

# SCHOOL OF ENERGY AND ENVIRONMENT NEWSLETTER

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## Dean's Message

By the time you are reading this September issue, I hope that the pandemic has slowed down. In this issue, I am glad to update you on the latest developments at the School of Energy and Environment (SEE), which include administrative, research and academic developments, as well as student achievements.

I take great pleasure in sharing with you that Prof. Wen-Xiong Wang has been appointed Associate Dean (Research and Graduate Studies), and that Dr Patrick Lee will continue to serve as Associate Dean (Undergraduate Studies). I am grateful to Dr Walid Daoud for his contribution to the School over the past years as Associate Dean (Research and Graduate Studies). I would also like to congratulate Dr Alicia An and Dr Chunhua Liu, who have recently been promoted to Associate Professor.

While I am much encouraged by these pieces of good news, it is with mixed feelings that I bid farewell to Ms Estella Tong, Director of Administration. Ms Tong has overseen the administrative office and provided the School with great advice for its development. Meanwhile, please join me to welcome Ms Janet Cheung who has just joined the SEE family as the Director of Administration.

Lately, Hong Kong and the entire world have been hit hard by the COVID-19 pandemic and the response to it, making learning and teaching more challenging. However, the School has reacted promptly by delivering teaching and hosting seminars online. These series of talks have been well attended and continue to serve as an important platform for knowledge transfer.

In the new academic year, the School will continue to provide the best learning experiences for its students and to coach them to succeed. A new professional training programme, the "Industry Ready Programme", has just been launched. In collaboration with the Hong Kong Green Building Council and the Building Services Operation and Maintenance Executives Society (Hong Kong), training sessions and internships have been provided to students to foster practical knowledge in energy auditing, retro-commissioning and other areas related to green building and sustainability. The scope of the programme will be expanded to benefit more students in the future.

I wish all of our students a good fresh start for the new academic year ahead.

Best,



Prof. Chak K. Chan  
Dean of School of Energy and Environment  
City University of Hong Kong



## Staff Development and Promotion



**Prof. Wen-Xiong Wang**  
Associate Dean  
(Research and Graduate Studies)

As the new Associate Dean (Research and Graduate Studies) of the SEE, I would like to promote a few agenda items that pertain mainly to facilitating our faculty members (many of whom are junior faculty members) to conduct cutting-edge research at an international level.

The SEE is in a unique position to conduct both fundamental and applied research, and much of this research is highly visible, both locally and internationally. It is fortunate that compared to

other disciplines, it is considerably easier for us to communicate our research results to society and the government. Fostering collaborations with the industrial sector, not only in Hong Kong but also in the Greater Bay area, will be one of the top priorities of the SEE. Thus, we will be more proactive in applying for different funding sources in Hong Kong and the Greater Bay area. Moreover, we will seek collaborations with different universities and institutes and promote our young faculty members to become the new 'stars' of their research fields.

Our graduate students are working at the frontiers of research. Thus, we will target the recruitment of top graduate students by seeking partnerships with our sister colleges in mainland China and elsewhere. Worldwide promotion of the advanced research conducted in the SEE is crucial to increasing our visibility.



**Dr Alicia An**  
Associate Professor

Abundant water and energy resources are crucial driving factors for fueling growth in today's socio-economic climate. Membrane based technologies have recently been positioned as practical and sustainable methods for water treatment; however, their high costs and a plethora of other factors have hindered their full-scale application in industry. Therefore, our research group has been resolute in developing emerging membrane technologies, such as membrane distillation, forward osmosis, and hybrid reverse osmosis for desalination, nutrient recovery from wastewater, and the removal of organic micropollutants to overcome current limitations.

Since joining City University six years ago, I have been teaching mainly water and wastewater treatment courses (Fundamentals of Environmental Engineering, Water & Water Resources Engineering, Wastewater Engineering & Water Quality Assessment, and Environmental Impact Assessment for Sustainable Development), whilst advising 10 PhD candidates (seven active and three graduates) among which three were selected through the Hong Kong PhD Fellowship Scheme.

Throughout, the innovative nature of our research group has continued to pioneer energy efficient membrane technologies for sustainable water and wastewater treatment. Our efforts have created positive environmental impacts on water resources in the Greater Water Bay Area, resulting in more than 10 competitive external grants (1 ECS, 2 GRF, 1 TBRS, 2 ITF, 2 ARG, Contract Research, and Consultancy), 60+ publications, and building close connections with institutions within and outside of Hong Kong.



**Dr Chunhua Liu**  
Associate Professor

Converting different sources of energies to electrical energy, as well as further integrating, transferring and utilizing electrical energy is the fundamental of industrialization.

My research aims to provide smart energy technologies to better human life. In particular, my research interests include electric machines and drives, electric vehicles and aircrafts, electric robotics and ships, renewables and microgrids, power electronics and wireless power transfer. Currently, based on my research work in electrical and electronic engineering, I mainly focus on transportation electrification and electric propulsion systems. In recent five years, I have obtained over 10 external and over 10 internal grants with total around HKD12M. These grants are from RGC, NSFC, ITC, ECF, STIC (Shenzhen), HKPC, CityU, etc. Based on these funded projects, I have published

over 200 referred papers, which can be found by at Google Scholar.

