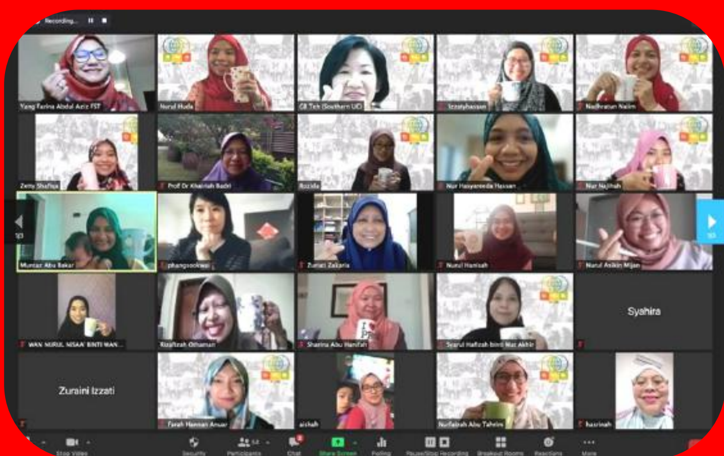


Berita IKM - Chemistry *in* Malaysia

March 2021




1st Board of Directors Meeting, 31 December 2020, Wisma IKM, Kuala Lumpur

ARTICLES

- Genetic Scissors: At the Cutting-Edge of Life
- Sound Lesson in Shaping Tomorrow
- Multi-Residue Pesticides Analysis in Vegetables using QuEChERS method by Gas Chromatography-Tandem Mass Spectrometer (GCMSMS) in comparison with liquid-liquid extraction method by Gas Chromatography-Micro Electron Capture Detector (GCμECD)
- Chemometric Approach In the Identification of Plastic Waste

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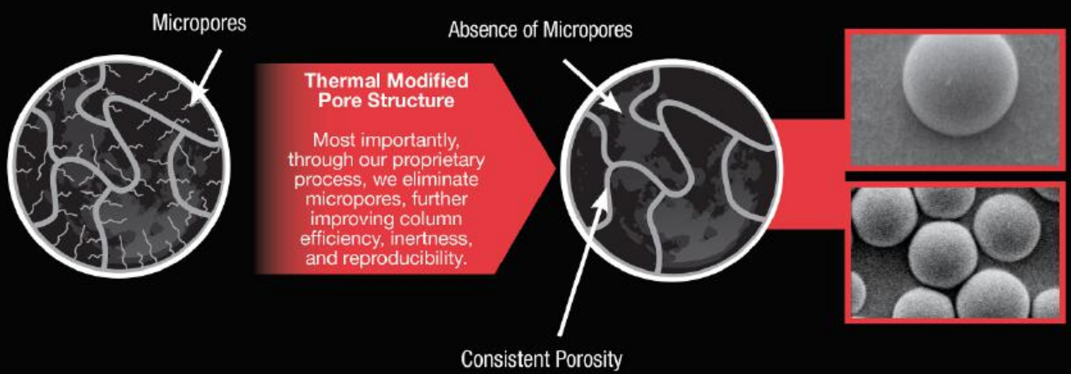

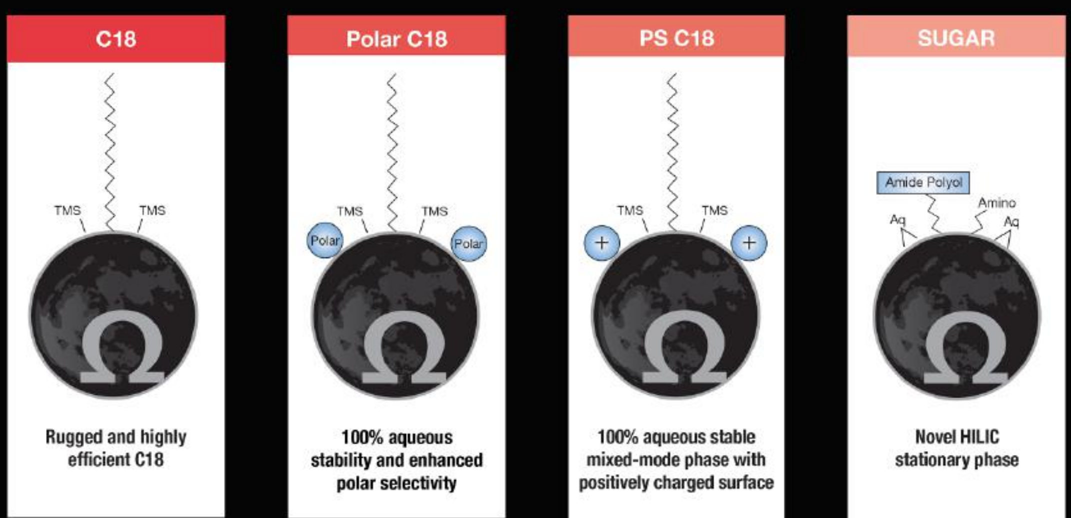

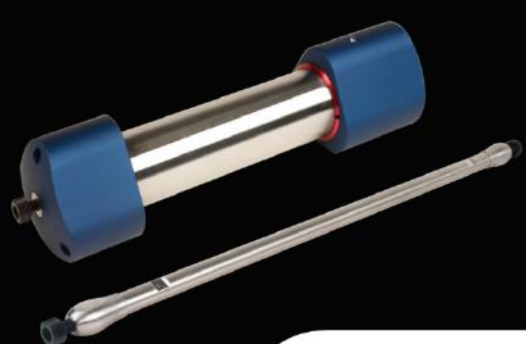

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Email: zuriatiz@gmail.com / ikmhq@ikm.org.my

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IKM 2021 – On the route to recovery

COVID-19 pandemic and vaccination
As we entered the year 2021, COVID-19 pandemic still rages on in spite of the tight control imposed by the government. In mid-February, the number of cases surged to more than 5,000 per day. Only starting March, the cases have gone down to around 1000+ per day. It is envisaged that these cases will go down further to double digits by May and finally become manageable by the end of the year. At the same time, we have received 312,390 doses of Pfizer vaccines on 21 February and started our first vaccination on our Prime Minister, YAB Tan Sri Dato' Haji Muhyiddin bin Haji Mohd Yassin, on 24 February, followed by half a million of health care professionals and frontline workers. In April, senior citizens and other high-risk groups will get their vaccination and by May, these will be extended to the whole population, except those below 18 years of age. However, vaccination does not mean that you are totally immune to the coronavirus. Strict measures under SOP are still needed for some time.

2021 – A Challenging Year for IKM
We are fortunate that, in spite of the pandemic, we are still able to carry out a number of major activities in 2020. We managed to proceed with Kuiz Kimia Kebangsaan Malaysia (K3M) 2020 with a record number of 39,068 candidates taking part. The IKM Law Hieng Ding Foundation has been incorporated under the Companies Act 2016 on 22nd October 2020 and we have the first Board Meeting on 31st December 2020. Unfortunately, our Malam Kimia 2020 has to be postponed to end of May 2021. In spite of the ongoing COVID-19 threats, we are going full steam ahead in 2021. We expect the Chemists Rules 2021 to be ready by mid-2021. The usual programmes and activities such as AGM, Refresher Course, LMIC Examination, Professional Centre programmes and K3M 2021 will go ahead. ICPAC KK and 20MICC 2021 will be held in Kota Kinabalu, Sabah, in early November 2021. LabAsia 2021 will be held from 20 – 22nd October 2021 in Kuala Lumpur Convention Centre (KLCC), Kuala Lumpur. A new event, Symposium on Best Practices and Innovations in Laboratory Management (BPI Lab) 2021 will be held in conjunction with LabAsia 2021 in KLCC.

In 2021, we are also planning for a new website that would be more interactive with our members and the general public to go online. The new website will cover all aspects of IKM functions and activities, and acts as a mean of communication between IKM and our members. On the accreditation of chemistry programmes in Malaysian universities, we expect the Joint Technical Committee (JTC) to complete its work to come up with a standard chemistry programme in the first half of 2021. Then the Malaysian Qualification Agency (MQA) under the Ministry of Higher Education can proceed with the accreditation of chemistry and chemistry-related programmes in Malaysian universities. We expect 2021 to be a challenging year. We are still not sure of the full recovery from the COVID-19 pandemic worldwide. Europe and the Americas are still very much ravaged by the pandemic, no doubt that vaccination in the USA and UK are proceeding with such a rapid phase. New coronavirus variants are popping up everywhere and we are still not sure that we have won the war against the virus. There is also a rush to open up the economy, making further complications in the recovery process. We just hope that these anti-virus vaccines are able to do their work to protect human from further infection.

Thank you and with best wishes.

Datuk ChM Dr Soon Ting Kueh
President, Institut Kimia Malaysia
Date: 15th March 2021

IKM LAW HIENG DING FOUNDATION

Historical
On 16th December 2010, I attended the Prize-Giving Ceremony of the Malaysian Toray Science Foundation (MTSF) held in Nikko Hotel (now known as Intercontinental Hotel), Kuala Lumpur. I was invited to sit next to Tan Sri Datuk Seri Law Hieng Ding who was the MTSF Chairman at that time. Tan Sri has just retired from his ministerial post as the Minister of Science, Technology and the Environment. He is one of the longest serving science ministers, having served in his ministerial post from 27th October 1990 to 26th March 2004 and as the deputy minister from 1987 to 1990.

Institut Kimia Malaysia (IKM) has been under the Ministry of Science, Technology and Innovation (MOSTI) since its incorporation under the Chemists Act 1975 on 1st November 1977. Tan Sri, as the MOSTI Minister, had been closely involved in the development of IKM until we progress to become a well-established professional scientific organisation recognized both in Malaysia and the world. Tan Sri had provided encouragement and support to make IKM the professional body in Malaysia.

At that moment at the dinner, it suddenly occurred to me that it would be good for IKM to establish a Foundation under his name to further promote the development of chemistry. So, I put forward the idea of setting up the Tan Sri Law Hieng Ding Foundation to him to recognize his contributions to the development of chemistry in Malaysia. He was pleased with the proposal and ask me how much is needed to set up the Foundation and I said we need a minimum of RM1,000,000. He replied that he is willing to contribute RM500,000 and would IKM be able to raise another RM500,000. I said that we can sure try and this sees the birth of the Tan Sri Law Hieng Ding Foundation.

After getting the approval from IKM Council, I went to prepare for the setting up of the Foundation. First is what the Foundation intends to achieve and second is the fund-raising part to raise RM500,000. The fundamental principle behind the Foundation is to further develop chemistry in Malaysia. Thus, I decided that the main objectives of the Foundation would cover the following three principal areas:

1. Popularisation of chemistry
To popularise chemistry among the Malaysia public, including public understanding and appreciation of chemistry, and recognising chemistry as a pure and applied science found in everyday life.

2. Chemistry Education
To promote and support chemistry education, both at the primary, secondary and tertiary levels, educating and training chemistry graduates and postgraduates for the job market, academia and research.

3. Advancing chemistry and profession of chemistry in Malaysia
To advance chemistry knowledge, innovation and technology for knowledge and wealth creation, sustainable economic development and to further develop the chemistry profession in Malaysia with continuous professional development.

The above three will be the main objectives of the Foundation.

The second task is to raise fund. After much discussion and planning, IKM held the Tan Sri Law Hieng Ding Foundation Fund Raising Dinner on the 11th November 2011. At this dinner, a total of RM350,000 was raised in addition to the RM500,000 from Tan Sri Law. IKM itself contribution RM50,000. The fund raising continued for a number of years and finally by 2017, IKM contributed another RM202,000 to make the Foundation exceeding RM1,000,000.

Then we began the process of registering the Foundation in 2018. Mr Surdass @ Vipin Kumar of Accosec Consultants Sdn. Bhd. (41753-K) was appointed to file for the registration of the Foundation. In compliance with the Companies Act 2016, the Foundation was renamed as **IKM Law Hieng Ding Foundation**, and in order for establishing the company as a Foundation with a Constitution, IKM applied for approval from the Minister of Domestic Trade and Consumer Affairs on 8th August 2018 and obtained his approval on 30th September 2020. On 22nd October 2020, the Foundation was registered with the Registrar of Companies under the Companies Act 2016.

by Datuk ChM Dr Soon Ting Kueh
Date: 31st December 2020

Foundation Incorporation
The IKM Law Hieng Ding Foundation is incorporated in Malaysia under the Companies Act 2016 on 22nd October 2020 [Company No. 202001034123 (1390444-A)].

Objects of the Foundation
The objects of the Foundation are:

- To promote public awareness, understanding and appreciation of chemistry and the chemistry profession. Funding for research with the aim of publication of articles in media or interviews on current issues relating to chemistry that are affecting the socio-economy of the country. Funding for prominent international or local speakers for public talks, forum, seminar on subjects or current issues relating to chemistry and funding for IKM or other institutions to participate in suitable local exhibitions with the aim to promote appreciation of chemistry and chemistry profession.

