
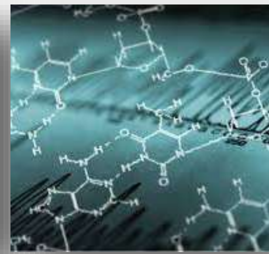


Berita IKM - Chemistry *in* Malaysia

June 2021



ARTICLES

- A Technology Transfer Framework for Smart Business Partnership
- Feeding the World in a Time of Climate Change
- Biosensors For Home Testing of COVID-19

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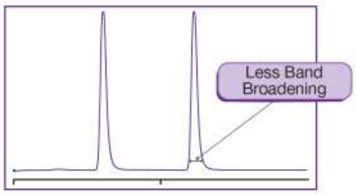

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Contents

Message from the President

COVID-19 Pandemic

On the current situation of the COVID-19 pandemic in Malaysia, I believe that we have reached a very critical stage. Recently we have more than 9,000 daily cases with 127 deaths. This is the highest in terms of the number of daily cases and deaths. For the last two weeks, the numbers of cases have shot up to more than 6,000 per day and the number of deaths has also increased significantly to nearly 3 digits. In fact, May is the deadliest month of the COVID-19 pandemic in Malaysia with more than 500 deaths. And looking at the trends in the last two weeks, we would not be surprised if the number of cases goes beyond 10,000 in the coming weeks.

This COVID-19 situation is really bad in Malaysia. Unfortunately, we have the honour of being number one in the number of COVID-19 cases per capita in the ASEAN countries. We are running out of ventilators in the hospitals and many patients with mild symptoms or are asymptomatic, are being turned away from hospitals and asked to quarantine at home. The ICU beds are been filled up very quickly and very soon, we will be overwhelmed with COVID-19 patients with not enough hospital beds and ICUs.

Is there a way out of this pandemic? Of course, we have to reduce the number of cases. This can only be done with strict control and following the SOPs imposed by the government. As professional chemists and responsible citizens, we have to make sure that we follow the SOPs closely and also make sure our family members and friends do the same. Avoid any unnecessary social functions and follow SOPs strictly while at work and also at home. This is the only way that we can reduce the number of cases gradually.

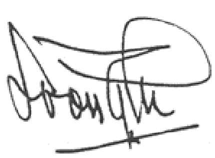
Of course, there is a parallel prong of attack to fight the pandemic. That is through vaccination. But our vaccination process is proceeding at such a slow pace that it will take months to vaccinate 70% of our population with age of 18 years and above. Considering we have a population of 32 million and people of ages 18 and above make up 70%, then we have 22.4 million of this group of citizens out of which 70%, or 15.68 million need to be vaccinated. Even if we vaccinate 1.0 million people a week, we need 16 weeks or 4 months to do the job. But we are nowhere near 1.0 million a week! This, the Government has to do something urgently! Otherwise, many Malaysians are going to die due to COVID-19.

As far as IKM, we are closing our office from 1 – 14th June 2021 following Government's total lockdown order. Our activities are also being halted until the COVID-19 situation is much better. For some meetings or events where we can, we shall do online or by zoom. Anyhow, the safety and wellbeing of our members come first.

But I believe that we human will win this war against the coronavirus. Very soon, there will be new medicine and drugs that are capable of controlling this disease and this virus will be just like the common cold. Things will be back to normal but we must always be alert on another outbreak of new viral diseases.

In the meantime, keep well and be safe and very soon, you will be able to enjoy life as like before.

Thank you and with best wishes.



Datuk ChM Dr Soon Ting Kueh
President, Institut Kimia Malaysia
Date: 31 May 2021

A Technology Transfer Framework for Smart Business Partnership

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Abstract: Major obstacle in getting research product or technology to market is the acknowledgement or reputation of the product or technology in industry. In addition, researchers have little knowledge in identifying the technology readiness level and assuming that prototypes are ready-made items for sale. This paper is guiding any technology transfer office in commercializing research product or technology through a powerful tool, which is licensing. Licensing mechanism is explored through the establishment of a smart business partnership framework. The important key factors are determined and described in details through usage of several case studies. The execution of the activities are lined up based on a stage-by-stage protocol starting from the IP management, proof-of-concept identification followed by a-or b-prototyping and finalized with term sheet that initiate the licensing step. The limitations and barriers are also discussed.