My education philosophy is to inspire students to learn, understand, use and create the knowledge to solve real-world problems. In this way, the students can truly connect knowledge with practical skills, and then contribute to our society. I am teaching two undergraduate core courses on Electromagnetic Principles for Energy Engineers, and Power Plant Engineering. Also, I serve as master's programme leader to equip our postgraduate students with necessary knowledge and skills. In addition, I am now supervising eight PhD students who will contribute to our society in electrical energy and power technologies after graduation.

Apart from the above, I am serving as Associate Editor of IEEE Transaction on Industrial Electronics, Editor of IEEE Transactions on Vehicular Technology, Editor of IEEE Transactions on Energy Conversion, Editor of Energies, Subject Editor of IET – Renewable Power Generation, Subject Editor of Cambridge University – Wireless Power Transfer, respectively.

## Research Success

### 2020/21 GRF Application Result

Faculty members at the SEE strive for research excellence and have succeeded in the recent General Research Fund application exercise.



Project Title  
**Aqueous Multiphase Chemistry of Organic Aerosols in Humid Urban Environments**

Principal Investigator  
***Dr Theodora Nah***



Project Title  
**Mass Transport, Electron Transfer and Coupling of Multi-electron Electrolyte in Aqueous Flow Battery for High Energy and Power Densities**

Principal Investigator  
***Dr Walid Daoud***



Project Title  
**Bioimaging of Trophic and Maternal Transfer of Silver Nanoparticles in Aquatic Organisms**

Principal Investigator  
***Prof. Wen-Xiong Wang***



Project Title  
**Microchannel Membrane-based Absorbers using Surfactant-modified Ionic Liquids for Heat/Mass Transfer Enhancement towards Compact and Crystallisation-free Absorption Heat Pumps**

Principal Investigator  
***Dr Wei Wu***



Project Title  
**Decadal Variation in the Impact of the NAO and Ural Blocking on Subseasonal Variation of the East Asian Winter Monsoon**

Principal Investigator  
***Prof. Wen Zhou***



Project Title  
**Microstructural Control of Nano-porous Metal/Metalloid for Battery Applications**

Principal Investigator  
***Dr Denis Yu***



Project Title  
**Development of Nanostructured Photoelectrodes for Solar Water Splitting via Advanced Electrochemical-based Synthesis Techniques**

Principal Investigator  
***Dr Yun Hau Ng***



Project Title  
**Rational Design of MoS<sub>2</sub> Electrocatalyst for pH-Universal Hydrogen Evolution: Mechanisms, Kinetics and Optimisation**

Principal Investigator  
***Prof. Michael Leung***



### Prof. Wen-Xiong Wang received over HK\$3M funding from TUYF Charitable Trust

Prof. Wen-Xiong Wang secured more than HK\$3M in funding from the TUYF Charitable Trust for the project “Life-History Characteristics and Population Dynamics of the Four-Fingered Threadfin Fish”.

### BBC reported Dr Carol Lin's research on recycling fabrics made from cotton and polyester blends through fungal cultivation



Fast fashion is leading to a mountain of clothing being thrown away, which has a huge impact on the environment. The fashion industry is responsible for 10% of global greenhouse gas emissions. Fibre-recycling technologies are vital for tackling this problem. Dr Carol Lin led a research group to develop a fungal-cultivation-based biological method for recycling fabrics made from cotton and polyester blends. The fungus *Aspergillus niger* produces enzymes that can break down cotton into glucose, which then can be turned into sugar syrup. The remaining pure polyester fibres can be reused to make clothing items. Dr Lin and her team are working on the upscaling and implementation of this method by using industrially produced cellulase enzymes. With collaborative effort with Dr. Shauhrat Chopra's research team in the SEE, they examined the environmental impact of this biological process for recycling textile waste.

#### Read more:

<https://www.bbc.com/future/article/20200710-why-clothes-are-so-hard-to-recycle>

<https://www.sciencedirect.com/science/article/pii/S0921344920303062>

#### Reference:

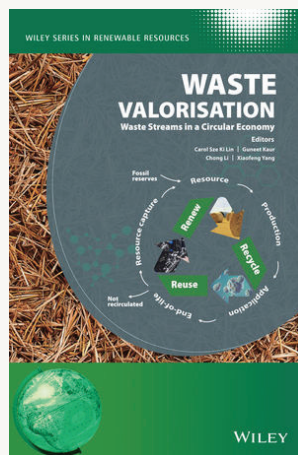
Subramanian, K., Chopra, S.S., Cakin, E., Li, X., Lin, C.S.K. 2020. Environmental life cycle assessment of textile bio-recycling – valorizing cotton-polyester textile waste to pet fiber and glucose syrup. *Resources, Conservation and Recycling*, 161, 104989.

