List of RGJ advisors 2023/2024

Name:	Assoc. Prof. Purim Jarujamrus		
Date of birth: 12 AUG 1984			Country of residence: THAILAND
Nationality: Present: Thai			Gender: ☑ Male ☐ Female
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Scopus Author ID: 35603449400 ORCID ID https://orcid.org/0000-0002-0666-150X			Google Scholar: https://scholar.google.com/citations?user=7rjnalwAAAAJ&hl=th

Degrees obtained:	Date obtained:	Awarding institution:
B.Sc. (Chemistry)	March, 23, 2006	Prince of Songkla University, Thailand
Ph.D. (Analytical Chemistry)	May, 8, 2012	Mahidol University, Thailand
Professional appointments:	**From - to:**	**Employing institution:**
Lecturer	2012-2016	Department of Chemistry, Faculty of Science, UBU
Assistant Professor	2016- 2020	Department of Chemistry, Faculty of Science, UBU
Associate Professor	2020- present	Department of Chemistry, Faculty of Science, UBU
Vice Dean of research and academic service	2019- present	Faculty of Science, UBU
Keio Guest Professor (global)	1 October 2023- 31 March 2024	Department of Applied Chemistry, School of Integrated Design Engineering, Keio University

Summary of research:	He has been focusing on the research and development of paper and thread as substrates for low-cost microfluidics& sensors combined with the functional nanocomposites-based methodologies for environmental monitoring, food monitoring, diagnosis, and the context of analytical chemistry education. He has authored more than 70 peer-reviewed journal papers and patents.

He is recognized in Analytical Green Chemistry for his research achievements which revolve around developing paper and thread as substrates for low-cost microfluidics& sensors combined with

the functional nanocomposites-based methodologies for **environmental & food monitoring** [1,3,4,5,6,7,11,12] **diagnosis** [2,9,10,13] as well as the **context of analytical chemistry education** [7,8,12].

For instance, in environmental monitoring, these novels sensitive, selective, and low-cost devices provide easy solutions to field-based monitoring of metal ions in real water samples. They could promptly inform nonprofessional users of the water quality in the environment. His proposed devices can also be demonstrated as paper/thread-based experimental devices, which are low-cost, easy to fabricate, mass production, less time-consuming in a laboratory experiment with minimized consumption of reagents & waste production, and suitable for various educational purposes. These could also be implemented to be experimental in introductory chemistry laboratory courses, especially in developing countries. Benefits are 'new,' 'green,' and 'low-cost' technologies of detection, built upon a solid systematic understanding of detection science which is a fundamental need. It is also expected that an expansion of his proposed research works beyond this application can be possible in the future, not only for detecting other metal ions but also for a wide range of chemical/biochemical sensing in various applications, e.g., environmental &food monitoring and diagnosis.

Biographical sketch:

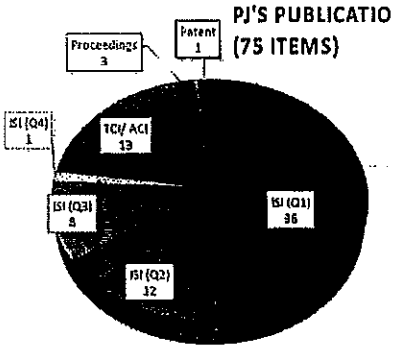
- Purim Jarujamrus obtained Ph.D. in Analytical Chemistry from Mahidol University (MU), Thailand, in **2012** under the Royal Golden Jubilee (RGJ) Scholarship from the Thailand Research Fund under Professor Juwadee Shiowatana. During his Ph.D. pursuit, he also has been a visiting scientist to work with Professor. Dr. Wei Shen at Department of Chemical Engineering, Faculty of Engineering, Monash University, Melbourne, Australia. He is currently an Associate Professor at the Department of Chemistry, Faculty of Science, UBU, and He has just been submitted as a Full professor to the system for evaluation since February **2023**

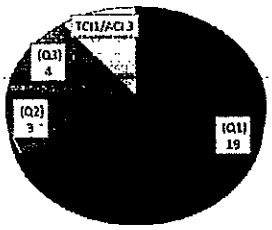
- He has been acting as a reviewer to the high of impact scientific journals. He has been invited to lecture as a Keynote speaker and Invited speaker in various Universities and research institutes in his home country and outside countries. In addition, he was the chairman of the academic laboratory competition of the National Chemistry Olympiad in **2018**. And the head of the organizing committee of "the Materials Research Society of Thailand International Conference (MRS-Thailand **2023**)."