Introduction

Technology transfer involves the transfer of knowledge and technical expertise, which can also be in term of physical devices and instrumentation. Some of the mechanisms that make technology transfer possible include joint research, collaborative agreements, licensing, technical and business pitching, trade exposition, [1] and information dissemination, which might include the usage of social media. Technology Transfer, also called Transfer of Technology and Technology Commercialisation, is the process of transferring skills, knowledge, technologies, methods of manufacturing [2], samples of manufacturing [3][4] and facilities. This can occur among governments or universities and research institutions. However, the most intended goal is to the industrial players to ensure that scientific and technological know-how are delivered efficiently. Some parameters that are often being missed out involved the scaling up process, the marketing tools ie social media, on-line marketing or establishment of a marketing agency. Many companies, universities and governmental organizations now have an Office of Technology Transfer (TTO) dedicated to identifying research, which has potential commercial interest and strategies for how to exploit it. However, improper management and administration of the technology transfer related matters are possible to cause misconduct behaviors that go beyond the legalized procedures set by acts, statutes, regulations or common procedures [5][6][7]. This article is proposing a framework of managing and conducting technology transfer of research and innovation outputs. The framework was established based on a collection of data accumulated based on case studies and successful commercialized intellectual property.

Procedures

Fig. 1 depicted the common pathway taken upon protection of intellectual property (IP) for novel innovation. The proposed start-up company (STU) can only be a choice when a joint venture (JV) company is not preferred. This is often the case when the technology readiness level (TRL) is at a stage where further market validation on b-prototype is needed. This article is intended to present the preliminary version of a framework (Fig. 2) designed to ameliorate an organization`s technology transfer capabilities. The method utilized was action research. The authors participated in the development of this initial version from May 2017 to April 2019, period during which we maintained close contact with the organization, its staff and some of its research and development projects, being able to acquire enough information and expertise to depict the referred framework. Two case studies, each from the science and technology cluster (with a food-based industry-Company A) and the social science cluster (with an ICT-based industry-Company B) were selected. Information was gathered to describe the background of the technology, provide an overview of the transfer events, identify the transfer strategies, describe the transfer process used, and explore the elements and mechanism involved that are responsible for the success or failure of the transfer process. The approach used was a combination of a case study and exploratory research. Primary data was collected through interviews with key individuals at Company A and Company B. This process consisted of interviews with the technology transfer facilitators assigned to manage each of the cases concerned with this research. The interview process was not limited to the interview questions; the session was used as an opportunity to understand other aspects of technology transfer that do not lie within the framework of this study (see Table 1).