### Dr Alicia An's paper listed as one of the most cited articles in the Journal of Membrane Science

Dr Alicia An's paper “PDMS/PVDF Hybrid Electrospun Membrane with Superhydrophobic Property and Drop Impact Dynamics for Dyeing Wastewater Treatment Using Membrane Distillation” was listed as one of the most cited articles in the Journal of

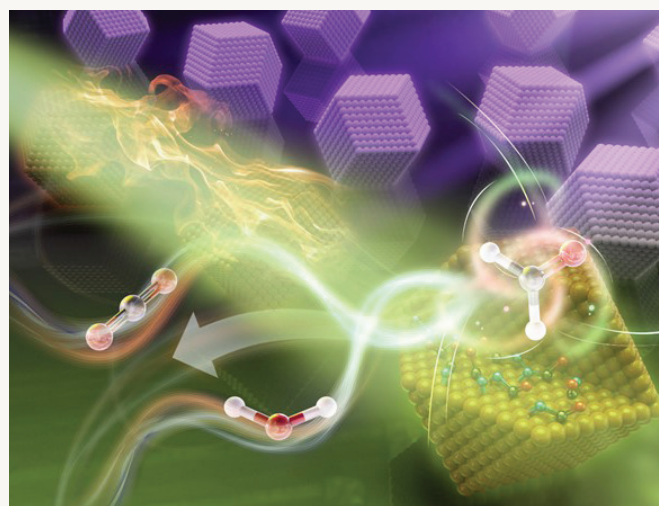
Membrane Science (a top journal in the field of membrane science).

### Dr Carol Lin published a new book entitled “Waste Valorisation: Rethinking Waste Streams in a Circular Economy” in the Wiley Series in Renewable Resources



Dr Carol Lin and alumni of her research team recently published a book entitled “Waste Valorisation: Rethinking Waste streams in a Circular Economy” in the Wiley Series on Renewable Resources. This book provides an overview of waste valorisation strategies under the circular economy concept with a detailed presentation of valorisation schemes for various types of waste streams. Sections on sustainability analysis, circular economy development and future trends are also included.

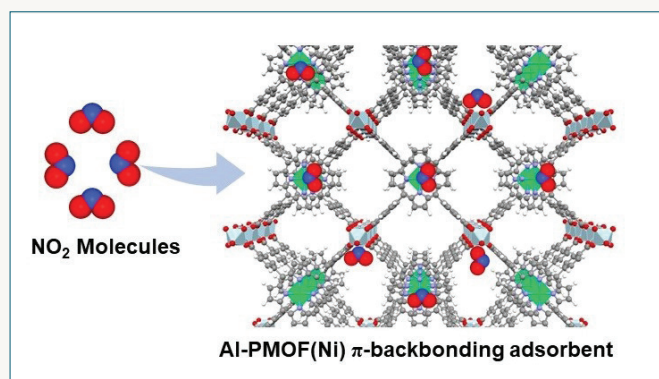
### Dr Jin Shang's article published in Chemical Science



Harvesting sunlight to address energy and environmental problems has been a fascinating and long-standing challenge in the context of building a sustainable society. An example of this is photocatalytic degradation of air pollutants for the maintenance of clean indoor environments. The key to an efficient and effective photocatalytic process is the design and development of good photocatalysts, and this is a highly active area of research. Dr Jin Shang has contributed substantially to this area, and some of his recent results were published in *Chemical Science*, a flagship journal of the Royal Society of Chemistry, and also highlighted on the back cover of the journal. In an Edge Article entitled “Isocyanate Group-Functionalized

Zeolitic Imidazolate Framework-8 (ZIF-8) for Visible Light Photocatalytic Degradation of Gaseous Formaldehyde”, Dr Shang described his facile thermal-treatment strategy to convert one of the most well-known porous metal-organic frameworks, ZIF-8, into a visible-light-driven photocatalyst with excellent formaldehyde-degradation performance. This strategy could unleash the potential for the design and development of metal-organic framework (MOF)-based photocatalysts with sufficiently broad-spectrum responses to enable efficient air purification. Although many porous MOFs have been synthesised by chemists over the past 30 years, Dr Shang’s work may unlock a new toolbox for scientists and engineers to explore and develop next-generation photocatalysts.

#### Dr Jin Shang’s paper published in *Angewandte Chemie International Edition*

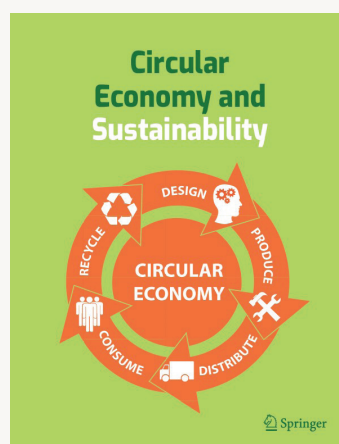


Nitrogen dioxide ( $\text{NO}_2$ ) pollution causes serious environmental problems and poses substantial health threats to humans.  $\text{NO}_2$  leads to the formation of photochemical smog and acid rain, which contribute to human disease. Various  $\text{NO}_2$  emission sources, such as exhaust from vehicles and flue gases from the burning of fossil fuels, release  $\text{NO}_2$  into the atmosphere. Although state-of-the-art selective catalytic reduction technologies are widely used in industry for high-temperature  $\text{NO}_2$  conversion (250–600 °C), the control and abatement of ambient  $\text{NO}_2$  emissions remains an elusive challenge. Dr Jin Shang has collaborated with researchers from the Australian Synchrotron, Jilin University and the Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences, to develop an efficient technology for ambient  $\text{NO}_2$  removal based on the selective adsorption on porous materials. Their research was published in *Angewandte Chemie International Edition*, a top general chemistry journal (<https://doi.org/10.1002/anie.202007054>), and is outlined below.