- He is currently a guest special issue editor of "Advances in Analytical Methods and Their Sensing Application for Food Contaminants" of "Foods," an open-access Q1 journal by MDPI (impact factor 5.561) from Jan-Sep **2023**. He has also been granted many scholarships and awards since **2012**. (e.g., Young researcher award at Faculty of Science, UBU **2015**; NorthEastern Science Park Innovation award **2018**; The patented award, Faculty of Science, UBU **2019**; An

excellently recognizable staff of Science and Technology, UBU in the year 2021; An excellently recognizable researcher, UBU in the year 2021; An excellently recognizable researcher who highest publishing in Science and technology, Ubon Ratchathani University, 2022)

Total publications in peer-reviewed Journals: 75; Patent: 1: h-index: 20, citation 1204





(Citation number and h-index are reported by Google scholar in July/2023)

Note: Q, IF, and Ct represent the quartile of the journal (https://www.scimagojr.com), The journal impact factor 2021 (2021 Journal Citation Reports (Clarivate Analytics, 2022)), and the citation (www.scholar.google.co.th), respectively

Selected publications

1. Suticha Chunta*, Suphat Phongthai, Purim Jarujamrus. Simple colorimetric assay using pectin hydrogel reagent coupled with camera-based photometry for trace arsenic determination. *Analytical and Bioanalytical Chemistry.* **(2023). DOI: 10.1007/s00216-023-04762-z.** (Article in press) (Q1, IF 4.478)
2. Akarapong Prakobkij, Suchada Sukapanon, Suticha Chunta, Purim Jarujamrus*, Mickey mouse-shaped laminated paper-based analytical device in simultaneous total cholesterol and glucose determination in whole blood. *Analytica Chimica Acta.* **(2023)**, 1263 (341303), 1-11. **DOI: 10.1016/j.aca.2023.341303.** (Q1, IF 6.911)
3. Nutthaporn Malahom, Trirat Ma-In, Puttaraksa Naksen, Wipark Anutrasakda, Maliwan Amatatongchai, Daniel Citterio, and Purim Jarujamrus*, Nitrogen-Doped Graphene Quantum Dots as "Off–On" Fluorescent Probes in Paper-Based Test Kits for Selective Monitoring of Cyanide in Food. *ACS Applied Nano Materials.* **(2023).** 6(13), 11144–11153. **DOI: 10.1021/acsanm.3c01109.** (Article in press) (Q1, IF 6.140) **(This article was selected as outside FRONT COVER*)**
4. Thanyanat Saiboh, Nutthaporn Malahom, Akarapong Prakobkij, Ketsarin Seebunrueng, Maliwan Amatatongchai, Sanoe Chairam, Yupaporn Sameenoi, Purim Jarujamrus*, Visual detection of formalin in food samples by using a microfluidic

thread-based analytical device. ***Microchemical Journal.*** **(2023)**, 190(108685),1-8. **DOI:10.1016/j.microc.2023.108685**. (Q1, IF 5.304)

