republic of Korea

Keynote Speaker

Assoc. Prof. Dr. Saowarux Fuangswasdi
Department of Chemistry, Faculty of Science, Chulalongkorn University, THAILAND

Invited Speaker

Prof. Zuriati Zakaria
Department of Chemical and Environmental Engineering, Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia

Invited Speaker

Prof. Angela Kohler
Universität Rostock

Invited Speaker

EE: Environmental Chemistry and Renewable Energy

Prof. Dr. Nurak Grisdanuruk
Chemical Engineering Department, Thammasat University, THAILAND

Keynote Speaker

Prof. Dr. Doh Chang Lee
Department of Chemical and Biomolecular Engineering Korea Advanced Institute of Science and Technology (KAIST), the Republic of KOREA

Keynote Speaker

Assoc. Prof. Dr. Kitirote Wantala
Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, THAILAND

Invited Speaker

Assoc. Prof. Dr. Thapanee Sarakonsri
Department of Chemistry, Faculty of Science, Chiang Mai University, THAILAND

Invited Speaker

Dr. Teera Butburee
National Nanotechnology Center, National Science and Technology Development Agency, THAILAND

Invited Speaker

Prof. Dr. Chun-Hu Chen
Department of Chemistry, National Sun Yat-sen University, TAIWAN

Invited Speaker

Prof. Dr. Nantanit Wanichacheva
Department of Chemistry, Silpakorn University, THAILAND

Invited Speaker

Prof. Truong Lam Son Hai
Faculty of Chemistry, University of Science, Vietnam National University Ho Chi Minh City

Invited Speaker

Prof. Eugene Bacolod
Department of Chemistry, University of San Carlos

Invited Speaker

FA: Food, Agriculture, and Cosmetics

Prof.Dr. Preecha Phuwapraisirisan

Department of Chemistry, Faculty of Science, Chulalongkorn University, THAILAND

Keynote Speaker

Assoc. Prof. Dr. Sunanta Tongta

School of Food Technology, Institute of Agricultural Technology , Suranaree University of Technology, THAILAND

Invited Speaker

IC: Inorganic Chemistry

Prof. Masaki Kwanao

Department of Chemistry, School of Science, Tokyo Institute of Technology, JAPAN

Keynote Speaker

Assoc. Prof. Dr. Pimpa Hormnirun

Department of Chemistry, Faculty of Science, Kasetsart University

Invited Speaker

Assoc. Prof. Dr. Kittipong Chainok

Faculty of Science and Technology, Thammasat University, THAILAND

Invited Speaker

IE: Industrial and Engineering Chemistry

Mr. Choosak Kiwjaroen

Simulation Technology Manager, Industria Digital, SCGC, Thailand

Keynote Speaker

Prof. Jürgen Rarey

Rareytec Co., Ltd., Thailand

Invited Speaker

MN: Materials science and Nanotechnology

Prof. Gopinathan Sankar
Department of Chemistry, Faculty of Maths & Physical Sciences, University College London, UNITED KINGDOM

Keynote Speaker

Prof. Guillermo Bazan
Institute for Functional Intelligent Materials (I-FIM) & Department of Chemistry, National University of Singapore, Singapore

Keynote Speaker

Prof. Kevin C.-W. Wu
Department of Chemical Engineering, National Taiwan University

Keynote Speaker

Prof. Dae-Duk Kim
College of Pharmacy, Seoul National University, Republic of KOREA

Keynote Speaker

Dr. Pongtanawat Khemthong

National Nanotechnology Center, National Science and Technology Development Agency, THAILAND

Invited Speaker

Prof. Yi-Tsu Chan

Department of Chemistry, National Taiwan University, TAIWAN

Invited Speaker

Sivakumar Vaidyanathan

Department of Chemistry, Indian Institute of Technology, India

Invited Speaker

Prof. Pierre-Henri Aubert

LPPI, CY Cergy Paris Université

Invited Speaker

Dr. Sabita Patel

Department of Chemistry, National Institute of Technology Rourkela

Invited Speaker

Prof. Peng Jiang

Department of Inorganic Nonmetallic Materials, University of Science and Technology