“In this study, we attempt to address the challenge of ambient  $\text{NO}_2$  removal by developing  $\pi$ -backbonding adsorbents for incorporation into porphyrin metal-organic frameworks (PMOFs). Our idea originated from nature—the ferroporphyrin in a natural molecule, haemoglobin, shows a strong affinity toward  $\pi$ -bonded molecules, such as oxygen and carbon monoxide, via a unique  $\pi$ -backbonding interaction. This

$\pi$ -backbonding can be formed and tuned between transition metals and  $\pi$ -bonded molecules to realise selective binding, which enables selective adsorption of gases. In other words,  $\pi$ -backbonding allows for gas purification by selectively removing a certain gas component from a stream of mixed gases, such as removing  $\text{NO}_2$  from air. Because  $\text{NO}_2$  is a  $\pi$ -bonded molecule, we designed PMOFs with high densities of transition metal sites to selectively bind  $\text{NO}_2$  and thus remove it from air. We achieved appreciable  $\text{NO}_2$  capacity and good regenerability. Our work affords new insights into the design of next-generation adsorbents for ambient  $\text{NO}_2$  removal, and showcases PMOFs as a platform to tailor  $\pi$ -backbonding adsorbents for various gas-separation applications pertaining to energy production and environmental remediation.”

#### Dr Liang Dong appointed as an editorial board member (Associate Editor) for the new Springer Nature journal, *Circular Economy and Sustainability*



Springer Nature has recently begun publishing a new journal called “Circular Economy and Sustainability”, and Dr Liang Dong has been appointed as an editorial board member (Associate Editor). This journal aims to take a new approach towards addressing the key concepts of circular economy and sustainability by combining the scientific

disciplines of economics, management, engineering, technology, environment and society. The editorial team includes world-famous scholars from these aforementioned fields.

#### Dr Liang Dong presented with the Excellent Session Chair Award in ICWMT15





As one of the largest international conferences in the field of waste management, the 15th International Conference on Waste Management and Technology (ICWMT15) was organised by the United Nations Environment Program, the Basel Convention Regional Center for Asia and Pacific and Tsinghua University, and held between 28 and 30 June 2020. The theme of the conference this year was the worldwide promotion of zero-waste cities. Due to the ongoing COVID-19 pandemic, the conference was organised online, and attended by more than 4500 participants. Dr Dong organised a session as part of the ICWMT15, entitled “Eco-industrial development Support Zero-Waste Cities: A Global Perspective”, in which invited scholars from China, Japan and South Korea to shared progress in this field. This session attracted more than 2800 participants and was won the “Excellent Session Award”.

**Dr Lin Zhang invited by IAEE to deliver a webinar on “Moving Green: Opportunities and Challenges of China’s Recovery Plan”**



Dr Lin Zhang was invited by the International Association for Energy Economics (IAEE) to deliver a webinar on “Moving Green: Opportunities and Challenges of China’s Recovery Plan” in July 2020.

After the restrictive lockdown and quarantine policies to contain the COVID-19 pandemic over the past few months, China has begun to re-start its economy with government aids. This talk provided an overview of the direct economic impact and the associated indirect environmental impacts of COVID-19, in addition to highlighting the challenges it may present in the fight against climate change, in the context of China’s current recovery plan.

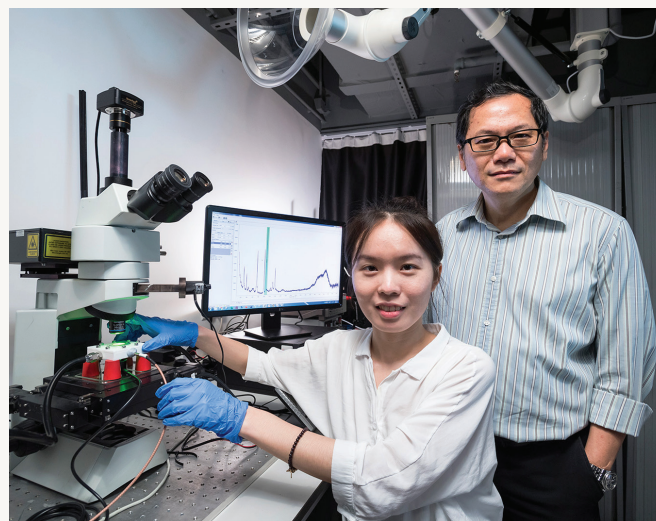
**Dr Shauhrat Chopra invited to share opinion on Sustainable Consumption and Production in One Earth journal**

Dr Shauhrat Chopra was invited by One Earth to share his opinion as one of the voices in an article on “Aligning Purchasing



Power with Sustainable Production and Consumption”. His short passage entitled “Credible ESG Data Disclosures” featured in the July issue, and highlights the need to establish Environmental, Social and Governance (ESG) data-acquisition tools to prevent ESG from becoming just another futile “green finance” initiative. ESG integration with stock exchanges and companies is necessary for achieving SDG12.6, but a lack of consistency and transparency in the data-collection procedures for ESG disclosures makes them vulnerable to greenwashing.

**Prof. Chak Chan received a Best Paper Award from Environmental Science & Technology Letters**



Prof. Chak K. Chan, Dean of the SEE and Chair Professor of Atmospheric Environment, Dr Gen Masao, Postdoctoral Fellow at the SEE (currently Assistant Professor at Kanazawa University, Japan) and Zhang Ruifeng, PhD student at the SEE, proposed a new pathway for sulfate formation through the photolysis of particulate nitrate. The research was published in the prestigious journal Environmental Science & Technology Letters and was recognised as one of the journal’s five Best Papers in 2019, and was the only such paper in the atmospheric pollution research area.