5. Rattapol Meelapsom, **Purim Jarujamrus***, Maliwan Amatatongchai, Sanoe Chairam, Chadin Kulsing and **Wei Shen**. Chromatic analysis by monitoring unmodified silver nanoparticles reduction on double layer microfluidic paper-based analytical devices for selective and sensitive determination of mercury (II). ***Talanta.*** **(2016)**, 155: 193-201. **DOI: 10.1016/j.talanta.2016.04.037.** (Q1, IF 6.556)
6. **Purim Jarujamrus***, Rattapol Meelapsom, Puttharaksa Naksen, Nadh Ditcharoen, Wipark Anutarasakda, Atitaya Siripinyanond, Maliwan Amatatongchai and Saksri Supasorn, Screen-printed microfluidic paper-based analytical device (μPAD) as a barcode sensor for magnesium detection using rubber latex waste as a novel hydrophobic reagent. ***Anal Chim Acta.*** **(2019)**, 1082, 66-77. **DOI: 10.1016/j.aca.2019.06.058.** (Q1 **(Tier 1 in Analytical Chemistry)**, IF 6.911)
7. **Purim Jarujamrus***, Akarapong Prakobkij, Sodsai Puchum, Sawida Chaisamdaeng, Rattapol Meelapsom, Wipark Anutrasakda, Maliwan Amatatongchai, Sanoe Chairam and **Daniel Citterio**. Acid–base titration using a microfluidic thread-based analytical device (μTAD). ***Analyst.*** **(2020)**, 145, 4457-4466. **DOI: 10.1039/D0AN00522C**. (Q1, IF 5.227)
8. Penbhorn Kajornklin, **Purim Jarujamrus***, Phuwadon Phanphon, Pakakan Ngernpradab, Saksri Supasorn, Sanoe Chairam, Maliwan Amatatongchai. Fabricating a Low-Cost, Simple, Screen Printed Paper Towel-Based Experimental Device to Demonstrate the Factors Affecting Chemical Equilibrium and Chemical Equilibrium Constant, Kc. ***J. Chem. Educ.*** **(2020), 97(7), 1984- 1991. DOI: 10.1021/acs.jchemed.9b00918**. (Q2, IF 3.208)
9. Nattasa Kitchawengkul, Akarapong Prakobkij, Wipark Anutrasakda, Nuttapon Yodsin, Siriporn Jungsuttiwong, Suticha Chunta, Maliwan Amatatongchai, and **Purim Jarujamrus***. Mimicking Peroxidase-Like Activity of Nitrogen-Doped Carbon Dots (N-CDs) Coupled with a Laminated Three-Dimensional Microfluidic Paper-Based Analytical Device (Laminated 3D-μPAD) for Smart Sensing of Total Cholesterol from Whole Blood. ***Anal Chem.*** **(2021)**, 93 (18), 6989-6999. **DOI: 10.1021/acs.analchem.0c05459.** (Q1**(Tier1 in Analytical Chemistry)**, IF 8.008)
10. Akarapong Prakobkij, **Purim Jarujamrus***, Suticha Chunta, Runglawan Chawengkirttikul, Tinnagon Keawin, Nutthaporn Malahom, Suparb Tamuang, Maliwan Amatathongchai, **Daniel Citterio**. Nitrogen-doped carbon dots/Ni-MnFe-

layered double hydroxides (N-CDs/Ni-MnFe-LDHs) hybrid nanomaterials as immunoassay label for low-density lipoprotein detection. ***Microchim Acta.* (2022).** 189 (72). 1-14. **DOI: 10.1007/s00604-022-05173-0.** (Q1, IF 6.408)

11. Nutthaporn Malahom, **Purim Jarujamrus***, Wipark Anutrasakda, Atitaya Siripinyanond, Maliwan Amatatongchai, **Daniel Citterio,** Duangjai Nacapricha. Ag_3PO_4/Ag nanocomposite for selective and sensitive cyanide determination in food samples through catalytical colorimetry using a paper-based test kit. ***Sens. Actuators B Chem.*, (2022).** 356(131351), 1-10. **DOI: 10.1016/j.snb.2021.131351** (Q1 **(Tier1 in Materials Chemistry)**, IF 9.221)
12. Rattapol Meelapsom, Waranphat Rattanakaroonjit, Akarapong Prakobkij, Nutthaporn Malahom, Saksri Supasorn, Sukhum Ruangchai, **Purim Jarujamrus***. Smartphone-assisted colorimetric determination of iron ions in water by using anthocyanin from *Ruellia tuberosa* L. as a green indicator and application for hands-on experiment kit. ***J.Chem.Educ.*, (2022).** 99(4), 1660−1671. **DOI: 10.1021/ acs.jchemed.1c01120.** (Q2, IF 3.208)
13. Budsakorn Wongsing, Akarapong Prakobkij, Wipark Anutrasakda, **Purim Jarujamrus***, Vanadium-Doped Porous Cobalt Oxide for its Superior Peroxidase-Like Activity in Simultaneous Total Cholesterol and Glucose Determination in Whole Blood Based on Simple Two-Dimensional Paper-Based Analytical Device, ***Anal Chem.*** (2022). 94, 13785−13794. **DOI: 10.1021/acs.analchem.2c02280.** (Q1 **(Tier1 in Analytical Chemistry**, IF 8.008)
14. Nutthaporn Malahom, **Purim Jarujamrus***, Wipark Anutrasakda, Runglawan Chawengkirttikul, Atitaya Siripinyanond, Rattapol Meelapsom, Maliwan Amatatongchai. Novel Paper-Based Colorimetric Immunoassay (PCI) for Sensitive and Specific Detection of Salbutamol Residues in Flesh of Swine and Urine Using Ag_3PO_4/Ag Nanocomposite as Label. ***J. Food. Sci.*** (2020), 85(1), 209-219. **DOI: 10.1111/1750-3841.14974. (This article was selected as FRONT COVER**)** (Q1, IF 3.693)
15. Siwaluck Boonruang, Puttaraksa Naksen, Wipark Anutrasakda, Kantapat Chansaenpak, Vinich Promaruk, Rattaporn Saenmuangchin, Chutima Phechkrajang, **Purim Jarujamrus***. Use of Nitrogen-doped amorphous Carbon nanodots (N-CNDs) as fluorometric paper-based sensor: A new approach for sensitive determination of

lead (II) at trace level under high ionic matrices. ***Anal. Methods***. (2021). 13(32), 3551 - 3560. **DOI: 10.1039/D1AY00765C. (This article was selected as outside FRONT COVER****)**. (Q2, IF 3.532).