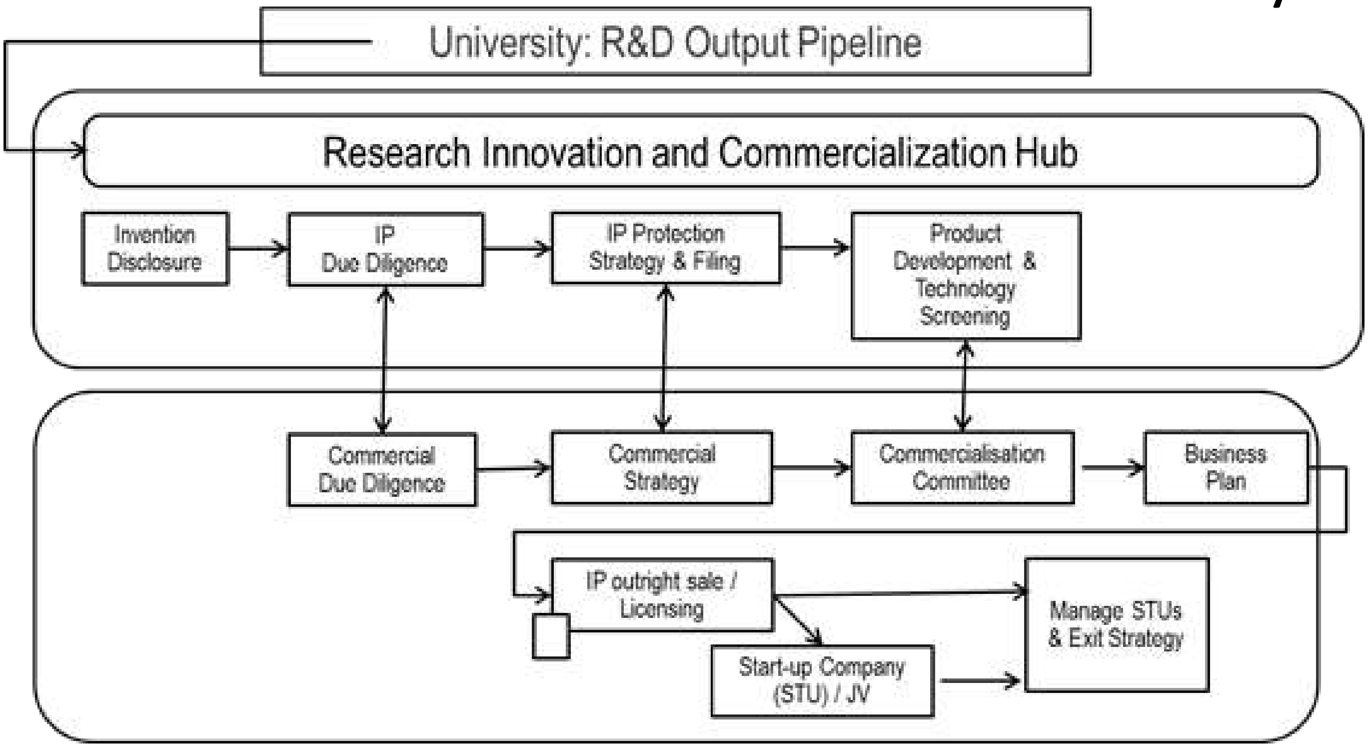

Fig. 1: Common pathway in conducting technology transfer in research institutes and universities in Malaysia

Findings

For the purpose of the investigation, the concept of 'transfer' not only retains its defined meaning of moving something to another location, but also includes the use of the transferred item [9]. 'Technology transfer' can be defined as a transfer of technical know-how, information, and people among corporate technical functions such as engineering, R&D, and manufacturing, and nontechnical functions such as sales and marketing to yield innovative services and products that meet the strategic needs of a business and a customer [4],[5],[9],[10]. It is commonly mentioned in the literatures that no two -technology strategies are the same, and that therefore technology transfers need to be tailored to a specific context. To this end, Khabiri, Rast and Senin [11] provide a framework for the technology transfer process in the broadest sense. The process is defined as a sequence of four different stages: prospecting, developing, trial, and adoption. Prospecting involves identifying the technologies that may be necessary to satisfy the needs of the end users. Developing involves further refining and enhancing the technologies. The trial stage involves the field-testing of the technologies to ensure that they meet the performance criteria before being transferred to the end user. After success in the first three stages, the technology is further developed, if necessary, before it is implemented or adopted by the end user. This process is dynamic, and the stages may overlap or take place in parallel. As with any complex system, developing a well-defined strategy can be the key factor for successful technology transfer.

For the purpose of this article, a strategy is defined as a roadmap that outlines the progress of the task and identifies possible barriers [12]. Shama [13] reveals three types of technology transfer strategy that have been used by national R&D facilities: passive, active, and entrepreneurial. Each strategy requires a certain level of commitment from the developer and the end user to make the strategy successful. A passive strategy, or a response to a 'pull effect', is concerned with information dissemination, and entails providing information or responding to enquiries [13]. According to Jun and Ji [14], a pull strategy happens when end-users express their technological needs (and/or demands) first, and then try to source the technology. The manufacturer is made aware of the market need, a solution to address this need is sought and identified (source), and the innovation is transferred [15]. An active or 'push' strategy entails 'pushing' a technology into the marketplace [13]. Push transfer strategies start by identifying one or more innovations. Then the market/operator (destination) is made aware of the innovation, the associated market need, and the business opportunity, and the innovation is transferred (via some transfer mechanism) from source to destination [15]. The need for the technology may not exist at that moment, but the idea is to push the technology in anticipation of changing the paradigm in favor of the technology. The entrepreneurial strategy integrates the passive and active strategies and introduces the idea of using the technologies to improve the economic wellbeing of an organization, and thereafter to create jobs [13].