## Academic Development



## Industry-Ready Programme



With generous support from the Hong Kong Green Building Council Limited (HKGBC) and the Building Services Operation and Maintenance Executives Society (BSOME), the SEE launched the “Industry Ready Programme” this summer to help senior-year undergraduate students to better equip themselves for employment.

To kick off the brand new “Industry Ready Programme”, two training sessions on “Retro-Commissioning (RCx) Training for Undergraduate Engineering” were organised in June 2020.

Upon completion of the training course, 8-week internship opportunities were offered to outstanding students. Many of the students were then accepted as summer interns by the Chinese YMCA of Hong Kong, Energen Consulting Limited, Hong Yip Service Co. Ltd., JLL and The Great Eagle Properties Management Company Limited.

The SEE strives to provide out-of-classroom learning experiences for our undergraduate students and plans to enhance the programme in the future by adding new elements.

## Summer Internship

In Summer 2020, despite the pandemic, more than 30 SEE undergraduates were offered summer internships in fields related to energy and environmental engineering. We are sincerely grateful for the tremendous support that has been provided by our internship partners, including but not limited to the following organisations:

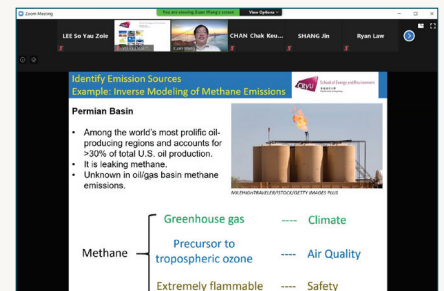
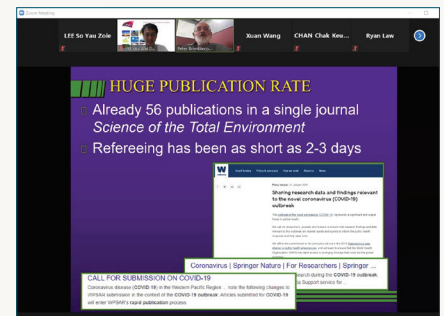
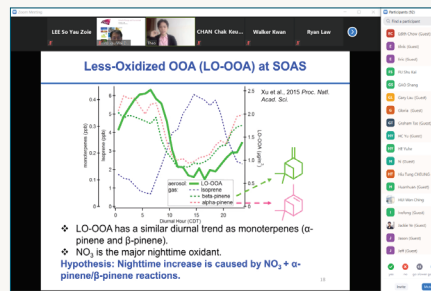
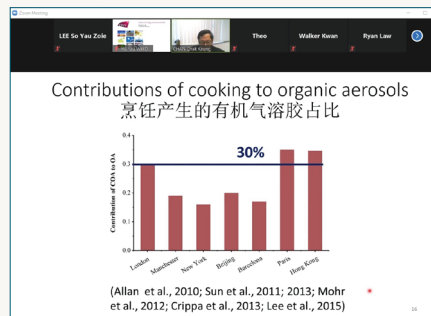
- Alaya Consulting Limited
- ARUP
- Associated Engineers, Limited
- Business Environment Council Limited
- Cathay Pacific Airways
- Chinese YMCA of Hong Kong
- CLP Power Hong Kong Limited
- Dunwell Petro-Chemical Co. Ltd
- Energen Consulting Limited
- Epro Advance Technology Ltd
- GAFTI
- Harbour City Estates Limited
- Hong Kong Green Building Council Limited
- Hong Yip Service Co. Ltd.
- JLL
- The Great Eagle Properties Management Company Limited
- Link REIT
- NWS Holdings Limited
- REC Engineering Company Limited
- Region Fine (HK) Ltd.
- Telex Environmental and Energy Management Limited
- Wecon Limited



## School Events

### SEE Tech Talk on Air Pollution and Society

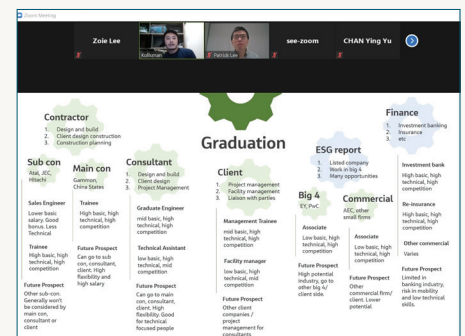
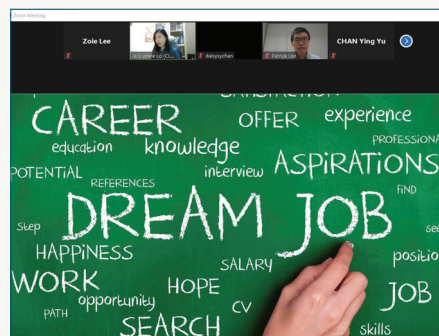
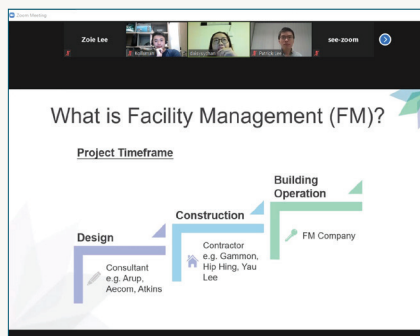
Prof. Peter Bimblecombe, Prof. Chak K. Chan, Dr Theodora Nah and Dr Xuan Wang hosted the SEE Tech Talk on Air Pollution and Society in May 2020, to share their expertise and views on the topic with the industry audience. Approximately 100 people participated in this online Tech Talk to learn more about “Bus Stops, Walkways and Parks as Polluted Microenvironments in Hong Kong”, “Contribution of Cooking Emissions to Ambient Particulate Matter”, “The Essential Role of Fundamental Laboratory Studies in Solving Today’s Air Pollution Issues” and “Atmospheric Chemistry Modelling: Objectives, Types, and Applications”.