*Front cover

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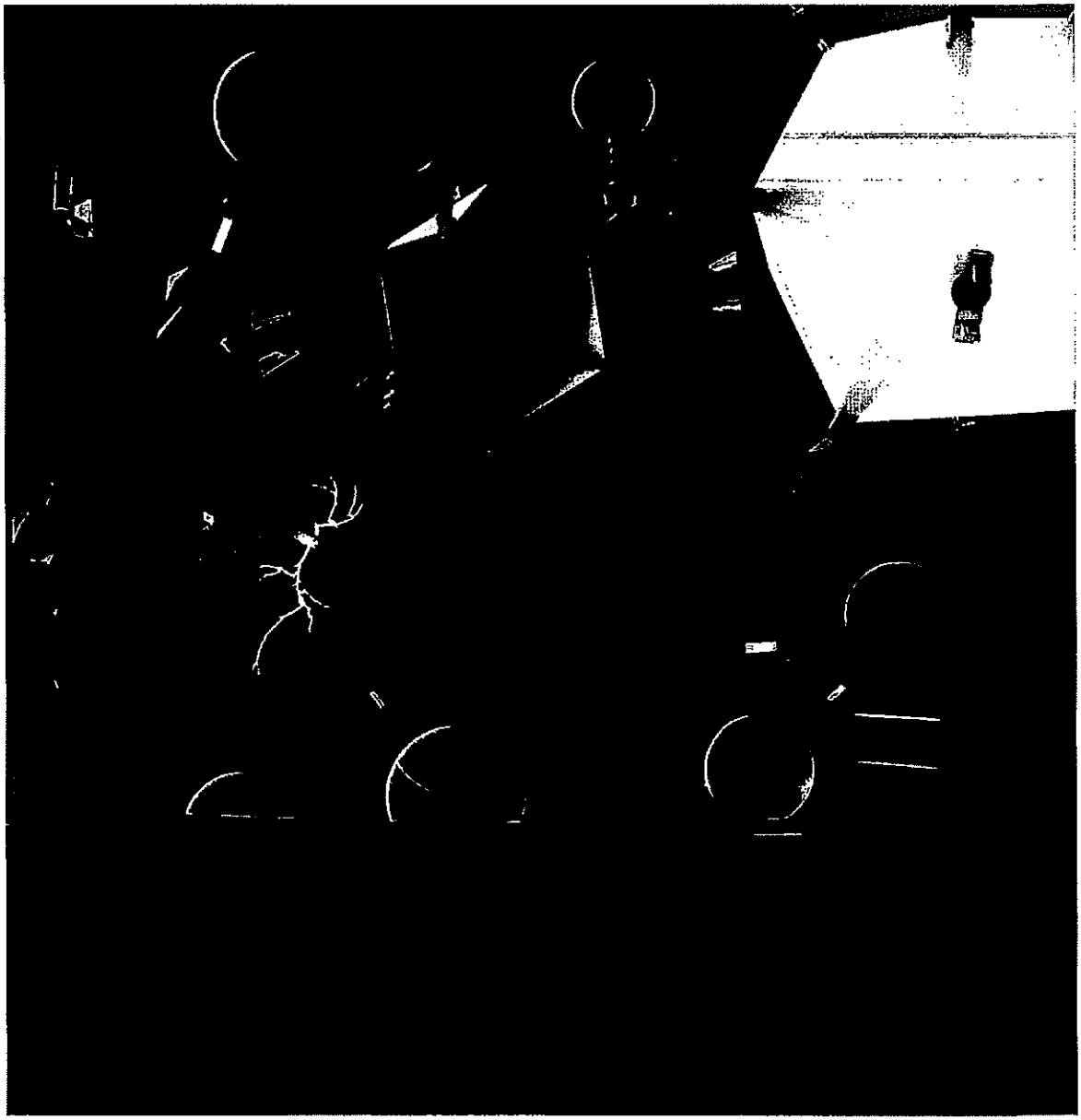

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**Front cover

January Online Cover: Paper-based Colorimetric Immunoassay (PCI) approach using Ag_3PO_4/Ag nanocomposite as effective label for selective and sensitive detection of salbutamol residues in pig flesh and urine, from "Novel paper-based colorimetric immunoassay (PCI) for sensitive and specific detection of salbutamol residues in flesh of swine and urine using Ag_3PO_4/Ag nanocomposite as label" by Nutthaporn Malahom, Purim Jarujamrus*, Wipark Anutrasakda, Runglawan Chawengkirttikul, Atitaya Siripinyanond, Rattapol Meelapsom, and Maliwan Amatatongchai.