- To promote chemistry education in schools and universities by providing assistance or bursary to needy students that are pursuing chemistry courses at local institutions of higher learning, funding for activities organised by universities on subjects relating to chemistry and funding for activities organised by Institut Kimia Malaysia, government departments or local universities with the aim to promote the interest in chemistry education.

- To promote chemistry as a professional and career in Malaysia by funding for IKM to organise talks or lectures to schools and universities on career advancement and opportunities in chemistry, funding for industry visits to chemical industries, to promote advancement of chemistry in Malaysia by providing sponsorship to IKM or other professional bodies for organising national and international seminars and conferences on chemistry, funding for IKM members to attend local or international conferences and funding for publications on academic research.

Member of the Foundation
Members of the Foundation are existing members of Institut Kimia Malaysia.

First Board of Directors Meeting
The First Board of Directors Meeting was held on 31st December 2020 at Wisma IKM, 127B Jalan Aminuddin Baki, Taman Tun Dr Ismail, 60000 Kuala Lumpur.

The following persons, as named in the Foundation's Constitution, were appointed as Directors of the Company:

- Datuk ChM Dr Soon Ting Kueh
- Tuan Haji ChM Mohamed Zaini Abdul Rahman
- Datin ChM Dr Zuriati Zakaria
- Assoc Prof ChM Dr Juan Joon Ching
- ChM Tea Hing San
- ChM Chang Hon Fong
- ChM Chan Woon Peng
- Dr Law Sie Ling – Representative from Tan Sri Law Hieng Ding Family

The meeting was attended by all Directors.

The Board appointed Datuk ChM Dr Soon Ting Kueh as the Chairman and elected ChM Chang Hon Fong as the Board Secretary cum Treasurer.

Company Secretary
The Joint Secretary of the Company appointed by the Board of Directors are:

(i) Mr. Surdass @ Vipin Kumar (MACS 00008)
(ii) Ms Chan Pui Sze (LS0009708)

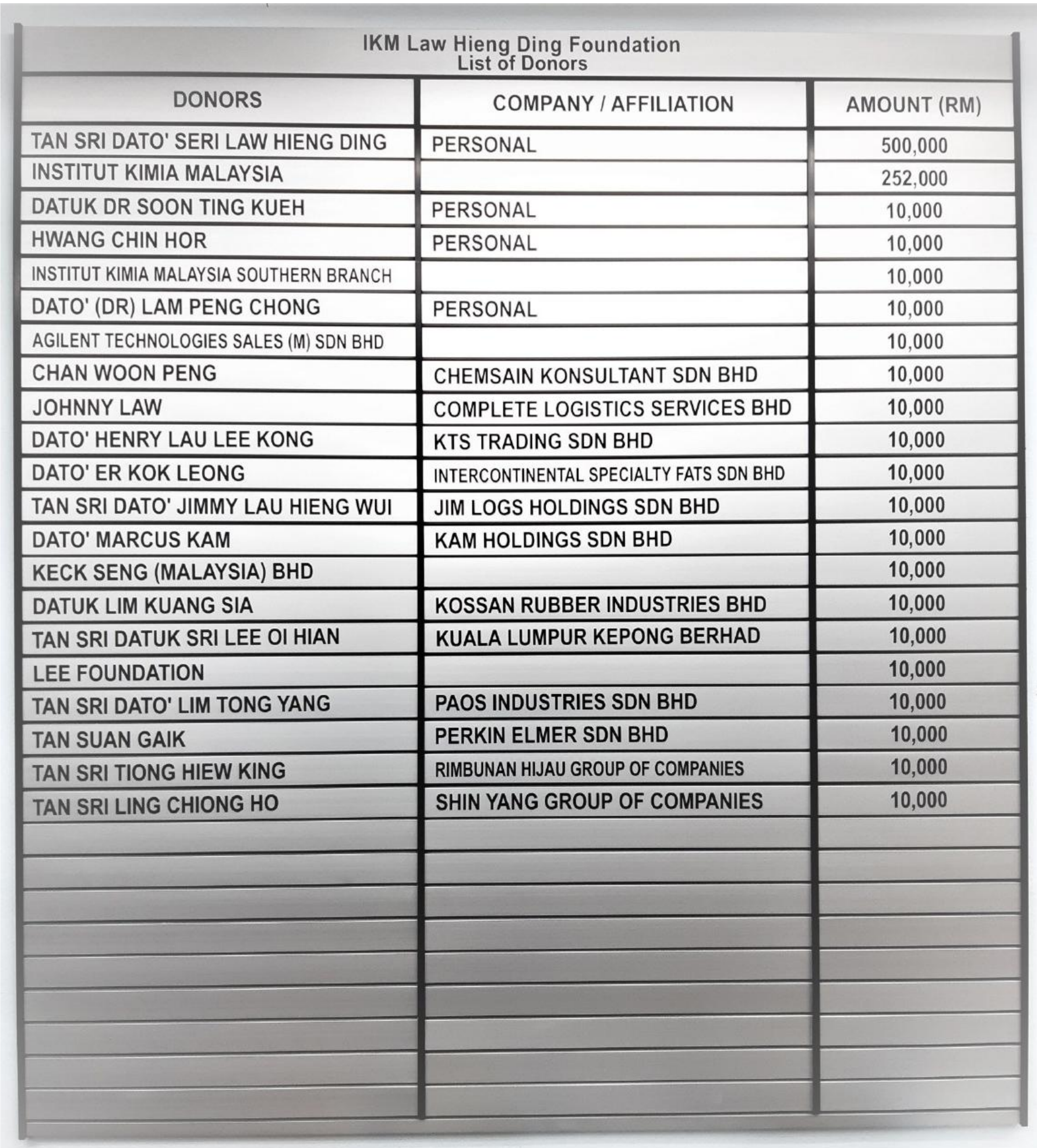
The registered address of the Company is Suite 12B-23, Level 12B, Wisma Zelan, No. 1 Jalan Tasik Permaisuri 2, Bandar Tun Razak, Cheras, 56000 Kuala Lumpur. The business address of the Company is 127B, Jalan Aminuddin Baki, Taman Tun Dr Ismail, 60000 Kuala Lumpur, Malaysia. IKM Secretariat will serve as the Secretariat of the Company.

The Board resolved to open a banking account in Malayan Banking Berhad at No.2, Lorong Rahim Kajai 14, Taman Tun Dr Ismail, 60000 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur. The Board is responsible for the management of the affairs of the Foundation.

Report by:

ChM Chang Hon Fong
Secretary / Treasurer, Board of Directors

Date: 31st January 2021



IKM Law Hieng Ding Foundation
List of Donors

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INSTITUT KIMIA MALAYSIA		252,000
DATUK DR SOON TING KUEH	PERSONAL	10,000
HWANG CHIN HOR	PERSONAL	10,000
INSTITUT KIMIA MALAYSIA SOUTHERN BRANCH		10,000
DATO' (DR) LAM PENG CHONG	PERSONAL	10,000
AGILENT TECHNOLOGIES SALES (M) SDN BHD		10,000
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JOHNNY LAW	COMPLETE LOGISTICS SERVICES BHD	10,000
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DATO' MARCUS KAM	KAM HOLDINGS SDN BHD	10,000
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TAN SRI DATUK SRI LEE OI HIAN	KUALA LUMPUR KEPONG BERHAD	10,000
LEE FOUNDATION		10,000
TAN SRI DATO' LIM TONG YANG	PAOS INDUSTRIES SDN BHD	10,000
TAN SUAN GAIK	PERKIN ELMER SDN BHD	10,000
TAN SRI TIONG HIEW KING	RIMBUNAN HIJAU GROUP OF COMPANIES	10,000
TAN SRI LING CHIONG HO	SHIN YANG GROUP OF COMPANIES	10,000

IKM Law Hieng Ding Foundation—List of Donors Notice Board at IKM Board Room at TTDI, Kuala Lumpur

IKM LAW HIENG DING FOUNDATION

1st Board of Directors Meeting, 31 December 2020, Wisma IKM, Kuala Lumpur

Launching of IKM Law Hieng Ding Foundation, 11 November 2011

Genetic Scissors: At the Cutting-Edge of Life

James Nurton, *freelance writer*

Republished from WIPO MAGAZINE December 2020 / No. 4, page 18-23

On October 7, 2020, the Nobel Prize in Chemistry was awarded to Professor Emmanuelle Charpentier, Director of the Max Planck Unit for the Science of Pathogens, Berlin, Germany, and Professor Jennifer A. Doudna, of the University of California, Berkeley, USA, "for a method of genome editing". Their discovery of the CRISPRCas9 "genetic scissors" is one of the most important scientific developments so far this century. It has the ability to transform agriculture and medicine, and even cure inherited conditions such as Huntington's disease, cystic fibrosis and certain types of cancer. But, as the researchers themselves have recognized, it also raises complex ethical, patent and policy issues, which are only just beginning to be explored.

The collaboration between Professor Charpentier and Professor Doudna brought together their expertise in pathogenic bacteria and RNA interference, respectively. It began in 2011 and was, according to Professor Charpentier, "short and intense", but its impact will be felt for many years. Their key achievement was identifying that CRISPR, a natural defense mechanism found in the DNA of bacteria, and Cas9, an enzyme, could be programmed to cut a DNA molecule at any point. As Professor Claes Gustafsson, Chair of the Nobel Committee for Chemistry, explained in a paper published by the Royal Swedish Academy of Sciences, "the development of this technology has enabled scientists to modify DNA sequences in a wide range of cells and organisms. Genomic manipulations are no longer an experimental bottleneck. Today, CRISPR-Cas9 technology is used widely in basic science, biotechnology and in the development of future therapeutics."

A Revolutionary Tool to Shape Biological Systems

"CRISPR-Cas9 is a powerful tool that has made gene editing faster, more accurate, cheaper and easier to operate. It's also a socially disruptive technology with many applications including to human medicine, agriculture and biofuels," says Dr Kathy Liddell, Director of the Centre for Law, Medicine and Life Sciences at Cambridge University in the UK. As of October 2020, 115 clinical trials using human genome editing (HGE) technologies are underway, according to the World Health Organization HGE Registry, including for widespread genetic diseases such as sickle cell disease and beta thalassemia. In March 2020, the first CRISPR-Cas9 gene therapy was administered to someone suffering from a rare condition known as LCA10, which causes childhood blindness and for which no other treatment is currently available. In this instance, the therapy was used to remove a mutation in the gene (CEP290) which causes the condition. But CRISPR-Cas9 has also

Common terms

DNA: Deoxyribonucleic acid, a molecule present in all cells that carries genetic instructions.

RNA: Ribonucleic acid, a single-stranded molecule sometimes referred to as DNA's "cousin."

CRISPR: clustered regularly interspersed short palindromic repeats – arrays of repeated DNA sequences.

Cas: CRISPR-associated proteins that cleave virus DNA. There are 93 of them, one of which is Cas9.

TracrRNA: trans-activating CRISPR RNA, which enables long RNA created from a CRISPR sequence to mature into its active form.