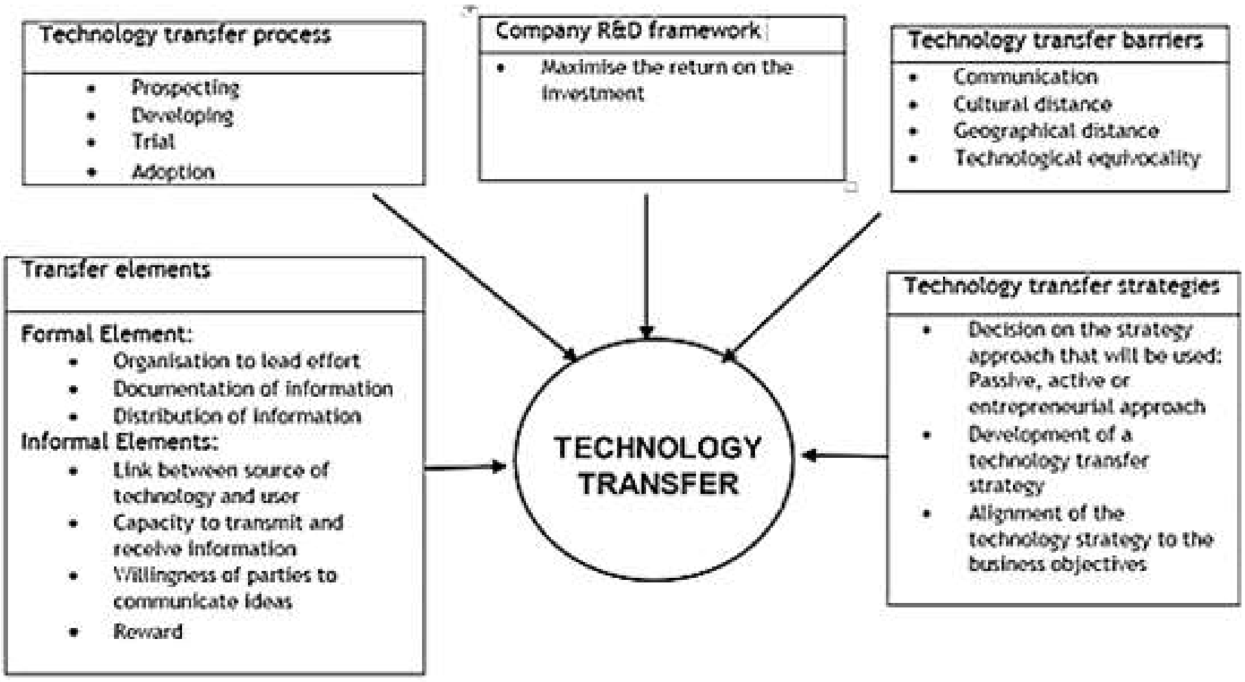

Fig. 2: Proposed framework for Technology Transfer in Universities and governmental Research Institutes.

Core areas of focus for the case studies
Initiation: Establish the starting point of the transfer, and identify why and by whom the transfer was conceived. The data that will be collected will define the importance of various stages of the process
Transfer strategy/process transfer: This research explores whether a dedicated plan is created in advance to facilitate the transfer, and compares it with existing plans from other similar companies. It seeks to investigate the steps involved in the creation of the plan and, again, compares them with the processes that are identified in the literature. The interview session also included discussions of how the technology transfer process for various technologies compares with other models.
Transfer mechanisms/elements: The researchers attempted to identify the formal and informal elements or factors that are present during the technology transfer. Specific details were obtained to describe what each mechanism entails, to what extent it was used, and how it contributes to the transfer process.
Technology transfer grid: The researchers examined the level of technical equivocality of the technologies, the level of communication between the transfer processes, and how cultural and geographical differences influence the process.