*** Front cover

Our work has been selected as the "Outside front cover" for "Analytical Methods"

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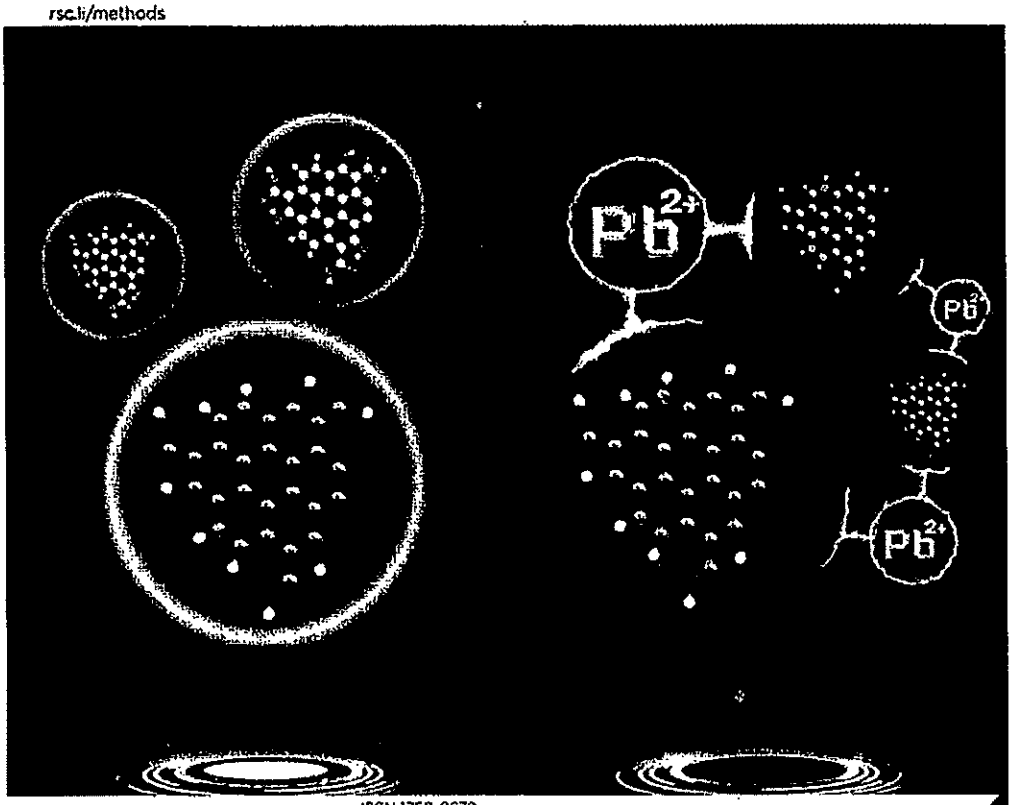

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ROYAL SOCIETY OF CHEMISTRY

PAPER
Purim Jarujamrus *et al.*
Use of nitrogen-doped amorphous carbon nanodots (N-CNDs) as a fluorometric paper-based sensor: a new approach for sensitive determination of lead(II) at a trace level in highly ionic matrices

Indexed in Medline!

การกรอกรายละเอียดในแบบฟอร์มนี้ ต้องดำเนินการให้ครบถ้วนตามความเป็นจริง หากตรวจสอบพบว่ามีการปกปิดหรือเป็นเท็จ วช. ขอสงวนสิทธิ์ที่จะไม่พิจารณาสนับสนุนและจะเป็นผู้ไม่มีสิทธิ์รับทุน วช. เป็นเวลา ๓ ปี

แบบเสนอโครงการวิจัย (Research Project)
ประกอบการเสนอขอทุนอุดหนุนการวิจัยของสำนักงานการวิจัยแห่งชาติ (วช.)
โครงการปริญญาเอกกาญจนาภิเษก (คปก.) ภายใต้ความร่วมมือไตรภาคีไทย-สวีเดน
ประจำปีงบประมาณ ๒๕๖๗