Invited Speaker

Prof. Yan Li

Department of Inorganic Nonmetallic Materials, University of Science and Technology

Invited Speaker

NP: Natural Products, Biological Chemistry and Chemical Biology

Prof. Genji Kurisu
Division of Protein Structural Biology, Institute for Protein Research, Osaka University, JAPAN

Keynote Speaker

Prof. Dr. Prasat Kittakoop
Laboratory of Natural Products, Chulabhorn Graduate Institute and Chulabhorn Research Institute, THAILAND

Keynote Speaker

Assoc. Prof. Dr. Pitak Chuawong
Department of Chemistry, Faculty of Science, Kasetsart University, THAILAND

Invited Speaker

Asst. Prof. Juri Sakata
Graduate School of Pharmaceutical Sciences, Tohoku University

Invited Speaker

Prof. Dr. Wipa Suginta
School of Biomolecular Science & Engineering (BSE), Vidyasirimedhi Institute of Science and Technology (VISTEC), THAILAND

Invited Speaker

OM: Organic Synthesis and Medicinal Chemistry

Prof. Tony James

Department of Chemistry, University of Bath, UNITED KINGDOM

Keynote Speaker

Prof. Martin Banwell

Institute for Advanced and Applied Chemical Synthesis, Jinan University, CHINA

Keynote Speaker

Assoc. Prof. Roderick Wayland Bates

School of Chemistry, Chemical Engineering and Biotechnology, Nanyang Technological University, SINGAPORE

Invited Speaker

Prof. Dev Arya

Department of Chemistry, Clemson University

Invited Speaker

Dr. Kantapat Chansaenpak

National Nanotechnology Center, National Science and Technology Development Agency, THAILAND

Invited Speaker

Assoc. Prof. Wei-Min Liu

Department of Chemistry, Fu Jen Catholic University, TAIWAN

Invited Speaker

Dr. Chanat Aonbangkhen

Department of Chemistry, Faculty of Science, Chulalongkorn University, THAILAND

Invited Speaker

Assoc. Prof. Dr. Punlop Kuntiyong

Department of Chemistry, Silpakorn University, THAILAND

Invited Speaker

PC: Polymer Chemistry and Bio-Based Materials

Prof. Sang Yong Nam

Department of Materials Engineering and Convergence Technology, Green Energy Convergence Research Institute, Gyeongsang National University, the Republic of KOREA

Keynote Speaker

Prof. Gert-Jan M. Gruter

Industrial Sustainable Chemistry, Universiteit van Amsterdam

Keynote Speaker

Prof. Jun Li

Department of Biological Engineering, National University of Singapore

Keynote Speaker

Prof. Suwabun Chirachanchai

The Petroleum and Petrochemical College, Chulalongkorn University

Keynote Speaker

Prof. Chi-How Peng

Department of Chemistry, National Taiwan Universit

Close

Invited Speaker

Prof. Hiroharu Ajiro

Division of Materials Science, Nara Institute of Science and Technology

Invited Speaker

Assit. Prof. Winita Punyodom

Department of Chemistry, Chiang Mai University

Invited Speaker

PT: Physical and Theoretical Chemistry

Prof. Satoshi Horike
Graduate School of Science, Kyoto University, JAPAN

Keynote Speaker

Prof. Daniel Packwood
Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University, JAPAN

Keynote Speaker

Prof. Yong-Hyun Kim
Graduate School of Nanoscience and Technology, Korea Advanced Institute of Science and Technology (KAIST)

Keynote Speaker

Prof. Cheng-Chau Chiu
Department of Chemistry, National Sun Yat-sen University, TAIWAN

Invited Speaker

Prof. Lichang Yin
Institute of Metal Research, Chinese Academy of Sciences, CHINA

Invited Speaker

Assoc. Prof. Supareak Praserthdam
Department of Chemical Engineering, Chulalongkorn University, THAILAND