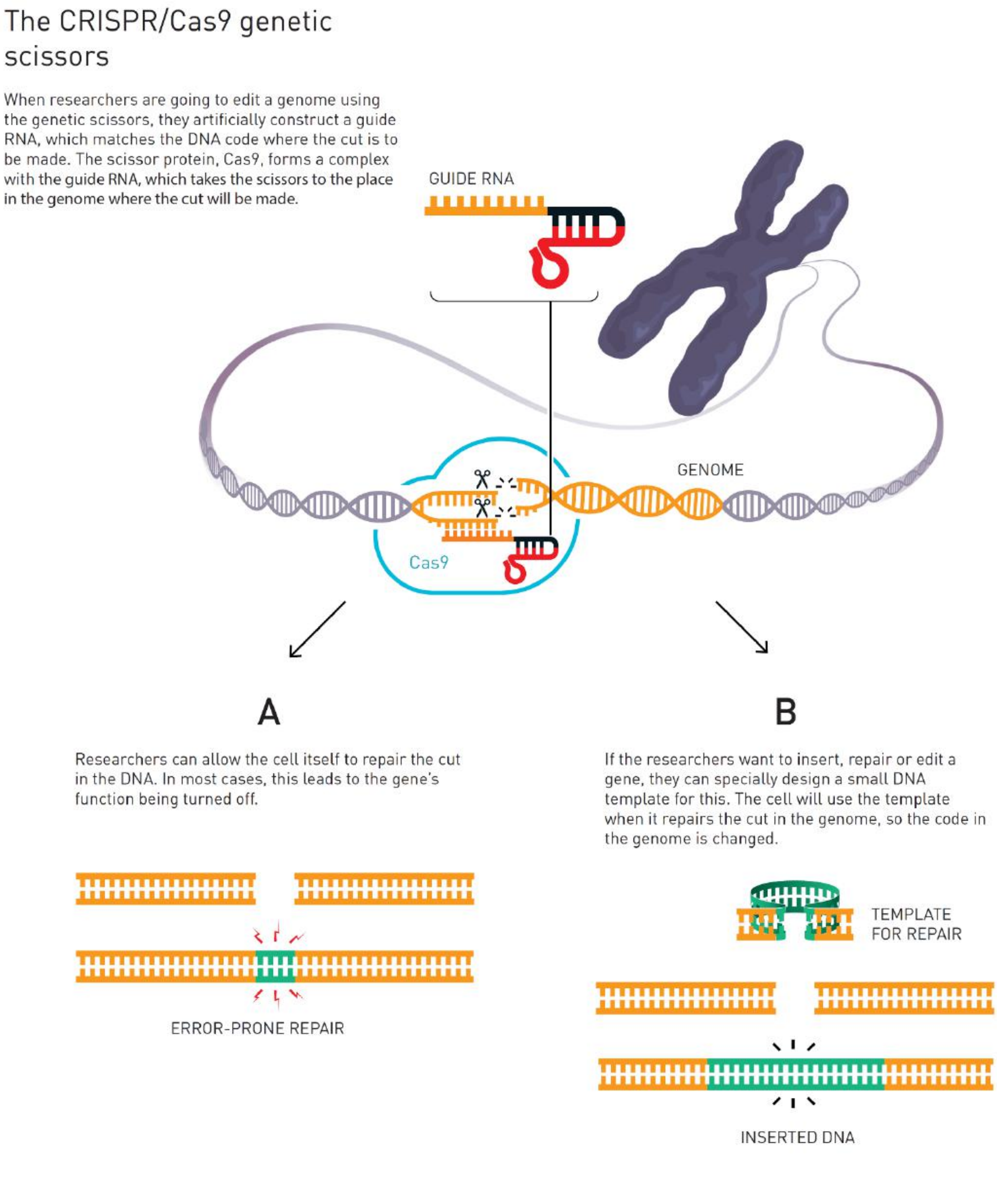
Professor Jennifer A. Doudna (left) and Professor Emmanuelle Charpentier (right) have been jointly awarded the Nobel Prize in Chemistry for their discovery of the CRISPR-Cas9 "genetic scissors," one of the most important scientific developments of the 21st century.

resulted in some less favorable headlines, with a long (and as yet unresolved) patent battle and ethical debates about "designer babies".

Professor Jacob S. Sherkow of the College of Law, University of Illinois at Urbana-Champaign in the United States, says this reflects the fact that CRISPR-Cas9 is "the most important advance in biotechnology in the past 40 years." "It allows scientists, researchers and developers to precisely edit the genome of a living cell. In other words, you can edit the software that makes us alive," he adds.

Responsible Development

The two Nobel Laureates realized the magnitude



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of their discovery early on. Professor Doudna has spoken about how, by 2014, she felt a growing responsibility to engage in the public ethical debates. In early 2020, she told the Financial Times: "We need to be thinking about these broader implications of a powerful technology and how to develop them responsibly." She helped establish, and is currently President and Chair of the Governance Board at the Innovative Genomics Institute in Berkeley, California, USA. The Institute is committed to advancing public understanding, providing resources for the broader community and guiding the ethical use of genomic technologies.

Ethical issues came to the fore in November 2018, when Chinese scientist He Jiankui announced that he had used CRISPR-Cas9 to create genetically edited twin girls. Other scientists condemned the research – including Professor Doudna, who immediately flew to Hong Kong (SAR) to investigate. He Jiankui was subsequently fired from his university, fined and imprisoned for three years. The case was very much an outlier: He Jiankui's research was not regulated or published and not even scientifically credible (his claim that the genetically modified embryos would confer HIV immunity met with considerable skepticism). Professor Sherkow notes that the ethical debates about editing human embryos to avoid genetic illness or favor certain characteristics are not new, and have been present since the introduction of in vitro fertilization (IVF) in the 1970s. "Some concerns about CRISPR-Cas9 are greatly overblown. It's not that different from what is being done now," he observes. Dr. Liddell agrees, saying: "In the UK, for example, we have a track record of broad, pragmatic deliberation on ethically contentious issues, such as IVF and prenatal screening. It's important to scrutinize arguments about whether there are real harms to society or human values from heritable gene editing." In many countries (including the UK) IVF research is regulated by a public authority so that new issues can be debated and resolved as they arise.

The Role of The Patent System

The ethical issues raised by CRISPR-Cas9 are not limited to human germline editing. In view of its potential to transform biological systems, there are also questions such as: Who decides how the technology can be used and by whom, and which uses are safe and socially acceptable? Which research should be prioritized? How to ensure fair access to life-changing therapies that may cost millions of dollars per treatment, particularly in health systems based on public payment? What is the social and economic impact of modifying the genes of crops or fuels on farmers and agricultural workers and what effect will such uses have on ecological systems? Some of these questions inevitably concern the role of the patent system, which is designed to incentivize innovation for the benefit of society as a whole.

Researchers have applied for thousands of patent applications involving CRISPR technology over the past decade, demonstrating the importance of patents in attracting and encouraging investment in research and technological development. As Professor Doudna herself has said: "There's a huge layer of IP [intellectual property] that's been developed. It will be interesting how that plays out in the future once we have products with value." Standards body MPEG LA has even proposed creating a CRISPRCas9
joint licensing platform (or patent pool) to promote access to related patented technologies.

Patent Battles Ensue

Professors Charpentier and Doudna filed their first application in the United States in 2013, and this has been extended to many other countries via the Patent Cooperation Treaty (published as WO/2013/176772). Since 2015, UC Berkeley and the University of Vienna (the patent applicants) have been locked in patent interference proceedings before the United States Patent and Trademark Office (USPTO) against the Broad Institute in the United States to determine the validity of their application. There have also been disputes between these parties in other jurisdictions. They are not over yet – which, as Professor Sherkow says, raises the prospect of further battles being fought in the courtroom. "One of the big questions is why these disputes have not been resolved, and who is reluctant to settle. The stakes are very high, and we could yet see a full trial about who was the first to invent "single guide RNA", with testimony from the various scientists involved," he says. So far, and perhaps surprisingly, the patent disputes have concerned issues about breadth and priority, rather than patentable subject matter. As Professor Duncan Matthews, Director of the Queen Mary Intellectual Property Research Institute at Queen Mary University of London, UK, says, the patent system is "part of the overall governance of technologies" such as CRISPR-Cas9.

In particular, many patent laws have morality or order public exclusions from patentable subject matter. These are defined in national patent law and addressed in a document produced by the WIPO Standing Committee on Patents (last updated in April 2020). "I think patent examiners at the European Patent Office, where they are required to apply a morality exception, have done a good job by not rejecting applications outright but instead allowing claims to compositions or vector systems (delivery methods) for genome editing.

Republished from WIPO MAGAZINE December 2020 / No. 4, page 18-23

They are applying the law as it is stated," says Professor Matthews, who has convened an expert group on patents and genome editing to study the topic. "In other patent systems, it is perhaps too early to say [how the exclusions will be interpreted] and we haven't yet seen disputes about the exceptions concerning morality or products of nature."

Patents as A Technology Governance Mechanism

Professor Matthews believes more work should be done on whether patent offices would allow genome inventions to be patented: "Until now, patents have been largely absent from the debate about human genome editing. I was pleased to be invited recently to give evidence before the WHO Expert Advisory Committee, which is considering patents as part of the governance of human genome editing." The international WHO expert panel was established in December 2018, and published a statement on governance and oversight in July 2019. Professor Matthews points out that the patent system could be a means of preventing rogue research: "Patents could be used responsibly to block unregulated use through a system of ethical licensing."

A Bold Future

While the details of gene editing may seem complex to the uninitiated, scientists speak of the relative simplicity of the CRISPR-Cas9 tool, which has made it available to researchers across the globe in a wide range of fields. "Academic research into CRISPR has taken off in the past few years," despite the well-publicized patent battles, says Professor Sherkow. "The limit of CRISPR is the human imagination," he notes. The Nobel Laureates have contributed greatly to this research, each of them being named on dozens of patent applications. Professor Charpentier has licensed IP to the biotech companies CRISPR Therapeutics and ERS Genomics while Professor Doudna has co-founded Caribou Biosciences, Intellia Therapeutics and Mammoth Biosciences.

"This is the first time that two women have shared a Nobel Prize in Chemistry and they will be an inspiration, especially to girls around the world who are interested in science," says Dr. Liddell. Their work has inspired hundreds of other researchers who have published papers on the use of CRISPR-Cas9 in many organisms. Scientists are also investigating the potential of other CRISPR associated systems such as Cas12a and Cas13, including to test for and treat COVID-19. Some of this research uses powerful artificial intelligence tools including machine learning and deep learning to improve predictability and reduce off-target effects. Less than 10 years since the landmark collaboration between Professors Charpentier and Doudna, enormous strides have already been made – but it looks like many more achievements are just around the corner.

The discovery by Professsors Charpentier and Doudna revealed that a DNA molecule could be 'cut' at any point by CRISPR, a natural defense mechanism present in the DNA of bacteria, and Cas9, an enzyme.

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20 - 21 October 2021

Kuala Lumpur Convention Centre (KLCC), Malaysia

"Advancing Excellence & Best Practices in Laboratory Operations and Management

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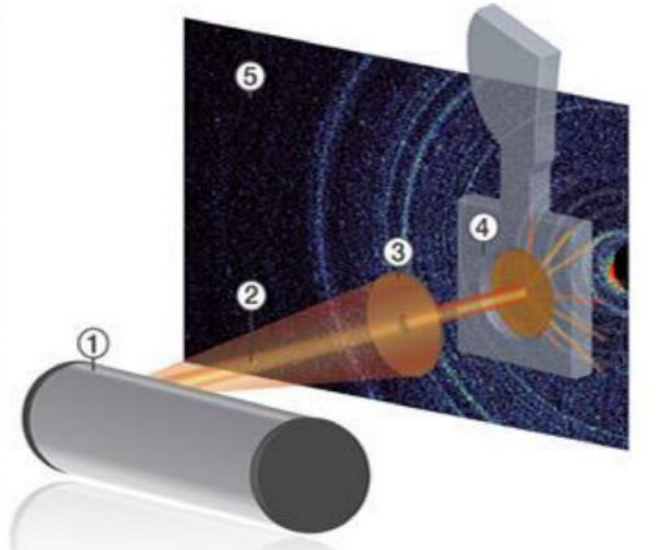

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  - Analyze unknown samples onsite
  - Non-technical sample preparation
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- ➢ **Building Forensics/ Corroded Cement**

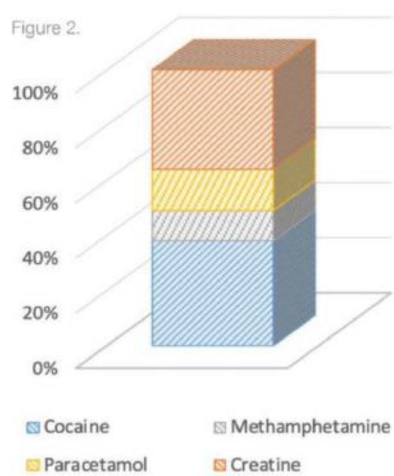

Figure 2. Controlled substance analyzed with Olympus XRD. The sample contains an appreciable amount of gypsum (filler material), as well as illicit drugs, cocaine and methamphetamine.

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Malaysian Journal of Chemistry (MJChem)

MJChem is a double-blind peer reviewed journal published by the Malaysian Institute of Chemistry (Institut Kimia Malaysia)
E-ISSN: 2550-1658

Scope

The Journal publishes articles on the following categories:

(i) Research Articles

(ii) Short Communications

(iii) Research Perspectives and

(iv) Reviews.