๑. ชื่อโครงการวิจัย Selective Fluorescence Sensing of D-Proline and D-Alanine in Saliva via Molecularly Imprinted Polymer Coupled with Graphene Quantum Dots (MIP-GQDs) for Gastric Cancer Detection

เซนเซอร์เรืองแสงที่ความจำเพาะเจาะจงสูงสำหรับการวิเคราะห์การหาปริมาณ D-proline และ D-alanine ในตัวอย่างน้ำลายโดยใช้พอลิเมอร์ที่พิมพ์ด้วยโมเลกุลควบคู่กับกราฟีนควอนตัมดอทสำหรับการวิเคราะห์มะเร็งในกระเพาะ

๒. ชื่อ-สกุล อาจารย์ที่ปรึกษา Associate Professor. Dr. Purim Jarujamrus (รศ.ดร.ปุริม จารุจำรัส)
Department of Chemistry, Faculty of Science, Ubon Ratchathani University (Thailand)
E-mail: purim.j@ubu.ac.th, prim310@hotmail.com
Telephone: 095-6059061

กลุ่มสาขาวิทยาศาสตร์พื้นฐานที่สมัคร (เลือกเพียง ๑ กลุ่ม)

☐ ชีววิทยา (Biology) ☑ เคมี (Chemistry)
☐ ฟิสิกส์ (Physics) ☐ คณิตศาสตร์ (Mathematics)

๓. ผู้ใช้ประโยชน์ (Research stakeholders) (กรณีมีความร่วมมือฯ) เช่น ความร่วมมือของหน่วยงานภาครัฐ (เช่น กระทรวง กรม)/เอกชนที่ร่วมสนับสนุนทุนวิจัย เช่น MOU เป็นต้น

☑ มี : Ubon Ratchathani Cancer Hospital (โรงพยาบาลมะเร็งอุบลราชธานี 405 ถนนคลังอาวุธ ตำบลข่ามใหญ่ อำเภอเมือง จังหวัดอุบลราชธานี)
Ubon Ratchathani University hospital (โรงพยาบาลมหาวิทยาลัย อุบลราชธานี)

☐ ไม่มี

๔. คำสำคัญ (Keyword) ของโครงการ

Gastric cancer; D-amino acid; D-proline; D-alanine; Biosensor; Fluorescence sensor; Molecular imprinted polymer (MIP); Diagnosis; Graphene quantum dots (GQDs)

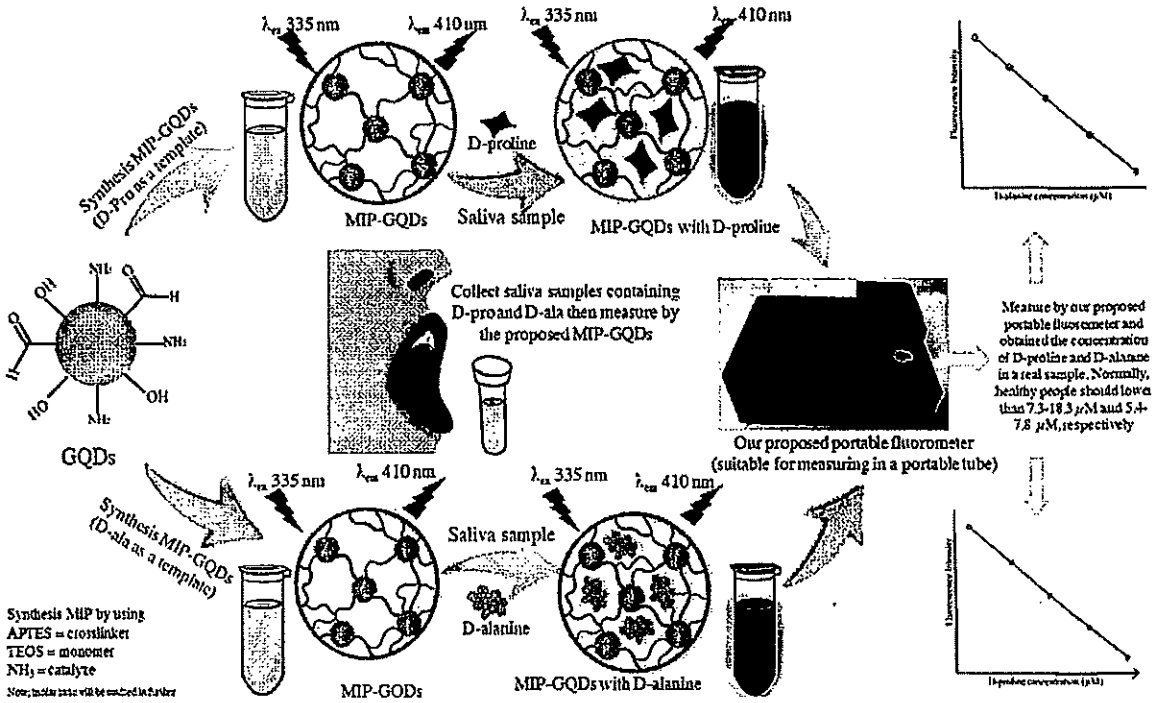
๕. ความสำคัญและที่มาของปัญหาที่ทำการวิจัย (Problem statement and significance of research)