### SEE Sharing Session on Job Hunting Skills

Mr Kollsman Chan (2016 Graduate/Sustainability Engineer, Jacobs), Ms Daisy Chan (2017 Graduate/Technical Services Engineer, The Hong Kong Jockey Club) and Ms Jacqueline Lo

(Career Employability Consultant, Career and Leadership Centre, Student Development Services, CityU) spent an evening online in August with our undergraduate students and new graduates, to share hints and insights related to job hunting.



### SEE Colloquium on Retro-Commissioning for Green and WELL Building

In June 2020, the SEE invited Mr Andrew Lau, Asia-Pacific Lead for Retro-Commissioning, JLL, as the guest speaker in the Colloquium. Mr Lau shared his extensive experience in energy

efficiency projects, energy-performance contracting, building automation and passive fire-protection with our students and staff. With more than 15 years of experience in energy and sustainability engineering, Mr Lau has delivered a range of diverse projects, including equipment upgrades, plant control optimisation and renewable energy.





## Student Achievements

### SEE Outstanding Final-Year Project Awards

The following students have been chosen as the recipients of the first Outstanding Final Year Project Awards of the year.

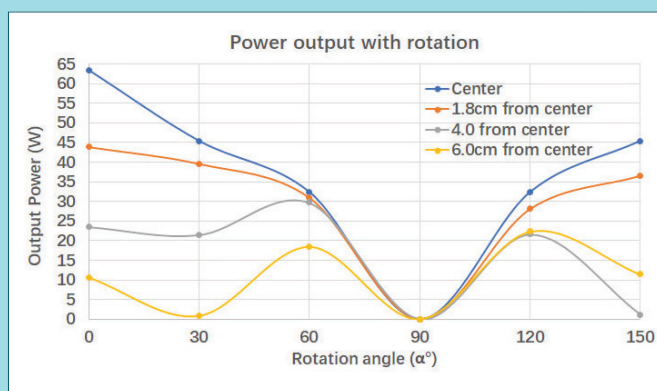
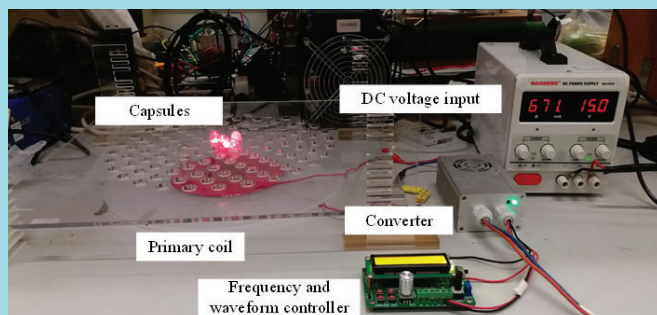
Award	Student	Project Title	Project Supervisor
Winner	Zhou Yujing	Design of Wireless Charging System for Energy Harvest of Implanted Biomedical Devices	Dr Chunhua Liu
First runner-up	Wan Ho Ching	Synthesis of Vanadium-based Materials with Micro/nano Structures as High-Performance Cathode Materials for Aqueous Zinc-ion Batteries	Prof. Michael Leung
Second runner-up	Xiong Jinlai	Scale Inhibition by Nanobubble Method for Membrane Distillation Process	Dr Alicia An

These awards were given to the students who demonstrated exceptional performance in their final-year projects in terms of (i) technical merit; (ii) originality, creativity and innovation, and (iii) potential for application in energy, environment or sustainability. Eight nominations were received and reviewed by the selection and judging panel, which comprised Prof. Johnny Chan (Panel Chair), Prof. Chak Chan and Ir Dr Cary Chan, JP. The panel appreciated the high-quality work produced by all of the nominated students.

## Awarded Projects

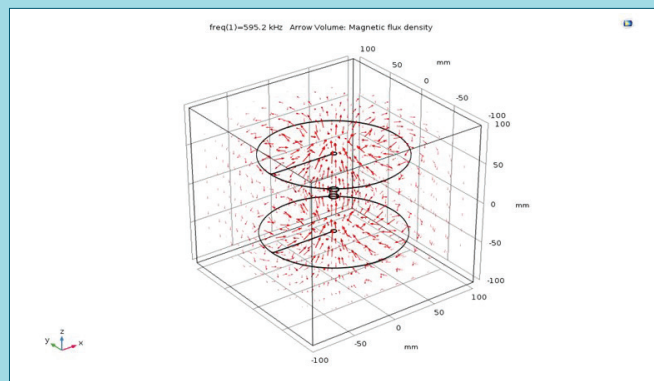
### Design of Wireless Charging System for Energy Harvest of Implanted Biomedical Devices

by Zhou Yujing, Winner



According to the Sustainable Development Goals released by the United Nations, it remains difficult for humans to secure good health and well-being. Inspired by the development of communication technologies and digitalisation processes, I believe that the current healthcare systems need to be upgraded to monitor the inner condition of our bodies in real time. Given my previous experience in wireless power transfer, I decided to realise a feasible implantable healthcare system that includes multiple biomedical devices. Since then, I have worked towards equipping traditional implants with wireless charging to achieve tremendously different functions.