Journal Website and Article Submission Information:

https://ikm.org.my/ojs/index.php/MJChem

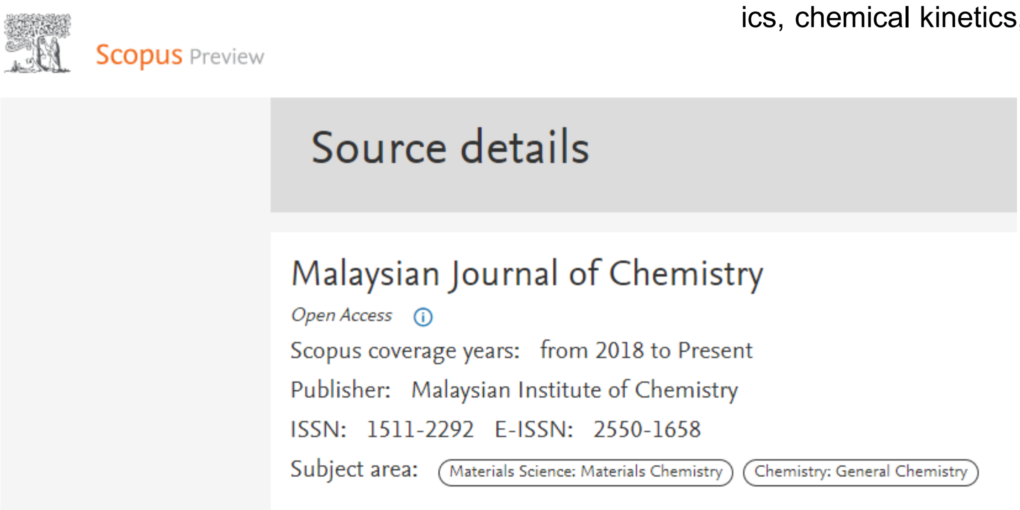
Article publishing charges:

RM400.00 (effective June 2021)

Indexed in Scopus

Article contributions including but not limited to, the following topics will be considered for publication:

- Analytical chemistry (Characterization and analysis)
- Inorganic chemistry (Organometallic chemistry)
- Materials chemistry (Solids, liquids, polymers)
- Nuclear chemistry (Radioactivity, nuclear properties and processes, such as nuclear transmutation)
- Organic chemistry (Structure, properties, composition, mechanisms and reactions of organic compounds)
- Physical chemistry (Chemical thermodynamics, chemical kinetics, electrochemistry, statis-


Scopus Preview

Source details

Malaysian Journal of Chemistry

Open Access

Scopus coverage years: from 2018 to Present

Publisher: Malaysian Institute of Chemistry

ISSN: 1511-2292 E-ISSN: 2550-1658

Subject area: Materials Science: Materials Chemistry | Chemistry: General Chemistry

(https://www2.scopus.com/sourceid/21100874945)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Recently, the Environment and Green Chemistry (EGC) Section of the Malaysian Institute of Chemistry and Monash-Industry Palm Oil Research Platform (MIPO) of Monash University Malaysia organized a virtual symposium entitled "**E-Symposium on Green Transformation of Agro Wastes, 2021 (E-SGTAW, 2021)"**, which was held on the 23-24th Feb 2021. Given the COVID-19 pandemic situation, the E-SGTAW 2021 was held entirely as a virtual event. This symposium is organized in collaboration with the National University of Malaysia, University of Malaya, University Tunku Abdul Rahman and Green Technology Section of Federation of Malaysian Manufacturers.

Every year, Malaysia produces approximately 80 million tonnes of biomass from various agricultural commodities. This biomass can be sustainably sourced, and according to the National Biomass Strategy 2020, the biomass available could create RM 30 billion in additional gross national income and reduce 12% of the national carbon emissions. The biomass industry can contribute to the Circular Economic, in line with the agenda of the United Nations Sustainable Development Goals. In Malaysia, biomass can be derived from oil palm, timber, sugar cane, bamboo, coconut shell and fibre, rice husk, sago, cocoa and other agricultural plantation byproducts. The industries could trigger the biomass-based new technologies or products demand. The research institutions could research to achieve the desired outcome that is currently useful for the nation. Strategic coordination was required to enhance the collaboration among the biomass feedstock owners, research institution, and technology providers.

The symposium was materialized to provide a platform for engagement and collaboration between university researchers, industry and government agencies. The spearhead of symposium is the Deputy Director of MIPO, ChM Dr Pushpamalar Janarthanan (*in pic*) of Monash Univesity. Academic staffs and postgraduate students of public and private universities, government agencies and industry members shared their research findings, challenges, experience and achievements. In the symposium, it was identified as the challenges and opportunities in biomass research and technology development. It has been a platform to promote the biomass industry and biomass research at both domestic and international levels. The experts' presentation and a lengthy discussion during the two day's sessions made it undeniable that biomass feedstock can be used as bioenergy sources, produces sustainable eco-products, and bio-agriculture products as biofertilizer animal feed and aqua feed, and could produce high-value building block chemicals. This symposium also acted as a platform bridging the industry, university and government agencies that could trigger collaboration forming new ventures that embedded in research culture at universities.

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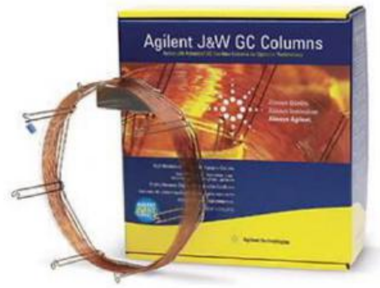

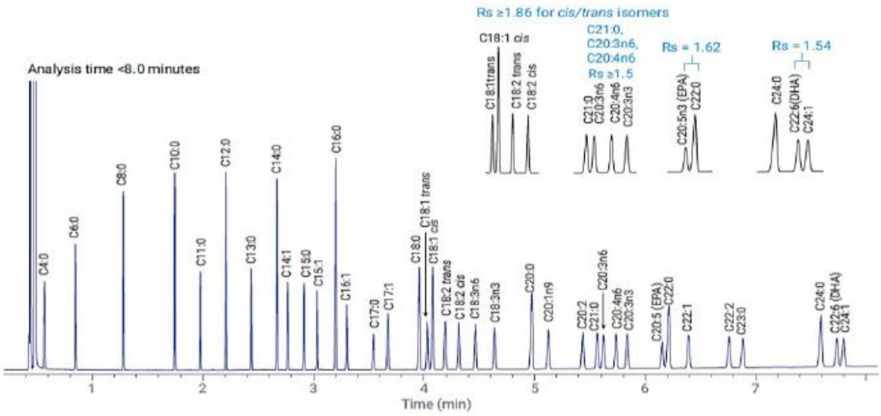

Parameter	Value
GC system	Agilent 7890B/ FID
Column	Agilent J&W DB-FastFAME, 20 m × 0.18 mm, 0.20 µm (G3903-63010)
Carrier gas	Hydrogen, 28 psi, constant pressure mode
Inlet	Split/splitless, 250 °C, split ratio 50:1
Oven	80 °C (0.5 minutes), 65 °C/min to 175 °C, 10 °C/min to 185 °C (0.5 minutes), 7 °C/min to 230 °C
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Injection	1 µL

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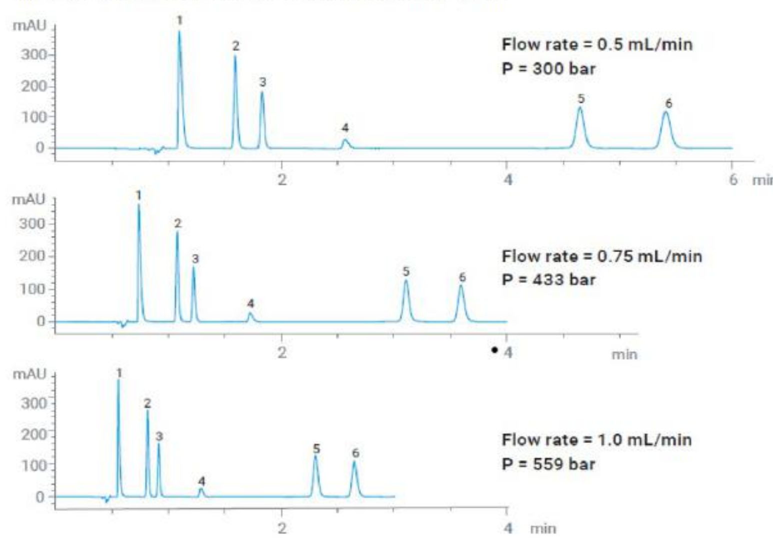

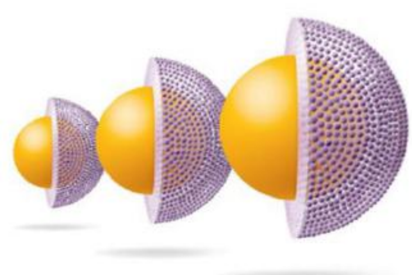

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Sound Lesson in Shaping Tomorrow

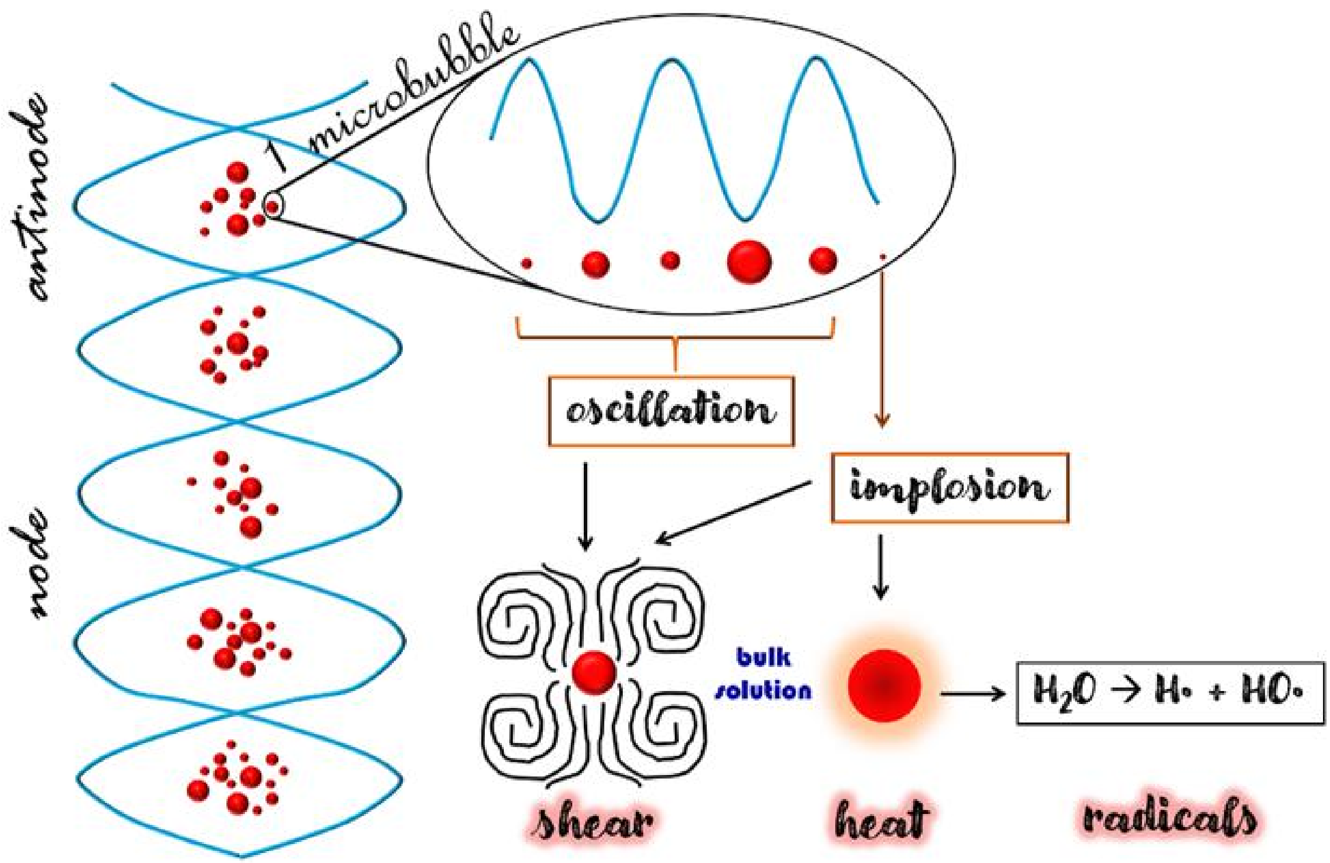
Nor Saadah Mohd Yusof, Department of Chemistry, Universiti Malaya

The chatters of snapping shrimps dominantly make up the familiar sound of the ocean we often hear. Its "ultra-loud" that in World War II, the sound from their snaps helped keeping the US Navies' submarines invisible from the Japanese sonic detectors. Despite the obvious physical snapping action by the shrimp's claw, researchers later discovered that the sound is produced by the popping of the generated bubbles during the snaps. Each snap is like firing a real-life gun, able to stunts and even kills targets like small fishes from afar. Thus, the snapping shrimp is also known as the pistol shrimp.

The sound produced during the snap can be up to 200 kHz travelling at 100 km/hour. During the popping, the local temperature of the bubble can reach up to ~5500 °C and light, known as sonoluminescence was produced. This is one of the many examples of "ultrasound-benders" in our nature. As intense as it sounds, sonochemists research on the similar ultrasound-generated effects on many systems. The understanding and control of the individual as well as their interdependent effects is crucial in unravelling its potential.

Ultrasound is acoustic energy that travels in the form of sine waves with frequency higher than human hearing range (> 18,000 Hz). Its derivated term, "sonochemistry" is an area to understand, and manipulate the effects it could carry. These effects could be easily generalized as ultrasonic physical and chemical abilities, but their manipulation requires exploration down much more intricate path. Therefore, to first understand the basic concept of ultrasound and sonochemistry, let us embark on the metaphorical journey by taking ultrasound as a king of its own kingdom. For ease of understanding, this is pictorially represented in the figure below.