Table 1: Foundation for the case studies

The analysis of case studies within the literature has highlighted factors within multinational organizations that have a great influence on the technology transfer process. Gibson and Sung [17] determined four important variables for technology transfer processes within and between organizations. These are communication interactivity, geographical and cultural distance, technological equivocality, and personal motivation. Gibson and Sung [17] combine the four elements in what they described as a technology grid that illustrates the importance of each factor in the success of a technology transfer process. Core barriers that have been identified include communication, which can be improved through creating a favorable cultural environment, trust, stronger ties between units, and a shared vision [18],[19],[20]. Factors that also affect the ease with which knowledge can be transferred are a lack of absorptive capacity, lack of motivation, lack of retentive capacity in recipients, and arduous relationships [21]. Further issues may include company politics, portfolio strategy and business strategy misalignment, lack of appropriate technical and human resources, the lack of a demand side environment, infrastructure issues, and dispersed geographical locations [22],[23]. The analytical framework contains the core themes and driving factors used to analyze the study.

Transfer process:

- Establish a top-level organizational strategy for technology transfer, and use it to facilitate the planning of the transfer stages, and to establish a culture for technology transfer within an organization;
- Because all technology transfer processes are

unique, approach the process on a project-by-project level to ensure that objectives and timelines are appropriate to the unique requirements of the project.

Technology strategy and transfer elements:

- Put portfolio management processes in place to ensure an overarching strategic approach to selecting projects; · Identify a single individual to manage the transfer project. The idea of having a single point of contact is good for communication management, and minimizes the potential for misunderstanding;
- Engage with end users right from the start. This is important in ensuring that appropriate objectives are set and in developing shared ownership of the technology. This tends to ensure less resistance to change on the part of the recipients of the technology;
- Undertake aggressive outreach efforts that emphasize pushing a technology into a new application. Consistently conduct market analyses to identify new potential end users. Once potential users are made aware of the technology, pull-efforts may be facilitated to assist the transfer process. Transfer efforts should focus on demonstrating the technology in its new application;
- Make use of personnel with relevant academic backgrounds and experience that will enhance the transfer process;
- Do not underestimate the informal elements, which are critical to the success of a technology transfer. Effective communication is paramount to a successful transfer process. It also minimizes the geographical distance barrier. Make use of visual telecommunication technologies as part of the solution to address the geographical barrier;
- Tie motivation for collaboration to performance targets and rewards.

Transfer barriers:

- Establish measures for success.
- Reduce the level of complexity in a technology to improve the transfer process and the effectiveness of the technology;
- Consider how to overcome: barriers of communication, lack of shared vision, lack of absorptive capacity, lack of motivation, lack of retentive capacity in recipients, company politics, portfolio strategy and business strategy misalignment, lack of appropriate technical and human resources, lack of a demand-side environment, infrastructure issues, and dispersed geographical locations.

Conclusion

There is no specific formula or tool in commercializing research product or technology. The safest route by mean of protecting university's reputation and interest is through licensing mechanism. The licensing though, must be with a company with if not reputation, is of no connection to the university.

Acknowledgements: The authors would like to thank Universiti Kebangsaan Malaysia for the funding allocation to conduct the research through its grant scheme KRA (Key research area) with grant no KRA-2018-010. A Business IT intern and a Master in Business Administration graduate assisted the project.

References

Lee, J. and Win, H.N. 2004. Technology transfer between university research centers and industry in Singapore, Technovation, 24(5): 433-442.

Matsuura, T. and Yuhong, W. 2006. International intrafirm transfer of management technology, Economy, trade and industry, RIETI Discussion Paper Series 06-E-006, Waseda University.