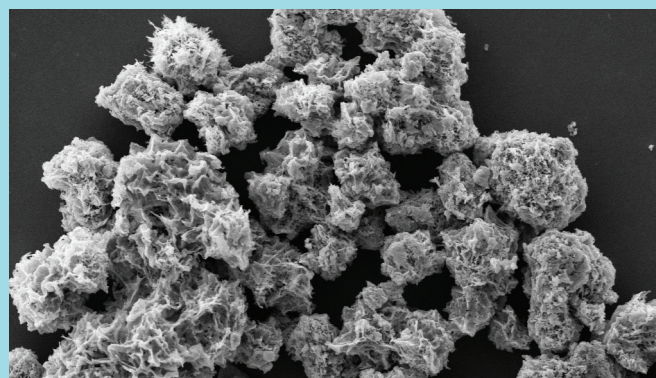
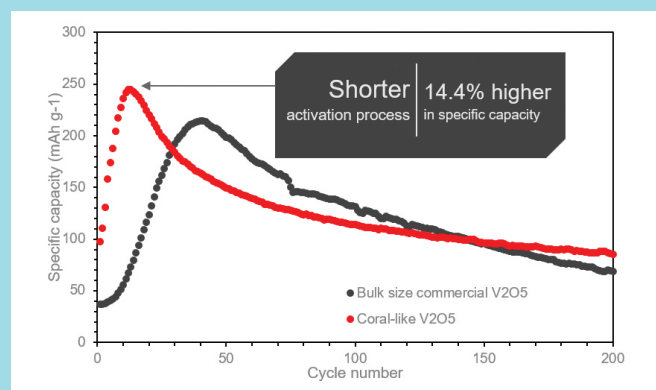
The literature review on this area was actually the most interesting task I have undertaken this year. I found that integrating new techniques with existing devices is possible, regardless of how mature these devices are. For example, although cochlear implants have been commercially available for many years, the advantages of adding wireless charging to these devices will outweigh any potential negative impacts. It is also attractive that similar improvements or prospective developmental directions related to technology in one field can be duplicated in another field. For example, the energy encryption technology used in electrical vehicles can be adapted for the implementation of wireless technology in implants. I thus summarised the major research outcomes related to the use of wireless technology in implants over the past 10 years in the form of a review that was published in *Energies*. This comprehensive review greatly assisted my subsequent experimental work, and I was able to easily develop possible circuit designs, coil outlooks and coil arrangements. Consequently, a feasible wireless-charging



system was established, and possible mitigations of some load variations were identified for future studies. This one-year final-year project has enabled me to cultivate a broad range of capabilities, from summarising published papers to applying what I learned to real product development.

### Synthesis of Vanadium-Based Materials with Micro/Nano Structures as High-Performance Cathode Materials for Aqueous Zinc-Ion Batteries

by Wan Ho Ching, First Runner-Up



Due to the growing use of renewable energy and decentralised power generation, energy storage has become a crucial element for maintaining the resilience and efficiency of our power infrastructure. Among various electrochemical storage technologies, aqueous zinc-ion batteries (AZIBs) constitute an appealing candidate for grid-storage applications, because zinc metal is abundant, they can be fabricated at low cost, and the aqueous electrolyte they contain is environmentally benign and safe.

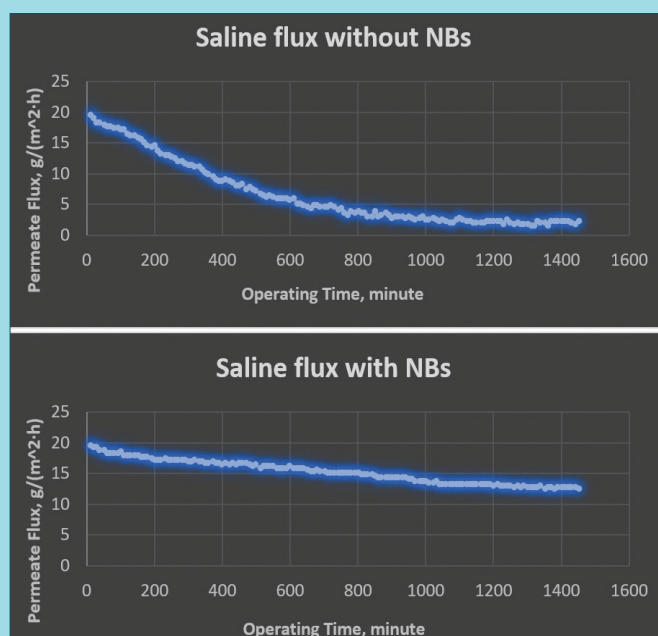


However, some challenges remain that impede the use of AZIBs in practical applications, one of which is the lack of suitable cathode materials. To tackle this challenge, in my FYP research I developed coral-like vanadium pentoxide (V<sub>2</sub>O<sub>5</sub>) as a high-performance cathode material for AZIBs. The unique micro/nano structure of coral-like V<sub>2</sub>O<sub>5</sub> has been proven to shorten activation processes and enhance specific capacity (245 mAh g<sup>-1</sup> at 100 mA g<sup>-1</sup>) compared to that of conventional bulk-sized V<sub>2</sub>O<sub>5</sub> (14.4% higher). In addition, the synthesis of the coral-like V<sub>2</sub>O<sub>5</sub> was achieved via fast and facile fabrication process. Notably, the 30-min hydrothermal treatment of this method meant that it consumed much less energy than other methods, which typically last 6–24 h. These attractive characteristics of coral-like V<sub>2</sub>O<sub>5</sub> cathodes have paved the way for the development of high-performance AZIBs that are commercially viable for use in grid-storage applications.