Ultrasound, in its reign, rules with the principle of monarchy. The ultrasound wavelength code of conduct propagates through the solution with its microbubbles army lining up at the antinodes. The wave is consequently composed of compression and rarefaction pressure cycles. The microbubbles army is the nucleation product of gas bubbles which were forced to expand during the rarefaction half cycle. These bubbles are theoretically the same as the bubbles produced by the pistol shrimp. Each microbubble oscillates as a proof of loyalty to the king and generates acoustic cavitation. Consider "acoustic cavitation" as the main



weapon in ultrasound kingdom, the force to rule the people. Therefore, as a start, it is crucial to understand the events caused by acoustic cavitation itself to the system.

In general, ultrasound monarchy of ruling involves two phases: "microscale" and "macroscale". The forces of both phases are influenced by many factors. Amongst them are the frequency and power applied, the reactors of sonication and the system being studied. On the microscale, acoustic cavitation induces the formation of bubbles at antinodes with sizes and stability depending on the frequency and power. Just like the bubbles produced by pistol shrimp. In general, at high frequency, the cavitation bubble size is small with a narrow size distribution, whilst at low frequency, the bubble size is relatively larger with a broader size distribution. Each bubble oscillates in response to the sine wave of ultrasound for a certain number of cycles depending on the bubble stability; and inertially collapse, also known as implosion. In the case of pistol shrimp, the collapse produces the loud popping sound which they use to communicate with one another. The collapse of acoustic-induced cavitation also results in strong shear produced from both, oscillation, and implosion; termed as acoustic/cavitation microstreaming.

Generally, shear produced is higher at lower-frequency and high-power systems. Apart from that, the collapse of the microbubbles could also result in severe damage to any system. As the microbubble is forced to grow during oscillation, the potential energy in the bubble builds up. The high energy is then suddenly released during the implosion as the ferocious shockwave and microjet. Some of the energy is also converted to heat, especially at the microbubble's local interface. It has been measured that the heat at the bubble-solution interface during collapse will be around 2,000 K, and the heat is dissipated to the surrounding bulk solution.

However, the theoretical temperature inside the bubble itself may be as high as 10,000 K. The molecules exposed to such intense heat will undergo pyrolysis and result in the formation of radicals. For an example, water molecules will generate H● and HO● radicals, which can be manipulated for various purposes. Interestingly, the high heat released is cooled down by the temperature of the bulk solution. Imagine millions of super-hot microreactors distributed in a relatively cooler solution system. This allows unique control over specific needs of certain experiments or manipulation of chemical reaction. On the other hand, the macroscale effect of ultrasound sets the hierarchy of the people in the ultrasound kingdom. The ultrasound waves could push particles/materials and cause efficient separation in a heterogenous system.

The physical and chemical effects of sonication described above serve as the basis for the many ultrasound-integrated technologies. One of the impactful examples is in health and medicine. The non-invasive method using high intensity focused ultrasound (HIFU) has impressively replace certain medical procedure requiring operation, such as in breaking kidney stones and managing benign tumors. Not only that the procedure is very efficient and safe, its non-invasive nature also reduces the complications and risks normally present during an operation, as well as allowing faster post-operation recovery.

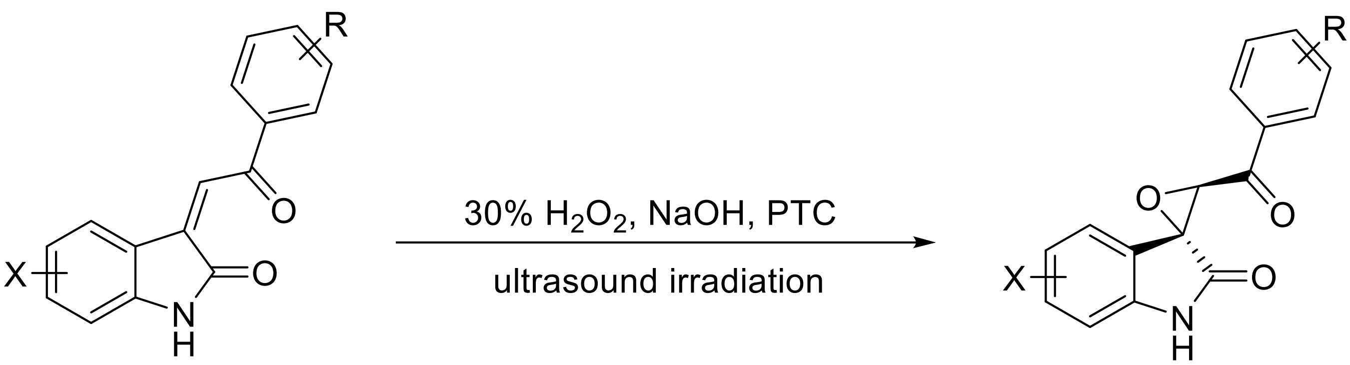
Ultrasound is also used to aid the delivery of intended materials, such as drugs and genes in many ways. To start, ultrasound could assist the process of encapsulation of certain valuable materials such as the hydrophobic drugs, allowing it to be safely carried to the intended parts of the body, with less unwanted loss along the way. A localized release will then be triggered by ultrasonication at the specific part of the body. The ultrasonic trigger will also lead to increased permeability of cell membranes, therefore increasing its delivery efficiency. This would especially be very beneficial in such treatment involving strong drugs to targeted part of the body, such as the use of drugs in treating cancers.

Ultrasound assistance in chemical reactions is also an enticing option in the area of organic synthesis. With cleverly designed experiment setups, ultrasound was proven to improve organic synthesis in many ways. The usual observed gains caused by its physical agitation are shorter reaction time, higher yield of product and significant increase of mass transfer, especially in heterogeneous reaction system. The heat generated from microbubble implosion could also eradicate the hassle of setting up experiment to achieve such extreme condition. In some distinct reactions, ultrasound could also protect/deprotect specific functional groups, reduce dependency on specific reagent or catalyst, and even provide a better regio- and stereo-selectivity/specificity towards certain desired product.

An example reported by Dandia et al. in Ultrasonics Sonochemistry is the synthesis of spiro-epoxyoxindoles with known properties as antitubercular, antifungal and anticancer. Excellent diastereoselectivity (95%) and high yield (91-96%) of product as shown in the reaction scheme below was achieved, even at only 12 minutes of ultrasonic irradiation. Such stereochemical control of the synthesized products will be the precursor to the development in many imperative areas.

Another example of ultrasound-improved technologies is as cleaning device. The shear produced by ultrasound, along with the shockwave and microjet during implosion could aid in detaching and dissolving tough dirt during the cleaning process. However, the development of such cleaning devices requires proper understanding and control of the intensity of physical effects generated. Tough systems such as pipe cleaning requires strong physical impact.

However, the shockwave and microjets could also cause surface pitting and erosion. In fact, the early discovery of ultrasound was due to the pitting observed on the metal propeller blades of a high-speed warship in 1885. Of course, no one wants such intense physical effect of ultrasonication from using face or teeth ultrasonic cleaner. Therefore, for such devices, much milder, yet efficient physical impact is required.



However, the strong physical ability of shockwave and microjet is now manipulated as different kinds of precision cutters, from cutting food products such as meat and cheese, to cutting materials such as plastic and metals. Many factories are now opting for this technology as the extreme precision level is said to be better than laser cutters, with other added values including requiring lower energy, safer to handle, and causing less negative impact to the environment.

Comparing the advanced developed technologies to what is present in nature is like looking at opposite sides of the same coin. The application of ultrasonic devices in breaking kidney stones, in chemical reactions, or in precision cutting might initially seem different than the killing action of a pistol shrimp. Though, at the fundamental level, the manipulation of the microbubbles in both cases are much more similar. The gap between the wonders in nature and nature-inspired human invention is bridged by the research on sonochemistry.

Each discoveries, manipulations and controls of ultrasound bring values into advanced ideas and technologies, and is a lesson for us, human to be a better “ultrasound-bender”. The interests and tireless effort of all researchers is a priceless investment with hope in shaping a better tomorrow.

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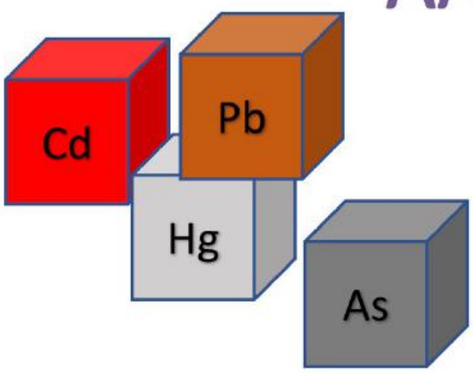

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However, laboratories in the pharmaceutical industry not only need to make sure their products comply with applicable regulations, they also need to make sure that data is acquired and stored in a secure and compliant manner. Learn to achieve full regulatory compliance effortlessly. This webinar will:

- Provide an overview of analysing impurities in pharmaceutical products through alleviating the pain of common challenges in the laboratory
- Help you to understand the requirements on analysing elemental impurities in drug products
- Enable you to acquire insights on tips and tricks to make elemental analysis work seamlessly in your laboratory

This webinar is open to everyone who has a burning desire to find out more!

Register for the on-demand webinar here:

Application Note

A fast, cost-effective HS-GC-FID method for the analysis of ethylene oxide in surgical-style face masks

Face masks are ubiquitously worn by medical staff while performing duties such as surgery in order to reduce the risk of infection to the patient and to protect themselves from splashes of bodily fluids.

With the recent spread of Covid-19, many governments around the world have made the wearing of some form of face covering compulsory.

Surgical face masks, along with other medical devices, are required to be sterilized to destroy bacteria and viruses. Steam could be used for sterilization, however, many medical devices are sensitive to heat or moisture, meaning that steam is not always suitable.

Sterilization using ethylene oxide is commonly utilized due to its ability to alter pathogen DNA. However, the use of ethylene oxide as a sterilizing agent has not been approved by the US Department of Labor's Occupational Safety and Health Administration (OSHA) to sterilize filtering face piece respirators.

The US Centers for Disease Control & Prevention (CDC) states that "Ethylene oxide is not recommended for cleaning filtering face piece respirators as it may be harmful to the wearer."

Ethylene oxide is known to be toxic, flammable, and carcinogenic and is easily absorbed by many materials. Exposure to ethylene oxide can lead to irritation, central nervous system depression, spontaneous abortion, and various cancers.

Due to these significant health effects, it is important that no ethylene oxide traces are found in the face masks or other respiratory devices that were potentially subjected to sterilization with this agent.

This application note demonstrates a fast, cost-effective analytical method suitable for the analysis of residual ethylene oxide and 2-chloroethanol in face masks using static headspace (HS) gas chromatography (GC) with flame ionization detection (FID).

Download our Application Note 73790 to learn the fast, cost-effective HS-GC-FID method for the analysis of ethylene oxide in surgical-style face masks here:

Spotlight

Nitrosamine Impurity Analysis

Certain pharmaceutical manufacturing processes can result in the production of genotoxic impurities (GTIs), such as N-nitrosodimethylamine (NDMA) and other nitrosamines, many of which are potentially carcinogenic.

Thermo Fisher Scientific is helping customers to screen and quantify nitrosamine impurities with confidence.

Whether you are analysing these impurities in finished drug products, active pharmaceutical ingredients, intermediates, or raw materials, you will benefit from the robustness and accuracy provided by high resolution accurate mass detection and quantitation or equally reliable quantitation by triple quadrupole technology. Our mass spectrometers will be the platforms for highly robust advanced analytical methods to answer your questions with high confidence.

Confident quantitation can be provided by our GC or HPLC separation systems coupled to Quadrupole and Orbitrap-based mass spectrometry systems together with advanced informatics capabilities.

Popular products for nitrosamines analysis include:

- Thermo Scientific™ Orbitrap Exploris™ 120 Mass Spectrometer - The proven Thermo Scientific Orbitrap technology in the Thermo Scientific Orbitrap Exploris 120 mass spectrometer accelerates your route to qualitative and quantitative confidence for both method development and everyday testing purposes
- Thermo Scientific™ Chromeleon™ 7.3 Chromatography Data System - Streamline your laboratory workflow using Chromeleon CDS software which delivers superior instrument control, automation, and data processing for compliant GxP pharmaceutical manufacturing and QA/QC environments.
- Thermo Scientific™ Vanquish™ Core HPLC System - The Thermo Scientific Vanquish Core is ideal for routine analysis requirements and can be seamlessly coupled to a mass spectrometer (MS), allows the users in the QC labs to obtain new benchmarks in accuracy, precision and sensitivity while delivering reproducibly consistent results

L - R: Thermo Scientific™ Orbitrap Exploris™ 120 Mass Spectrometer; Thermo Scientific™ Chromeleon™ 7.3 Chromatography Data System software; Thermo Scientific™ Vanquish™ Core HPLC System

Nitrosamine Impurities Analysis

There are a variety of MS-based methods that can be leveraged to provide confident and reliable quantitation of nitrosamine impurities as shown by official methods advocated by regulatory agencies.