Zeile, W. 2014. Multinational enterprises and international technology transfer. Research Spotlight (September)

Cui, A.S., Griffith, D.A., Cavusgil, S.T. and Dabic, M. 2006. The influence of market and cultural environmental factors on technology transfer between foreign MNCs and local subsidiaries: A Croatian illustration, Journal of World Business, 41(6):100-111.

Chew, B. 2000. Technology transfer in Malaysian high technology industry, Institute Of Technology Management And Entrepreneurship, National Technical University, College Of Malaysia, p. 7.

Zhelev, D. & Mork, V. 2014. Intra-firm knowledge transfer: A qualitative case study of knowledge transfer and its implications in a soft service firm. Master's Thesis, Business Studies, Uppsala University.

Malik, K. 2015. A conceptual framework for intra-company technology transfer: Cases of leveraging production process innovations across MNEs. Technology Analysis & Strategic Management, 27(10): 1129-1142.

Le Grange, L. and Buys, A. 2002. A review of technology transfer mechanisms, South African Journal of Industrial Engineering, 13(1): 81-100.

Bozeman, B. 2000. Technology transfer and public policy: A review of research and theory, Research Policy, 29(4): 627-655.

Dhar, B.J.R. 2012, Foreign direct investment, intellectual property rights and technology transfer. Background paper No 6, UNCTAD

Khabiri, N., Rast, S. and Senin, A.A. 2012. Identifying main influential elements in technology transfer process: A conceptual model. Procedia - Social and Behavioural Sciences, 40: 417-423.

Sun, Y. and Cao, C. 2015. Intra- and inter-regional research collaboration across organizational boundaries: Evolving patterns in China. Technological Forecasting and Social Change, 96(7): 215-231.

Shama, A. 1992. Guns to butter: Technology-transfer strategies in the national laboratories, The Journal of Technology Transfer, 17: 6.

Jun, Y. and Ji, I. 2016. Demand-pull technology transfer and needs-articulation of users: A preliminary study, Procedia Computer Science, 91, pp. 287-295.

Bauer, S. and Flagg, J. 2010. Technology transfer and technology transfer intermediaries. Assistive Technology Outcomes and Benefits 6(1): 129-150.

Creighton, J., Jolly, J. and Buckes, T. 1985. The manager's role in technology transfer, The Journal of Technology Transfer, 10: 16.

Gibson, D. and Sung, T.K. 2005. Knowledge and technology transfer: Levels and key factors, International Journal of Technology Management, 29: 14.

Inkpen, A. 2005. Knowledge acquisition and transfer in strategic alliances, in Knowledge management: Organizational and technological dimensions, J. Davis, E. Subrahmanian and A. Westerberg (eds), Heidelberg: Physica-Verlag HD, pp. 97-113.

De Meyer, A. 1991. Tech talk: How managers are stimulating global R&D communication, Sloan Managament Review, 49: 7.

Monica, L. 2013. Social capital and value creation: A replication of 'The role of intrafirm networks' by Wenpin Tsai and Sumantra Ghoshal, American Journal of Business and Management, 2: 8.

Szulanski, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm, Strategic Management Journal, 17: 17.

Boyle, K.A. 1986. Technology transfer between universities and the U.K. offshore industry, IEEE Transactions on Engineering Management 1: 33-42.