I am honoured that my project was recognised by the School and was given this prestigious award, and I take this opportunity to thank Prof. Michael Leung and Dr Bin Wang for providing valuable insights throughout the project, as well as Dr Denis Yu and Dr Helen Lu (THEi) for sharing their laboratory equipment and technical support. This project would not have been successful without their help and guidance!

### Inhibition of Scale Formation by Nanobubble Method for Membrane Distillation Process

by Xiong Jinlai, Second Runner-Up



In response to the rising freshwater scarcity, the seawater-desalination industry has been growing rapidly. In the most widely used desalination methods, scale formation can severely affect overall plant performance. This is particularly a problem in plants using membrane-based technologies, in which scales can be formed easily, resulting in substantial degradation of membrane permeability. It was found that super-tiny air bubbles, such as microbubbles and nanobubbles, possess

excellent scale-perturbing properties because of their extremely small size. Therefore, super-tiny air bubbles were introduced into the feed solution in a membrane-based desalination process to determine whether they can help to reduce scale formation. We targeted the generation of nanobubbles for this study.

To this end, our team set up a laboratory-scale membrane distillation (MD) process. We first proved that nanobubbles did not affect the MD process. Then, we set the nanobubbles as the only variable in different tests and performed every test multiple times to determine the effects of nanobubbles on scaling in MD.

After several tests, it became apparent nanobubbles greatly attenuated scale formation, such that they effectively alleviated the scaling problem. We consider that this method is effective because it can extend the operating time of MD by a significant margin. Moreover, because of its chemical-free nature, the process is more environmentally-friendly. We believe that this approach has great potential and that more interesting results will be obtained in the near future.

### Second Runner-Up in 6th Hong Kong University Student Innovation and Entrepreneurship Competition



Mr Cheung Ho Lam and Miss Lai Pui Ka, recent BEng graduates (Class of 2020) in Energy Science and Engineering, participated in a group that were the second runners-up in the 6th Hong Kong University Student Innovation and Entrepreneurship Competition (in the Entrepreneurship sector). Under the supervision of Dr Edwin Tso and Dr Shauhrat Chopra, the group proposed an innovative project called "AquaBox" to sell water at hiking trails, thereby reducing plastic waste and helping to prevent hikers from heat-stroke. This project involved harvesting water from the air by using passive radiative cooling technology, which does not consume any electricity.



CALL FOR **SUPPORT** FROM OUR **ALUMNI!**

# SUPPORT

## OUR UNDERGRADUATES!

### Background

We value both academic excellence and comprehensive development of our students. In the past few years, SEE has been promoting seven attributes among our students. We expect our graduates to be technically competent, interdisciplinary, innovative and entrepreneurial. They should be effective communicators and leaders with global vision and a belief in life-long learning. These attributes cannot be nurtured merely in classes. Students are thus encouraged to take part in major competitions, student exchanges, internships or even self-initiated projects to enrich themselves through channels other than textbooks. We believe that you, one of those successful alumni, could also play a role in encouraging your younger fellows to be better equipped for the future!

About the Scholarship

You are cordially invited to be one of the donors of the proposed award known as “**SEE Undergraduate Alumni Awards**”. The overview of the proposed award is as follows:

**Name of Award:** SEE Undergraduate Alumni Awards

**Number of Awards:** Maximum of three per academic year

**Award Value:** HK\$2,000

**Validity:** For two years from academic year 2019/20

**Eligible Students:**

Full-time undergraduate students from the School of Energy and Environment (Bachelor of Engineering in Energy Science and Engineering or Bachelor of Engineering in Environmental Science and Engineering) who

- have achieved a CGPA over 3.0 by the end of the previous academic year
- have demonstrated promising attributes, such as leadership potential and aspiration for advancement, etc.
- have been active in co-curricular and extra-curricular activities, including but not limited to student exchanges, internship programmes, volunteer work, competitions, etc.

All award recipients will have to join the SEE Alumni Association and continue to devote themselves to the development of the School.

### Be Our Donors

To be one of our donors, you simply have to complete the enclosed **CityU Alumni Giving Club Donation Form** or **Online Donation Form** (Please visit: <https://www.cityu.edu.hk/aro/apps/agc/AGCSecuredForm.aspx>).

Please choose “Others” under “Use of Gifts” on the online form, and indicate “**SEE Undergraduate Alumni Awards**”. Remember to also indicate the amount you wish to donate, giving the duration, the payment method (i.e., credit card/cheque/bank transfer) and your personal information. To maximise the use of your contribution to CityU, 10% of your gift will be allocated to support the University’s general development, including capital projects. It would be great if we could receive your gift by the end of March 2021 to fund the establishment of the award.

**Contact Us**

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