To learn more, please visit this dedicated web page on Nitrosamine Impurities Analysis to:

- Speak to our specialist
- Join our pharma/biopharma community

Explore **thermofisher.com/nitrosamines**

Thermo Fisher Scientific Analytical Instruments Receive Prominent Industry Awards

Thermo Fisher Scientific, the world leader in serving science, announced that several of its analytical instruments and solutions have been recognized through multiple respected industry awards.

These award-winning analytical solutions support scientists across many sectors including pharmaceuticals, food and beverage, environmental, clinical, and industrials, to accelerate research into biopharmaceuticals and small molecules, and ensure the safety and quality of consumables.

R&D 100 Award

The Thermo Scientific™ Chromeleon™ 7.3 Chromatography Data System (CDS) software was recognized as a winner of an R&D 100 Award for the Software/Services category by R&D World Magazine. The Chromeleon 7.3 CDS software was designed to enhance compliance, standardization and efficiency. Through greater automation and better workflow support, the software has enabled customers to achieve productivity gains of up to 33 percent.

The Thermo Scientific™ VeriSpray™ PaperSpray Ion Source was also nominated as a finalist in the Analytical/Test category for its ability to automate direct mass spectrometry based ionization of complex sample matrices. The ion source enables the analysis of unprocessed samples in a single step, with results in under two minutes.

Top 15 Innovations of 2020

The Thermo Scientific™ Vanquish™ Core HPLC Systems and Thermo Scientific™ Orbitrap Exploris™ 240 mass spectrometer were included in The Analytical Scientist's Top 15 Innovations of 2020.

The Vanquish Core HPLC Systems were recognized for their ability to streamline analytical processes through simplified method transfer and minimize downtime via the automatic monitoring of system health.

To enhance research and analysis in metabolomics, biopharmaceuticals and small molecules, the Orbitrap Exploris 240 mass spectrometer delivers increased accuracy, precision and sensitivity to provide scientists with the power needed to drive innovation and streamline the transition from proteomic studies to clinical applications.

Nominated for The Medicine Maker Innovation Awards 2020

The Vanquish Core HPLC Systems and Orbitrap Exploris 240 mass spectrometer received further recognition in The Medicine Maker Innovation Awards 2020, where they were both nominated as finalists for their innovation and potential impact within pharmaceutical development and manufacturing.

Nominated for the Scientists' Choice Award 2020

The Vanquish Core HPLC Systems and Thermo Scientific iCAP PRO X ICP-OES spectrometer were nominated by the SelectScience community for the Scientists' Choice Award for Best New Separations Product and Best New Spectroscopy Product of 2020, respectively. The iCAP PRO X ICP-OES is an inductively coupled plasma optical emission spectroscopy (ICP-OES) instrument designed to accelerate trace element analysis by capturing the complete spectrum of high matrix samples in a single run.

L - R: Thermo Scientific™ Vanquish™ Core HPLC System; Thermo Scientific™ Orbitrap Exploris™ 240 Mass Spectrometer

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Global Women's Breakfast 2021 (Chemists)

In conjunction with the 3rd IUPAC Global Women's Breakfast (#GWB2021), Environment and Green Chemistry Section and Inorganic & Bioinorganic Chemistry Section, Institut Kimia Malaysia hosted the virtual breakfast on February 9, 2021, with the theme 'Empowering Diversity in Science' to address the barriers and inequalities faced by women in science. Dr. Nurul Izzaty Hassan and Dr. Muntaz Abu Bakar chaired and organized this event together with Department of Chemical Sciences UKM, School of Chemical Sciences USM, and American Chemical Society (ACS) Malaysia Chapter. The Global Women's Breakfast is expected to help chemists, both women and men expand their network of contacts, leading to new career opportunities for research, employment, or education. The 1st IUPAC Global Women's breakfast was held in February 2019, the 2nd in 2020.

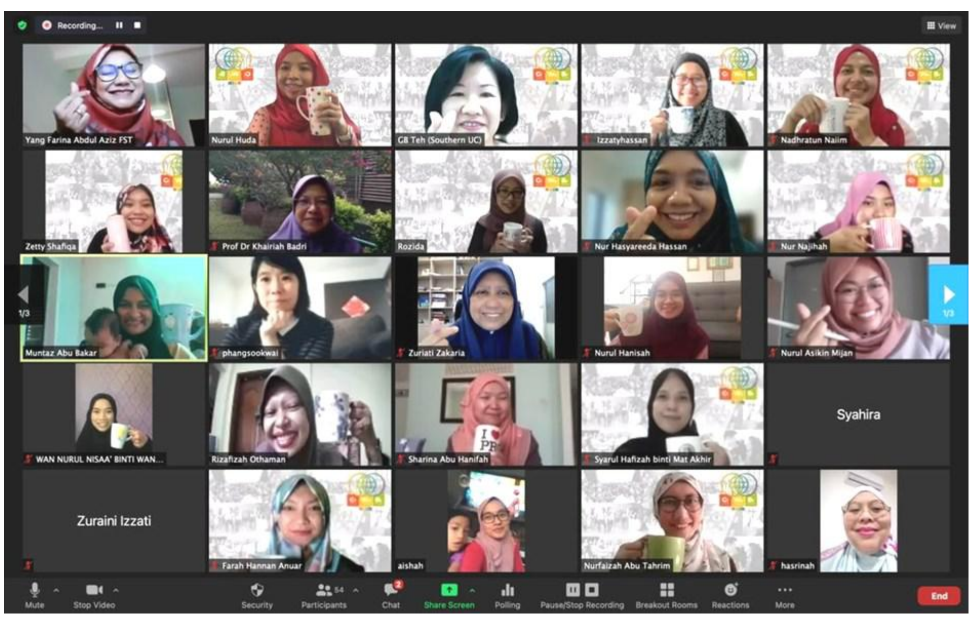
Since the beginning of 2020, we are facing an unprecedented period of uncertainty. The spread of the coronavirus (COVID-19) has significantly impacted every corner of the globe in the form of financial hardship, career, economic, and a decline in people's mental and physical wellbeing. In this GWB event, we organized a motivational talk entitled 'How to be resilient during a pandemic'. Prof. ChM. Dr. Yang Farina Abdul Aziz shared her personal stories of hope, resilience, and inspiration during this pandemic. There has been no test of resilience as there is happening right now with the pandemic. While this COVID-19 virus has shut down the whole country and many of us feel a lack of control, some things are within our control; we can only control ourselves and what we do. We need to face the reality as things are moving with each passing day, by waking up and feel positive for the day, show more empathy or help the unfortunate peoples. If we think we are in a bad position, there will be someone else in much dire condition in this difficult time. In a nutshell, everyone is facing the harsh reality of a pandemic, be brave, patient and always count your blessings.

'Change is constant. The reality is hard but we have to face it, this too shall pass. Be brave, patient, and always count your blessings' – Prof. ChM. Dr. Yang Farina Abdul Aziz

We managed to reach out to nearly sixty people from many different universities, companies and other scientific organizations such as Petronas Research Sdn Bhd, Afcona Chemicals Sdn Bhd, Southern University College, UM, IIUM, USM, USIM, UTP, and UKM. We would like to thank our co-organizer, ACS Malaysia Chapter for generously sponsoring breakfast e-voucher worth RM20 from Starbucks Malaysia for each participant.

Written by
Dr. Nurul Izzaty Hassan, UKM

Our virtual breakfast photo session at the end of the event! #CuppaOnZoom



IUPAC Global Womens Breakfast 2021

Empowering Diversity In Science

Time : **8.30am - 10.00am** | Date: **9 Feb 2021**

Venue: **Virtual** zoom

https://bit.ly/zoomvirtualbreakfast_gwb2021

"Giveaway breakfast voucher RM20 each for lucky participants. Your next coffee is on us"

Tentative

8.30am - Welcoming remarks from organizers of IUPAC Global Womens Breakfast 2021

8.45am - Motivational talk by
Prof. ChM. Dr Yang Farina Abdul Aziz
"How to be resilient during a pandemic"

9.45am - Q&A session

9.55am - Virtual breakfast photo session #CuppaOnZoom

10.00am - End session

Organizer :

Environment and Green Chemistry Section

Inorganic and Bioinorganic Chemistry Section

ACS American Chemical Society UKM International Student Chapter

Universiti Kebangsaan Malaysia — Department of Chemical Sciences, Faculty of Science & Technology, UKM

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APEX

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IUPAC Global Women's Breakfast 2021
Nasi Lemak and Teh Tarik with Women Chemists@UiTM
GWB2021@UiTM

Date: 9th February 2021
Venue: Online Webex Platform

This is the first-ever webinar on IUPAC Global Women's Breakfast (GWB 2021) – Nasi Lemak and Teh Tarik with women chemists @ UiTM by the School of Chemistry and Environment (PPKP) that was conducted virtually due to Movement Control Order because of COVID 19 pandemic. The GWB 2021 with the theme "Empowering Diversity in Science", stimulates chemists to present innovative research ideas as well as encourage discussion and collaboration across universities and industries.

The main purpose of GWB 2021 is to establish an on-going network where women in the chemical and related sciences can connect with each other in a meaningful way to support their professional aspirations. GWB 2021 was held two days prior to the United Nations Day of Women and Girls in Science. Goal 5 of the United Nations Sustainable Development Goals is: Achieve gender equality and empower all women and girls.

Nasi Lemak and The Tarik are the most popular morning breakfast among Malaysians. Participants engagement in the webinar was achieved through an active participation where they posed Instagram and tweeter photo together with Nasi Lemak and Teh Tarik. The webinar was jointly organized by other government agencies namely Chemistry Department of Malaysia, SIRIM Berhad, Malaysian Institute of Chemistry and Universiti Teknologi MARA (UiTM). A virtual forum was organized from 9.00 am until 11.00 am.

The webinar received overwhelming response; a total of 115 participants in Webex and 349 in Facebook live. University staff, postgraduate and undergraduate students as well as public participated in the virtual webinar. The webinar was officiated by the Dean of Faculty of Applied Sciences, Prof. Dr. Hj. Farida Zuraina Mohd Yusof after the opening speeches by the Chairperson, Assoc. Prof. Dr. Zainiharyati Mohd Zain.

The dean highlighted that the success of GWB 2019 and 2020 have demonstrated a network of both women and men working together to address the barriers and inequalities faced by women in science. Such continuous initiative and effort have catalysed momentum on the establishment of an on-going networking in a meaningful way to support their professional aspirations and to develop leadership skills.

The webinar started with a talk by Ms. Liyana Shahira Asshad, an alumni of UITM, who works as a photonic engineer and crisis manager in Germany. She shared her experience in adopting chemistry knowledge for her career pathway and the strengths for seeking a job or higher position in job market. Her talk indeed was an inspiration to younger women chemist and students.

Dr. Maisari Utami from Universitas Islam Indonesia was an invited international collaborator; expressed her thoughts about challenges that women chemists faced and collaboration opportunity between Universitas Islam Indonesia and UiTM. This session was moderated by Prof. Dr. Norizan Ahmad.

Our master of ceremony, Dr Hamizah Mohd Zaki with a mug of Teh Tarik

Assoc Prof Dr. Zainiharyati Mohd Zain, Chairperson of GWB2021@UiTM

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Special Appearance from Alumni

MS. LIYANA SHAHIRA ARSHAD
PHOTONIC ENGINEER AND CRISIS MANAGER
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The session also invited 3 panels, ChM. Dr. Nazarudin Mohamed @Ibrahim from Chemistry Department of Malaysia, ChM. Dr. Nurul Izza Nordin from SIRIM Berhad and Prof. Ts. ChM Dr. Chan Chin Han from Malaysian Institute of Chemistry. Dr. Lim Ying Chin served as a moderator of the forum and panels shared their experience of what inspired them to be a chemist as well as women multiple roles in the society which includes work, family and life. Dr. Nazaruddin discussed about gender equality that is being practiced among the chemistry professionals in Malaysia.

Dr. Nurul Izza emphasised on women entrepreneurship in the chemical industry. Prof. Chan shared her views on chemist sustainability and relevance in our society and the achievement of women chemists in Malaysia according to the professional body's perspective.

During the Q&A session, all inquiries and concerns were well-explained by members of the panel with examples. The webinar concluded with a photo session. Overall, this was a fruitful and successful webinar whereby positive feedback from participants were received with an excellent rating score.

In a nutshell, the webinar's organizing committee expresses their sincere appreciation to UiTM and IUPAC for the opportunity to organise this event.