Invited Speaker

Assoc. Prof. Alejandro Montoya
School of Chemical and Biomolecular Engineering, The University of Sydney, AUSTRALIA

Invited Speaker

Dr. Anchalee Junkaew
National Nanotechnology Center (NANOTEC)

Invited Speaker

Prof. Yoshitada Morikawa
Department of Precision Engineering, Graduate School of Engineering, Osaka University

Invited Speaker

Prof. Akira Nakayama
Department of Chemical System Engineering, The University of Tokyo

Invited Speaker

S1: Emerging Technologies for Climate Change Solutions

Assoc. Prof. Wongkot Wongsapai
Multidisciplinary Research Institute , Chiang Mai University

Keynote Speaker

Prof. Jun Huang
School of Chemical and Biomolecular Engineering, The University of Sydney

Keynote Speaker

Prof. Pei-Chen Su
School of Mechanical and Aerospace Engineering, Nanyang Technological University

Keynote Speaker

Dr. Pinit Kidkhunthod
Synchrotron Light Research Institute

Invited Speaker

Prof. Rojana Pornprasertsuk
Department of Materials Science, Faculty of Science, Chulalongkorn University

Invited Speaker

Dr. Chanon Pornrungroj
Department of Chemical Engineering, Chulalongkorn University, THAILAND

Invited Speaker

Dr. Rongrong Cheacharoen
Metallurgy and Materials Science Research Institute, Chulalongkorn University

Invited Speaker

Prof. Yeshui Zhang
School of Engineering, University of Aberdeen

Invited Speaker

Prof. Tomoaki Watanabe
Department of Applied Chemistry, Meiji University

Invited Speaker

Asst. Prof. Manaswee Suttipong
Department of Chemical Technology, Chulalongkorn University

Invited Speaker

Asst. Prof. Jitti Kasemchainan

Department of Chemical Technology, Faculty of Science, Chulalongkorn University

Invited Speaker

Dr. Suttipong Wannapaiboon

Synchrotron Light Research Institute

Invited Speaker

Assoc. Prof. Soorathep Kheawhom

Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University

Invited Speaker

Prof. Lukman Noerochim

Department of Materials and Metallurgical Engineering, Institut Teknologi Sepuluh Nopember

Invited Speaker

S2: Novel Materials and Technologies for Future Semiconductors

Prof. Yi-Jen Chiu
Department of Photonics, National Sun Yat-sen University, TAIWAN

Keynote Speaker

Dr. Watcharaphol Paritmongkol
School of Molecular Science and Engineering, Vidyasirimedhi Institute of Science and Technology (VISTEC), THAILAND

Invited Speaker

Assoc. Prof. Dr. Rawat Jaisuthi
Physics Department, Faculty of Science and Technology, Thammasat University, THAILAND

Invited Speaker

S3: Intersection of Chemistry and Quantum Technology

Prof. Guillem Aromi

Departament de Química Inorgànica i Orgànica and IN2UB, Universitat de Barcelona, SPAIN

Keynote Speaker

Dr. Hideyuki Hara

BioSpin Division, Bruker Japan K.K.

Keynote Speaker

S4: Advancing Healthcare through Bio-Chemistry

Prof. Xiaoguang Lei
Department of Chemical Biology, College of Chemistry and Molecular Engineering, Peking University, P. R. China

Keynote Speaker

Assoc. Prof. Kanlaya Prapainop
Department of Biochemistry, Faculty of Science, Mahidol University, THAILAND

Invited Speaker

Prof. Qi Zhang
Department of Chemistry, Fudan University

Invited Speaker

Prof. Cheng-Chih Hsu
Department of Chemistry, National Taiwan University

Invited Speaker

CK: CST-KSIEC Joint Special Session

Prof. Jongwook Park
Department of Chemical Engineering, Kyung Hee University

Invited Speaker

Assoc. Prof. Dong Woog Lee
Ulsan National Institute of Science and Technology (UNIST)

Invited Speaker

Assoc. Prof. Sanghyuk Wooh
School of Chemical Engineering & Materials Science, Chung-Ang University