Stomach cancer (gastric cancer) is the leading cause of cancer-related fatalities worldwide, caused by a fast pace of life and poor eating habits [1-5]. Therefore, early detection and prompt treatment are crucial [6-8]. However, many of those diagnosed with early stomach cancer lack any particular symptoms, making it challenging to make a timely diagnosis and administer appropriate care [3]. The blood test, biopsies, and endoscopies are traditional diagnostic methods for gastric cancer [9]. Usually, these methods are based on the enzyme-linked immunosorbent assay (ELISA) principle that specific antibodies bind the target antigen and detect the presence and quantity of antigens binding. However, these methods are complicated, time-consuming, depend on rigorous laboratory facilities, may adversely affect human tissues, and use biomolecules [3, 8]. As a result, there is an urgent need for practical and rapid techniques for early gastric cancer diagnosis, especially the analysis of simple and noninvasive clinical samples. The D-amino acid level in salivary has been reported as a related early gastric cancer. In addition, early gastric cancer patients had significantly higher levels of D-proline (D-Pro) and D-alanine (D-Ala) in their saliva than healthy individuals (7.3-18.3 μM and 5.4-7.8 μM, respectively) [3, 10, 11]. Recently, chromatography [12], electrochemiluminescence [13], and electrochemical biosensors [14]. Their detection methods had expensive instruments and highly complex preparation. Many researchers are interested in the colorimetric method based on peroxidase reaction [3, 15, 16] for D-Ala and D-Pro sensors. The colorimetric assays are easy and affordable. However, the main disadvantage is that the colorimetric methods are high background interference, high interference, and low sensitivity. Therefore, low-cost, high sensitivity and high selectivity are needed.

The fluorescence technique can improve gastric cancer detection by providing a simple and sensitive when using fluorescent probes. Graphene quantum dots (GQDs) as fluorescence sensors have attracted much attention for their uniquely small Stokes shifts, narrow absorption bands, sharp emissions, high fluorescence quantum yields, and excellent chemical and photostability [15, 16], due to many advantages that are suitable as a sensitive fluorescence probe. In addition, selectivity needs to be improved. Thus, we will develop a molecularly imprinted polymer (MIP) used as a D-Pro and D-Ala imprinted polymer to enhance selectivity.

Novel MIP coupled with GQDs (MIP-GQDs) as a novel biosensor for selective and sensitive D-pro and D-ala based on the fluorescence strategy will be proposed for the first time. The experiment will utilize a miniaturized microcentrifuge tube with various advantages, e.g., it facilitates reagent reduction to just 500 µL/tube, resulting in a cost-effective detection with waste reduction (as shown in the schematic diagram). Moreover, a portable fluorescence device will also be designed to measure the fluorescence intensity from those above.

Our developed sensor will be a novel practical, selective, low-cost, and noninvasive sensor for early gastric cancer screening (the schematical diagram). This concept is expected to apply to other target analytes for cancer disease diagnostic applications.



Schematic diagram: Selective fluorescence sensing of D-Proline and D-Alanine in saliva via molecularly imprinted polymer coupled with graphene quantum dots (MIP-GQDs) for gastric cancer detection

๖. ทฤษฎี/สมมุติฐานของโครงการ (Hypothesis)

6.1 Stomach cancer (gastric cancer)

. Stomach cancer, also known as gastric cancer, is a kind of cancer that begins in the stomach. The stomach is in the upper center of the abdomen, right below the ribs. The stomach aids in the breakdown and digestion of meals. Gastric cancer is a global disease that is the fifth most common cancer and the third leading cause of death [18]. Usually, gastric cancer can be determined via carcinoembryonic antigen (CEA) in human serum, classified as an invasive sample [9]. Recently, a noninvasive sampling has been interested in which uses D-amino acid in human salivary. The D-amino acid level in salivary has been reported as a related early gastric cancer. In addition, early gastric cancer patients had significantly higher levels of D-proline (D-Pro) and D-alanine (D-Ala) in their saliva than healthy individuals (7.3-18.3 μM and 5.4-7.8 μM, respectively) [3, 10, 11].