The GWB2021@UiTM organizing committee

Collaborator from Universitas Islam Indonesia

Prof. Chan Chin Han, GWB2021@UiTM forum panellist

Multi-Residue Pesticides Analysis in Vegetables using QuEChERS method by Gas Chromatography-Tandem Mass Spectrometer (GCMSMS) in comparison with liquid-liquid extraction method by Gas Chromatography-Micro Electron Capture Detector (GCµECD)

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ABSTRACT
A multi-residue pesticides analysis in vegetables was established using QuEChERS extraction method and analysed with a Gas Chromatography-Tandem Mass Spectrometer (GCMSMS) in comparison to liquid-liquid extraction method by Gas Chromatography-Micro Electron Capture Detector (GCµECD). The samples for GCMSMS analysis were extracted by 1% acetic acid in acetonitrile and cleaned by dispersive solid phase extraction with anhydrous magnesium sulphate ($MgSO_4$) and primary secondary amine (PSA) whereas for analysis using GCµECD, the samples were extracted with acetone, dichloromethane and petroleum ether with no clean-up step. The parameters for both the GCMSMS and GCµECD were optimized for the analysis of the multi-residue pesticides within a run time of 20.75 and 30.60 minutes respectively. The mean recoveries were within the range of 70 – 120 % with RSDs of all the pesticides analysed to be < 20% indicating satisfactory precision.

KEYWORDS
Gas Chromatography-Tandem Mass Spectrometer, Gas Chromatography-Micro Electron Capture Detector, QuEChERS, Multi-residue Pesticides

INTRODUCTION
QuEChERS, a method widely used nowadays for the analysis of pesticides is an easier and less expensive method compared to other conventional methods. The name is a word formed from "Quick, Easy, Cheap, Effective, Rugged and Safe". The amount of time needed for extraction was shortened and it also helps in increasing the life span of the column as there is a clean-up procedure done on the samples before analysis is carried out with the instrument. Multiple monitoring mode (MRM) used in GCMSMS is an ideal technique for multi-residue analysis as it is very sensitive and selective in identifying target compounds. In MRM mode, a precursor ion of a target residue is isolated in the first quadruple followed by a collision in the second quadrupole after which selected product ions are filtered through the third quadruple to reach the detector. Thus, specific target compound will be identified directly.

METHODS
Instrumentation
Analysis was carried out using a Gas Chromatography-Tandem Mass Spectrometer (GCMSMS) Agilent 7890B system in comparison to a Gas Chromatograph-Micro Electron Capture Detector (GCµECD) Agilent 6890N. Data processing was

	GCµECD	GCMSMS
Column	Column 1: DB-35MS (30 m x 320 µm x 0.25 µm), Pressure: 18.47 psi, Flow: 3.6 ml/min, Average velocity: 56 cm/sec, Column 2: HP-5 5% Phenyl Methyl Silicone (30 m x 320 µm x 0.25 µm), Pressure: 18.47 psi, Flow: 3.6 ml/min, Average velocity: 56 cm/sec	Column 1: HR5MS U1 (15m x 250 µm x 0.25 µm), Pressure: 9.3672 psi, Flow: 0.974 ml/min, Average velocity: 25.761 cm/sec, Hold up time: 0.97047 min, Column 2: HR5MS U1 (15m x 250 µm x 0.25 µm), Pressure: 3.2771 psi, Flow: 1.229 ml/min, Average velocity: 57.417 cm/sec, Hold up time: 0.43541 min
Oven Temperature	110 °C	60 °C
Mode	Splitless	Splitless
Heater	80 °C	80 °C
Pressure	18.47 psi	9.3672 psi
Septum purge flow	55.6 ml/min	3ml/min
Thermal Aux 2 (MSD Transfer Line) Temperature	NA	250 °C
Post Column Details	NA	Backflush, Start time: 20.75 min, Post run duration: 5.00 min, Oven Temperature: 310 C, Inlet Pressure: 1 psi, Column flow: 4.078 ml/min
Inlet	NA	Multi-Mode MMI
Carrier gas	Helium	Helium
Collision gas	NA	Nitrogen

The recommended operation conditions for the both the instrument system performed using the Agilent Masshunter software for the GCMSMS system whereas Agilent Chemstation software was used for data processing in GCμECD.

Preparation of standards
GCMSMS
Stock standard solutions of 500 mg/L were prepared by weighing 5 mg of each pesticide standard into a 10 mL volumetric flask and made up to volume with methanol. Mixed multi-residue pesticides standards of 10 mg/L were then prepared by pipetting 0.2 mL of each stock standard solution into a 10 mL volumetric flask and made up to volume with acetone : isooctane v/v 25:75. A working standard solution of 1 mg/L were then prepared by pipetting 0.1 mL of the 10 mg/L mixed multi-residue pesticides standard into a 2 mL vial and make up to 1 mL with acetone : isooctane v/v 25:75. The calibration standards at 10, 20, 30, 50, 100, 200 and 400 μg/L were freshly prepared for the construction of the calibration curve using the matrix-matched approach. 10 μL of internal standard – triphenyl phosphate were added into each calibration standard.

GCμECD
Stock standard solutions of 500 mg/L were prepared by weighing 25 mg of each pesticide standard into a 50 mL volumetric flask and made up to volume with acetone-isooctane v/v 25:75. Mixed multi-residue pesticides standards of 10 mg/L were then prepared by pipetting 0.2 mL of each stock standard solution into a 10 mL volumetric flask and made up to volume with acetone : isooctane v/v 25:75. A 2 mg/L mixed multi-residue pesticides standard was prepared by pipetting 2 mL of the 10 mg/L mixed multi-residue pesticides standard into a 10 mL volumetric flask and made up to volume with acetone : isooctane v/v 25:75. A working standard solution of 0.04 mg/L was then prepared by pipetting 0.02 mL of the 2 mg/L mixed multi-residue pesticides standard into a 2 mL vial and made up to 1 mL with acetone : isooctane v/v 25:75.

Preparation of samples
A minimum of at least 1 kg of vegetables were chopped and were then homogenized and mixed thoroughly using a blender. For QuEChERS extraction by GCMSMS, a representative sample of 15 ± 0.05 g of the sample was weigh for analysis in a 50 mL centrifuge tube. The test portion was then extracted by adding 15 mL of 1% acetic acid in acetonitrile. The sample was shaken and vortexed for 1 minute. 150 μL of internal standard was added to the sample. The tube was capped and shaken vigorously. 6 g of anhydrous magnesium sulphate ($MgSO_4$) and 1.5 g of sodium acetate (NaOAc) were added into the same tube. The tube was shaken and vortexed for 1 minute. The tube was centrifuged at 4000 rpm for 2 minutes. A dispersive solid phase extraction (dSPE) clean-up of the supernatant was performed. 5 mL of the supernatant was decanted into a 15 mL centrifuge tube containing 0.45 g anhydrous $MgSO_4$ and 0.15 g PSA. The tube was shaken and vortexed for 1 minute. The tube was centrifuged at 4000 rpm for 2 minutes. 1 mL of the final extract was transferred into a 2 mL auto sampler vial and 3 μL was injected into GCMSMS for analysis. For liquid-liquid extraction by GCμECD, a representative sample of 10 ± 0.05 g of the sample was weighed for analysis in a 50 mL centrifuge tube. The test portion was then extracted by adding 10 mL of acetone. The sample was shaken and vortexed for 1 minute. 5 g of anhydrous sodium sulphate (Na_2SO_4) was added into the same tube. The tube was shaken and vortexed for 1 minute. The extract was then added with 10 mL of dichloromethane and 10 mL of petroleum ether. The sample was shaken and vortexed for 1 minute. The tube was centrifuged at 4000 rpm for 2 minutes. 5 mL of the supernatant was decanted into a 15 mL centrifuge tube and 1 drop of dodecane was added into the extract. The extract was evaporated to dryness. 1 mL of acetone was added into the dry extract and was then transferred into a 2 mL auto sampler vial and was injected into GCμECD for analysis.

RESULTS
Linearity of the calibration curves of all the pesticides tested using GCMSMS has $r^2 \geq 0.99$. Example of a few of the calibration curves are shown in Figure 1. Satisfactory mean recoveries ranging from 70 % to 120 % (refer to SANTE/11945/2015) were obtained for samples that were analysed with GCMSMS. The samples were spiked with multi-residue pesticide standard solutions at 10 μg/L, 50 μg/L and 100 μg/L. However, some samples that were analysed using GCμECD have recovery that are below 70 %. The relative standard deviation (RSD) for most of the pesticides analyse with GCMSMS ranges from 1.00 % to 10.00 % whereas RSD for analysis done with GCμECD has a higher RSD reading. LOD for each of the pesticides is found to be at least 10 times lower than the maximum residue limit (MRL) of 0.01 mg/kg when analysed with GCMSMS.

DISCUSSIONS

Analysis using GCMSMS can determine both quantitation and confirmation process whereas analysis using GCμECD can only determine quantitation process. Longer analysis time is needed when analysing with GCμECD as results need to be confirmed by other qualitative technique such as with gas chromatography mass spectrometer (GCMS). This is because as a non-specific detector, the target compound identification is only achieved by comparing the retention time of the sample chromatographic peak and its expected retention time as determined during calibration. On the other hand, GCMSMS was able to detect almost all volatile compounds which in this case were pesticides from organophosphorus, organochlorine, synthetic pyrethroid, fungicides, triazole and triazine whereas GCμECD can only detect halogenated compound such as organochlorine, synthetic pyrethroid and fungicides. GCMSMS also provides excellent sensitivity as MRM mode is used during analysis where the specific target compound transition has been set. This allows identification and quantitation of pesticides at low levels. GCMSMS is capable of analysing simultaneous full scan and MRM which provides the capability to identify more specifically compounds analysed to the targeted pesticides. GCMSMS also has a wide range of pesticides database, each with their retention time, multiple transition for quantitation and confirmation and thus makes it so much easier during method development. Method development using GCμECD will need a lot more time and effort as each pesticides standards need to be analysed beforehand to identify the retention time before it can be set into the method.

Instrument	GCMSMS			GCμECD		
	Recovery (%)			Recovery (%)		
Concentration (μg/L)	10	50	100	10	40	400
Pesticides						
Lindane	87.2	99.6	98.5	69.0	102.0	64.0
Hexachlorobenzene	79.7	97.6	102.1	80.0	107.0	96.0
Aldrin	75.9	103.8	112.4	63.0	79.0	79.0
Bifenthrin	74.2	106.3	113.1	77.0	70.0	72.0
Permethrin	74.6	103.6	109.7	108.0	89.0	63.0

Table 1 Comparison of mean recoveries for GCMSMS and GCμECD.

Instrument	GCMSMS			GCμECD		
	RSD (%)			RSD (%)		
Concentration (μg/L)	10	50	100	10	40	400
Pesticides						
Lindane	7.30	3.83	4.10	8.85	10.71	6.17
Hexachlorobenzene	6.66	3.23	5.51	15.09	2.07	3.44
Aldrin	3.78	2.45	4.23	18.41	2.44	4.11
Bifenthrin	3.73	3.24	2.62	4.07	12.74	10.82
Permethrin	5.36	3.29	2.52	3.50	14.64	7.24

Table 2 Comparison of relative standard deviation (RSD) for GCMSMS and GCμECD.