Invited Speaker

Assoc. Prof. Jeong F. Kim
Department of Chemical Engineering, Kyung Hee University

Invited Speaker

Prof. Vinich Promarak

School of Molecular Science and Engineering, Vidyasirimedhi Institute of Science and Technology (VISTEC)

Invited Speaker

Asst. Prof. Benjaporn Narupai

Department of Chemistry, Chulalongkorn University

Invited Speaker

Assoc. Prof. Worawat Meevasana

School of Physics, Suranaree University of Technology

Invited Speaker

Dr. Teerapat Rutirawut

School of Physics, Suranaree University of Technology

Invited Speaker

CST Awards 2024

1 **Prof. Dr. Jatuporn Wittayakun**
Suranaree University of Technology
CST Distinguished Chemist Award (Inorganic Chemistry)

2 **Assoc. Prof. Dr. Anyanee Kamkaew**
Suranaree University of Technology
CST Distinguished Young Chemist Award (Organic Chemistry)

4 **Assoc. Prof. Dr. Thanit Praneenararat**
Chulalongkorn University
CST Award for Distinguished Contribution to Chemical Education

5 **Assoc. Prof. Dr. Purim Jarujamrus**
Ubon Ratchathani University
ACES-CST Early Career Award for Contribution to Green Chemistry

6 **Dr. Teera Butburee**
National Science and Technology Development Agency
Shimadzu-CST Young Chemist Award

7 **Dr. Surasak Kaenket**
Vidyasirimedhi Institute of Science and Technology
Merck-CST Distinguished Dissertation Award

8 **Ampika Phoungsiri**
King Mongkut's Institute of Technology Ladkrabang
Metrohm-CST Young Chemist Award

9 **Asst. Prof. Dr. Wisit Hirunpinyopas**
Kasetsart University
Merck-CST-TYCN for Sustainable Future Award

10 **Muttakeen Che-Leah**
Wiangsuwanwittayakhom School
Dow-CST Award for Distinguished School Science Teacher
Lower Secondary Education

11 **Ratanaphun Utmeemang**
Srisawatwittayakarn-changwatnan School
Dow-CST Award for Distinguished School Science Teacher
Upper Secondary Education

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SMALL — SCALE CHEMISTRY TEACHERS NETWORKING ABSTRACTS

The development of a micro-scale paper-based analytical device for citric acid determination in fruit juice samples, based on the acid-base titration principle

Vitavas Jumpathong*, Akiko Nakamura , Napasawan Dachkong and Napat Saleephol
Angthongpatthamarotwitthayakhom School, Singburi-Angthong Secondary Educational Service Area Office
**E-mail: vitavasjumpathong@apw.ac.th*

Traditional titration laboratory experiments used in teaching have several limitations, including (1) high costs, (2) safety concerns, and (3) time constraints. This project aims to address these challenges by designing and developing a paper-based micro-analytical device to measure the citric acid content in fruit juice samples. The study is divided into four stages:

• Stage 1 involves designing a paper-based analytical device to detect citric acid in fruit samples, such as commercially available lemon juice. The device is a portable, biodegradable paper-based test kit that uses minimal microliter-level amounts of chemicals.

• Stage 2 focuses on preparing the necessary solutions, including sodium hydroxide (NaOH), potassium hydrogen phthalate (KHP), diluted fruit juice (20x), and a 1% w/v thymol blue indicator solution.

• Stage 3 involves determining the exact concentration of sodium hydroxide using a KHP solution.

• Stage 4 involves measuring the amount of citric acid in fruit juice samples, such as artificial lime juice.

The experimental results indicated that the citric acid content in artificial lime juice, as determined using the micro-scale paper-based analytical device, closely matched the value stated on the label and was consistent with results obtained through standard titration. The paper-based device measured the citric acid content to be 5.125% (w/v) based on the average of 10 repetitions. This analysis demonstrated high consistency with the standard acid-base titration method, while achieving a thousand-fold reduction in chemical usage.

Keywords: acid-base titration; micro-scale; paper-based analytical device; citric acid