โครงร่างเพื่อขอการสนับสนุนงบประมาณส่งเสริมการจัด Virtual Visiting Professor

ภายใต้โครงการพลิกโฉมมหาวิทยาลัย (Reinventing University Project) ประจำปีงบประมาณ 2564

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ข้อมูลของอาจารย์ผู้ประสานงาน

ดร. อิทธิพล จีระพันธ์

สาขาวิทยาศาสตร์กายภาพ คณะวิทยาศาสตร์ มหาวิทยาลัยสงขลานครินทร์ วิทยาเขตหาดใหญ่

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ข้อมูลของอาจารย์ชาวต่างชาติ (Information of the visiting professor)

Jian Zhen Ou

Associate Professor, Director of Advanced Electronics and Sensors, School of Engineering, RMIT University, Australia

Adjunct Professor, Director of Joint Laboratory of Nanoscale Functional Materials and Sensing, School of Materials Science and Engineering, Southwest Jiaotong University, China

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Brief Biosketch of Prof. Jian Zhen Ou

Prof. Jian Zhen Ou is the director of Advanced Electronics and Sensors, School of Engineering, RMIT University, Australia and the director of Joint Laboratory of Nanoscale Functional Materials and Sensing, School of Materials Science and Engineering, Southwest Jiaotong University, China. His research interests include two-dimensional materials, chemical and biological sensing, nanoscale electronics, and artificial intelligence-driven sensors. He has over 130 peer-reviewed publications in top journals including *Nature Materials*, *Nature Communications*, *Advanced Materials*, *Nano Today*, *ACS Nano, Nano Letters,* and *Advanced Functional Materials*, with more than 11,000 citations and an h-index of 54. He was the recipient of several prestigious awards, including *Victoria Fellow* (2017), *Malcolm Moore Industry Award by RMIT* (2017), *Discovery ECR Award by Australian Research Council* (2016),

Research Award of Excellence-ECR (Technology) by RMIT (2016), and *Europe AMA Innovation Award Finalist by Association of Sensors + Measurement* (2016). He was also selected as the top emerging leader in Engineering and Computer Science by *The Australian Research Magazine* in both 2018 and 2019. Prof. Ou is currently holding four international patents on "Human Gas Sensing Capsule" and has been the scientific advisor for RMIT's spin-off company Atmo Biosciences Ltd since 2019.

The full Curriculum Vitae (CV) and lists of publications of Prof. Jian Zhen Ou are enclosed.

Expertise Areas:

Chemical sensors, biological sensors, low-dimensional materials, catalysts, and machine learning-assisted sensors

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<u>ประวัติการวิจัยร่วมกันระหว่างอาจารย์ในต่างประเทศและกลุ่มวิจัยในไทย (Background of the Joint Research Collaboration)</u>

มีงานวิจัยที่มีส่วนสัมพันธ์กัน และมีโอกาสเสริมสร้างและกระชับความร่วมมือระหว่างมหาวิทยาลัยสงขลานครินทร์และมหาวิทยาลัย RMIT University ประเทศออสเตรเลียและมหาวิทยาลัย Southwest Jiaotong University ประเทศจีน ทั้งนี้ เคยมีงานตีพิมพ์ร่วมกัน คือ Y. Cheng, B. Ren, K. Xu, **<u>I. Jeerapan</u>**, H. Chen, Z. Li, J. **<u>Z. Ou</u>** "Recent progress in intrinsic and stimulated room-temperature gas sensors enabled by low-dimensional materials" ***Journal of Materials Chemistry C*** (2021) https://doi.org/10.1039/D0TC04196C. (Impact Factor = 7.393; Q1 Web of Science)

<u>แผนการดำเนินงาน (Plans of Activities)</u>

<u>รวม 4 ชั่วโมง</u>

1. การประชุมหารืองานวิจัยร่วม (Research Group Meeting)

1.1. เนื้อหาหลัก (Topics)

Gas sensors and miniaturized electronics: sensor and energy device applications

1.2. วันและเวลา (Date and Time)

We plan to organize a meeting in November – December 2021. We expect the meeting on November 30, 2021. The meeting will be held for at least 3 hours.