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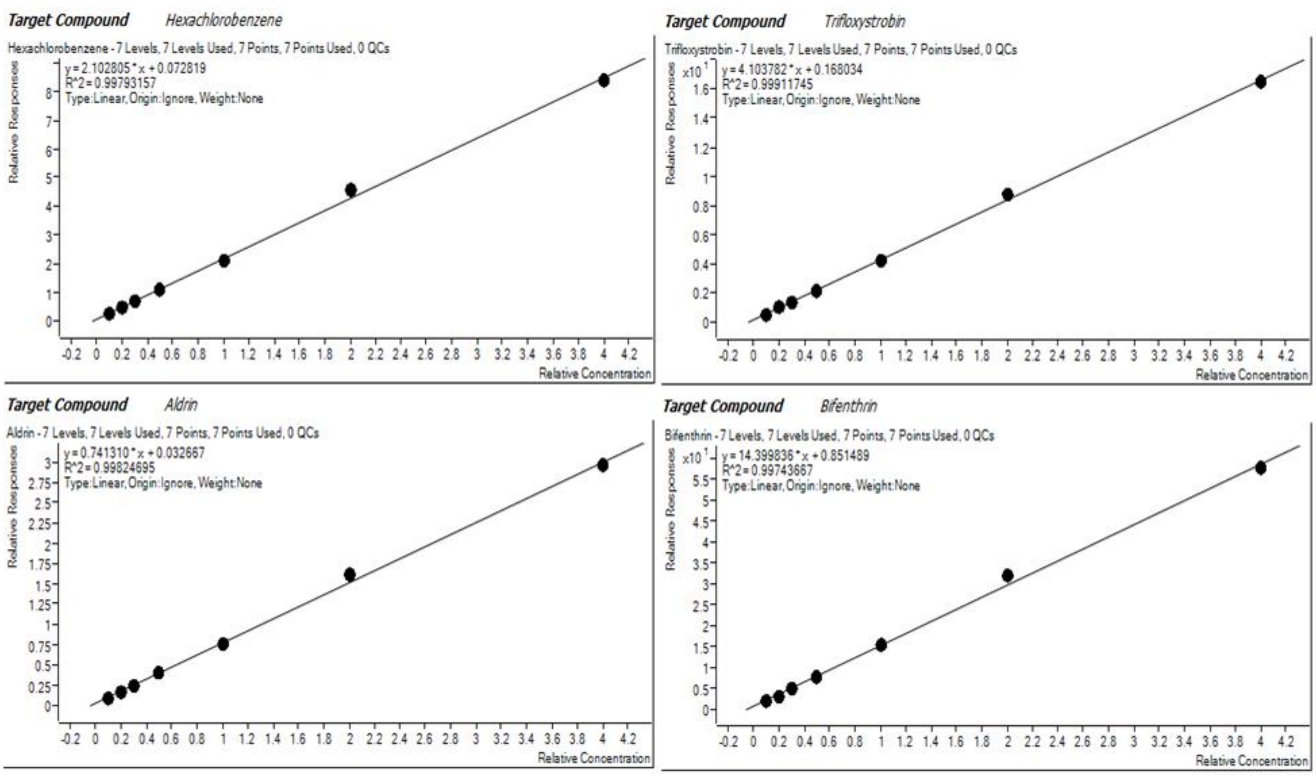

Figure 1 Linearity of calibration curves for analysis using GCMSMS

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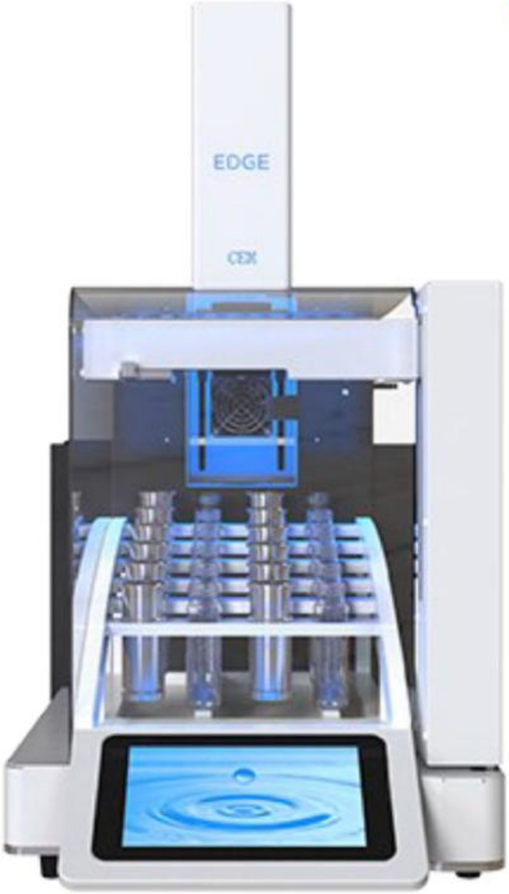

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GWB@USM 2021: Take Away with a Snap

ChM Dr. Lee Hooi Ling

The 2021 IUPAC Global Women's Breakfast (GWB@USM 2021) at Universiti Sains Malaysia (USM) was held at the School of Chemical Sciences on 9 February 2021. This event is the second time that it was organized in USM since its inception in 2019. Due to the Covid-19 pandemic, *Take Away with a Snap* was selected, in which strict SOP was practiced. Packed foods were ordered where participants would collect them with selfies to support this year's GWB's theme on Empowering Diversity in Science. Besides, a food bank cabinet for students was also set up on this momentous day. To celebrate the solidarity of this occasion, USM also collaborated with Universiti Kebangsaan Malaysia (UKM), Institut Kimia Malaysia (IKM), and American Chemical Society (ACS) Malaysia Chapter to coordinate an online webinar by ChM. Prof. Dr Yang Farina from UKM on "How to be resilient during the pandemic?". The webinar gained a positive response and had a good turn up in the session.

By the end of the day, it attracted organizers from 319 cities in 70 countries. We hope to see you next year, 2022GWB, which is tentatively planned for 16 February 2022!

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Chemometric Approach In the Identification of Plastic Waste

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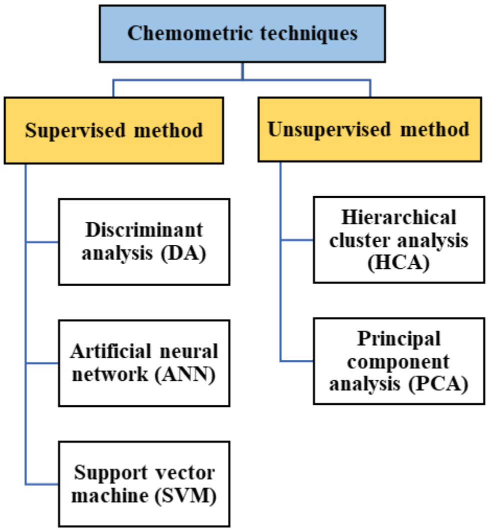
Polymers, or commonly referred to as plastics by the public have a wide range of uses not only due to their low price, but plastics also have many other advantages including durable, lightweight, non-rusty and others. Examples of commonly used plastics include poly (ethylene terephthalate) (PET), high density polyethylene (HDPE), low density polyethylene (LDPE), poly (vinyl chloride) (PVC), polypropylene (PP) and polystyrene (PS) (Chamas et al., 2020). Apart from commodity plastics such as PET, HDPE, LDPE, PVC, PP and PS, there are also polymers that can be classified as advanced materials, such as poly(butylene adipate-*co*-hexamethylene adipate), unsaturated polyamide, polyimide, and polyaniline which are used in the health, automotive, aerospace and electronics sectors respectively.

Our World in Data (OWD) estimates approximately 400 million tons of waste materials are currently produced worldwide (Lavender et al., 2020). The OWD reports that most of these plastic wastes are found in areas within 50 kilometers of the sea, which may be related to public areas or downstream areas. Malaysians recorded an increase in plastic waste production by more than 100 percent in less than 15 years, which is 38,142 tonnes in 2018, compared to 19,000 tonnes in 2005 (Muzamir, 2020). The Solid Waste Management and Public Cleansing Corporation (SWCorp) reports that one Malaysian produces 1.17 kilograms of rubbish a day in 2018, compared to only 0.8 kilograms in 2005, 20 percent of which is plastic waste. In addition to landfills, plastic waste may be released into the environment during collection or transportation. Illegal dumping of domestic and industrial waste into abandoned areas is often a major source of pollution (Allsopp et al. 2005). The presence of plastic waste in the environment, whether as a macroplastic or as a microplastic fragment, has been recognized as a global issue. It is one of the most challenging anthropogenic phenomena affecting planet earth and is also one of the major threats to biodiversity (Machado et al., 2018). Biodegradable polymers or generally biodegradable plastics refer to polymers that are capable of decomposing producing carbon dioxide, methane, water, inorganic compounds, or biomass where the dominant process is the enzymatic reaction by microorganisms (Song et al., 2009). Typically, biodegradable plastics are made from renewable raw materials such as starch or cellulose (Vijaya & Reddy, 2008). Biodegradable plastics can also be produced directly through enzymatic polymerization. For example, biodegradable polyester can now be produced using Lipase as an enzyme (Pasma et al., 2018). The basic material in the production of polymers, namely monomers can be produced either through sugar fermentation on (Pasma et al., 2018) or enzymatic degradation on the lignin (Pasma et al., 2019). Renewable biomass, such as oil palm empty fruit bunches can be used as raw material in sugar production (Pasma et al., 2013). Sugar is produced when either acidic hydrolysis or enzymatic hydrolysis on one of the components of lignocellulosic material, namely cellulose is carried out. Indeed, the use of biodegradable plastics is a better approach as it can help address the effects of environmental pollution including increasing soil pollution (Allsopp et al., 2005). After all, nowadays biodegradable plastics find many applications in various sectors of use.

The fact is that a large number of plastics are not biodegradable. Even biodegradable plastics still have the potential to have a significant impact on ecosystems and human health (Song et al., 2009; Manzoor et al., 2020). Although biodegradable plastics are better than non-biodegradable plastics, they are also likely to be microplastic sources (Cole et al., 2011). According to a report by *Plastic Debris in the World's Oceans* (Allsopp et al., 2005) further research is needed to identify whether biodegradable plastics are fully decomposed or not in different environmental conditions, what are their residues and their hazard levels. Studies on plastic waste pollution in soil are increasingly being conducted to identify the level of plastic waste pollution in an area. This is important because the presence of plastic waste can affect soil ecosystems (Guo et al. 2020). The presence of plastic waste in the soil will reduce soil fertility and inhibit plant growth (Vijaya & Reddy, 2008). In general, efforts to identify the presence of plastic waste in the soil involve a large number of samples and many data sets need to be analysed one by one. As a result, this method takes a long time. In fact, data interpretation is also often subjective due to confusion in the identification of plastic waste. Various methods have been used to detect the presence of plastic waste in the soil such as infrared spectroscopy (FTIR) (Afrin et al., 2020; Chai et al., 2020; Li et al., 2019) and Raman spectroscopy (Dong et al.,



2020; Mehdinia et al., 2020; Sobhani et al., 2019). In fact, researchers began using methods that could speed up the identification process by combining spectroscopy techniques and chemometric techniques (Bertoldi et al., 2020; Li et al., 2019; Shan et al., 2018). Raman spectroscopy technique has advantages over other spectroscopy techniques such as short analysis period, minimal sample preparation and the Raman spectrum produced is not disturbed by the presence of water or moisture. The most commonly used chemometric techniques are principal component analysis (PCA) and hierarchical cluster analysis (HCA). Pearson correlation matrix can be used to show the relationship between each sample according to the type of plastic. Coastal areas, rivers and landfills have the potential to be contaminated with plastic waste which can be directly linked to human activities such as recreational activities, garbage dumping and garbage collection (Leed & Smithson 2019). Therefore, the author has selected several coastal and river areas in Melaka, as well as landfills in Dengkil Selangor for the purpose of preliminary studies. Generally, the results of this study show that samples from Pantai Puteri and Pantai Tanjung Kling have plastic waste content in the range of 50 - 60 ppm. Meanwhile, the level of plastic waste pollution as found the samples from Tanjung Bidara Beach and Tanjung Bidara river bank is in the range of 90 - 100 ppm.

The picture above shows the ZnCl2 solution used to extract soil samples (left), plastic waste mixed with organic matter added with oxidizing agent, H2O2 then heated on a hot plate (center) and organic matter begins to decompose on day 3 of the process of plastic waste cleaning (right).

The level of plastic waste pollution found in samples from Dengkil landfill is in the range of 80 - 90 ppm. In addition, the results of the study also show that polyethylene dominated all study areas by 54 percent, followed by PS by 38 percent and PP by 8 percent.

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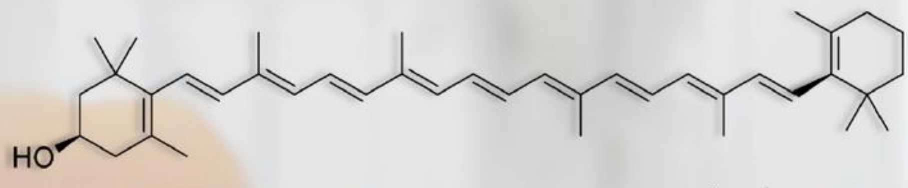
The Chemistry of - MANDARINS -

One of the Must-Have Fruits for Chinese New Year!

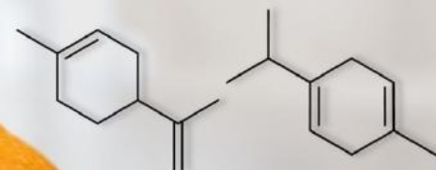
Sight: Beta-cryptoxanthin



βCX (in short) is the molecule that accounts for the **orange-yellow colour** of ripe mandarins.

Smell: Monoterpenes

Limonene (75%) and **gamma-terpinene** (16%) are the main molecules that make up the distinct scent of mandarin essential oil.



Happy Chinese New Year!

by ChM Dr Yvonne Choo Shuen Lann

Gong Xi Fa Cai

Taste: A Mix of Sweet, Sour and Bitter

You may notice some mandarins are less sweet, that may be due to the sour component (**citric acid**) being more than the sweet (**glucose, fructose, sucrose**). Like a balancing game!

Did You Know?

柑 (Its Chinese name) can be read as "Kam" in Cantonese which symbolises "**Gold**".

Chap Goh Mei (15th Day), young ladies throw **mandarins** inscribed with contact details into the river in hope of gaining a husband/boyfriend.

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