6.2 Graphene quantum dots (GQDs)

GQDs are zero-dimensional (0D) with a size of less than 10 nm. Regarding GQDs, HRTEM images demonstrate that these materials are highly crystalline, with interplanar distances around 0.21 nm related to the graphene lattice's (100) spacing and a spacing of approximately 0.34 nm between graphene layers owing to its (002) lattice. Dependent on the carbon precursor, synthesis method, and heteroatom dopant, CDs' graphene layer spacing (d002) [15. 16, 17]. GQDs offer broad absorption and emission in the deep ultraviolet, visible, and near-infrared ranges, as well as effective multiphoton up-conversion emission that can be regulated by surface functional species, size, shape, and heteroatom doping; they are good candidates for biosensing. GQDs also have unique optoelectronic, chemical, and magnetic characteristics; therefore, they have a wide variety of applications in biomedicine, electronics, biosensors, and renewable energy.

6.3 Molecularly Imprinted Polymer (MIP)

Molecularly imprinted polymers are artificial receptors for a specific substance. As such, they are natural antibody-antigen systems mimics. They have many advantages due to their high specificity, selectivity, and stability under critical conditions [19-21].

๗. วัตถุประสงค์ของโครงการ (Objectives)

To develop a selective fluorescence sensing of D-Proline and D-Alanine in saliva via molecularly imprinted polymer coupled with graphene quantum dots (MIP-GQDs) for gastric cancer detection.

๘. การทบทวนวรรณกรรม/ผลงานวิจัยที่เกี่ยวข้อง (Literature Reviews)

Probe	Method	Real sample	Linearity range (LOD)	Reference
CDs@NC nanozymes	Colorimetric method based on peroxidase reaction	saliva	D-pro 20 to 300 μM (7.7 μM) D-ala 20 to 400 μM (18.6 μM)	22
N/S-CDs@NC	The luminol–H_2O_2 electrochemiluminescence (ECL) system and Colorimetric based on peroxidase reaction	Carcinoembryonic antigen (CEA) in serum and D-Pro and D-Ala in saliva	LOD of D-pro 0.14 μM LOD of D-ala 0.35 μM LOD of CEA 0.26 pg mL^{-1}	23
MIP-GQDs	On-off fluorescence utilizing a miniaturized microcentrifuge tube coupled with a portable fluorometer	saliva	LOD should be less than 126.3 μM D-proline (D-Pro) and 46.1 μM D-alanine (D-Ala), respectively)	**Proposed method**

๙. ระเบียบวิธีวิจัย (Methodology)

9.1 Synthesis and Characterization of GQDs, MIP-GQDs, and NIP-GQDs

9.2 The optimization conditions of D-pro and D-ala determination by using MIP-GQDs as a fluorescence probe by using the fluorescence spectrometer.

- concentration of MIP-GQDs, Reaction time, pH study, working range, and linearity range

9.3 The optimization condition of D-pro and D-ala determination using MIP-GQDs as a fluorescence probe in a portable tube using the portable fluorometer.

9.3.1 concentration of MIP-GQDs

9.3.2 Reaction time, pH study

9.4 Analytical performance study of the proposed device

9.4.1Working/linearity range

9.4.2 Selectivity and stability study

9.4.3 Inter-Intra batch precision study

9.5 Real samples application and recovery study (accuracy test reported in % recovery)

9.6 Method validation

๑๐. ขอบเขตของการวิจัย (Scope of the study)

The development of selective fluorescence sensing for gastric cancer detection: quantifying D-Proline and D-Alanine in Saliva using molecularly imprinted polymer linked with graphene quantum dots (MIP-GQDs). This work allows two primary steps: initially, synthesizing and characterizing MIP-GQDs as a fluorescent probe for quantifying D-proline and D-alanine; subsequently, optimizing and downsizing the detection system through integration with the newly designed fluorometer and its application to real saliva samples for screening a gastric cancer.

๑๑. ผลผลิต (Output) ผลลัพธ์ (Outcome) และ ผลกระทบ (Impact) ที่คาดว่าจะได้จากการวิจัย

Output: To obtain a D-proline and D-alanine sensor in saliva using a developed MIP-GQDs probe for screening a gastric cancer

Outcome: The research results generated through this research proposal will be communicated using publications in world-standard journals.

Impact: The sensor we have developed has the potential to serve as an alternative detection platform for various other intriguing target analytes.

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