Group Meeting Schedule

#Hour	**Literature Talks/Activites**
0:00-0:30	Dr. Itthipon Jeerapan and team
0:30-1:00	Dr. Jian Zhen Ou
1:00-2:00	Thought Provoking Questions
2:00-3:00	Solutions/Collaboration Plans

1.3. ผู้เข้าร่วม (Expected Participants)

1.3.1. ดร. อิทธิพล จีระพันธ์ และทีมวิจัย

1.3.2.ทีมวิจัยของ Prof. Jian Zhen Ou ในมหาวิทยาลัย RMIT University ประเทศออสเตรเลียและมหาวิทยาลัย Southwest Jiaotong University ประเทศจีน

Prof. Baiyu Ren (Southwest Jiaotong)

Prof. Zhong Li (Southwest Jiaotong)

Dr. Guanyu Chen (Southwest Jiaotong)

Dr. Bao Yue Zhang (RMIT)

Dr. Kai Xu (RMIT)

1.4. สถานที่จัด (Location)

Online/TBD

1.5. ผลลัพธ์ที่คาดหวัง (Expected Outputs)

We expect to have 2 joint journal publications resulted from the collaboration. It is not only strengthening the collaboration with RMIT University, Australia, it also opens opportunities to collaborate with School of Materials Science and Engineering, Southwest Jiaotong University, China. This will be beneficial for our PSU.

2. การบรรยายพิเศษ (A Special Lecture)

2.1. ชื่อวิชาและข้อมูลวิชา (Subject)

324-472 ENVIRONMENTAL CHEMISTRY

การวิเคราะห์แก๊สเชิงปริมาณและคุณภาพ การประยุกต์ใช้ความรู้ทางเคมีเพื่อช่วยควบคุมปัญหาเชิงสิ่งแวดล้อม (Applications of knowledge in chemistry to environmental problems, control, and prevention)

2.2. เนื้อหาหลัก (Topics)

New generation of gas sensors

2.3. เนื้อหาย่อ (Abstract)

Modern sensor technology has become the basic enabling technology in all aspects of society-from the realization of complex automated production lines to simple touch-sensitive buttons in daily life. Gas sensors are a key member of the sensor family, and their application in detecting gaseous species is of great significance for assessing human health, ensuring public safety and the critical concern about air-quality monitoring, and monitoring industrial and food production processes. Moreover, with respect to air quality indoor and outdoor, incidence rate of health problems which is often triggered by poor air quality, is growing significantly. Two-dimensional materials have attracted rapid attention in the last decade due to their unique electronic and optical properties including tunable electronic band structure, intercalatable van der Waal's gap, and engineerable exposed crystal facets. However, their gas sensing properties have been less studied and most of them are either low in selectivity or have extremely slow recovery kinetics, resulting in not being practical for industry use. Here, we explore novel candidates in the 2D material category, particularly post-transition metal chalcogenides and transition metal oxides. Their large surface adsorption energy towards paramagnetic gas molecules and large perturbation of electronic band structure upon surface gas adsorption results in the impressive gas response with extra-high sensitivity, great selectivity, and fast recovery kinetics. Furthermore, we have integrated the developed gas sensor into a non-invasive, indigestible capsule platform which for the first time enables real-time and accurate gas profiling along the human gastrointestinal tract. This novel medical tool accompanied the advanced sensor technologies has successfully passed the Phase 1 Human clinical trials and is undergoing the commercialization process.

คำสำคัญ (Keywords): Chemical sensors, low-dimensional systems, human health, pollutant gas monitoring

2.4. วันและเวลา (Date and Time)

We plan to organize a class (special lecture) in December 2021 - January, 2022. The special lecture will be 1 hour.

2.5. ผู้เข้าร่วม (Expected Participants)

2.5.1.Students in PSU, particularly in 324-472 ENVIRONMENTAL CHEMISTRY.

2.5.2.Members of Center of Excellence for Trace Analysis and Biosensor, Thailand

2.5.3.Broad audience

2.6. สถานที่จัด (Location)

Online/TBD

2.7. ผลลัพธ์ที่คาดหวัง (Expected Outputs)

In term of the class, this lecture has 4 specific aims:

2.7.1.To introduce students and participants to the range of research methods, analytical approaches, and surface chemistry modeling

2.7.2.To deepen students' and participants' understanding of principles of surface chemistry of nanomaterials, gas sensing mechanism, and low-dimensional systems

2.7.3.To help students and participants learn how to develop good questions and choose methods to tackle research challenges.

2.7.4.To encourage the development of critical thinking, experimental observation, and literature review skills.