IKM PAHANG BRANCH Online Symposium 2021: Chemistry for Sustainable World

IKM Pahang Branch (IKMPB) successfully organized an online symposium with the theme "Chemistry For Sustainable World" on 16th January 2021. The symposium was co-organized by Kulliyyah of Science, International Islamic University Malaysia (IIUM) Kuantan Campus and Faculty of Sciences and Technology, University Malaysia Pahang (UMP), with sponsor from Waters Analytical Instruments, Agilent Technologies and Biotropic Center UMP. This was the first symposium organized by IKMPB and it was arranged virtually due to the current pandemic situation. This knowledge sharing event had attracted overwhelming response from different universities and 24 papers had been selected for the symposium presentation. Registration started at 8:30am, and the participants were welcomed by the Programme Chair, Assoc. Prof. ChM Dr. Chong Kwok Feng. He expressed his appreciation towards co-organizers and co-sponsors for their tremendous support. He emphasized that the symposium theme was parallel to the United Nations Sustainable Development Goals, to provide shared sustainable blueprint for peace and prosperity for people and the planet. The welcoming message was also delivered by Prof. Dr. Shahbudin Saad (Dean of Kulliyyah of Science IIUM), Assoc. Prof. ChM Dr. Mohd Hasbi Ab Rahim (Dean of Faculty of Industrial Sciences and Technology, UMP). They hoped the symposium could inspire the participants with a perspective of ideas in shaping a sustainable world. The symposium was divided into 5 sessions, with the topic on building a sustainable world in chemistry way. The presenters exchanged research ideas with the participants at the end of their presentation. The highlights of the symposium was product introduction by Dr. Chong Kam Weng, Application Chemist from Waters Analytical Instruments. The symposium ended at 4:00pm and the organizing committee extended their heartiest congratulations to all participants. All the accepted papers in IKMPB Online Symposium 2021 will be recommended for publication in Malaysian Journal of Chemistry.

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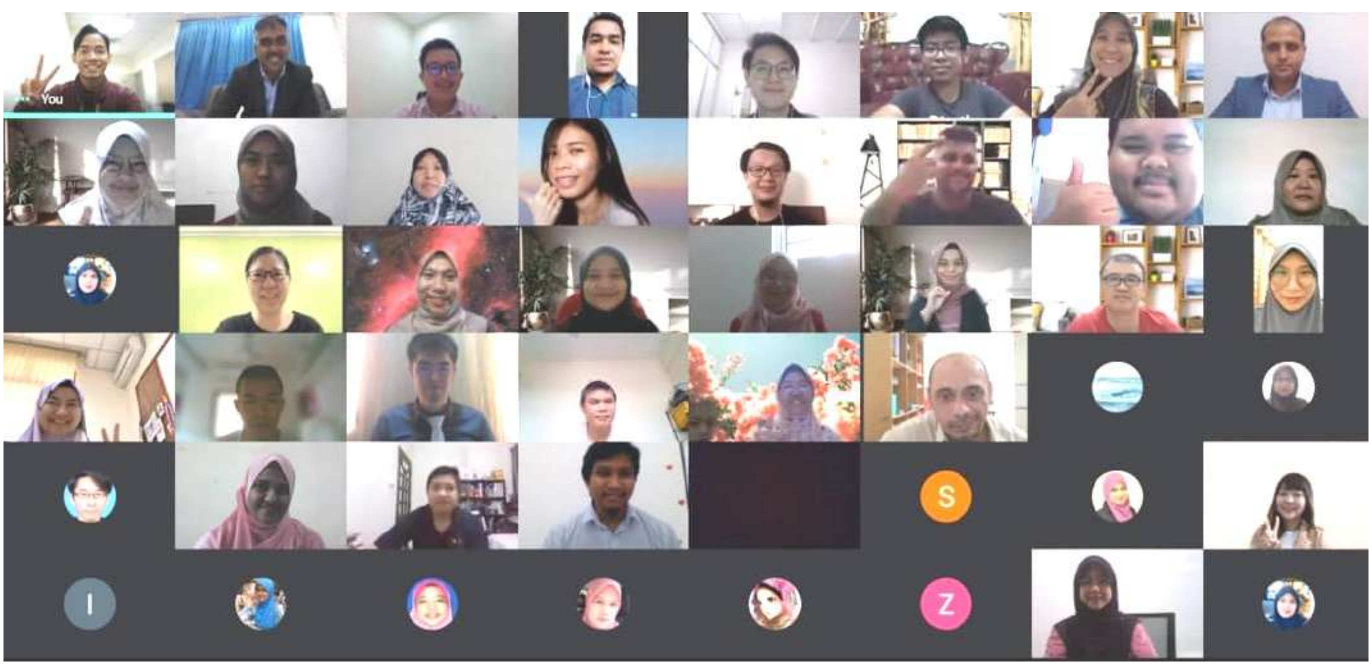

54th IKM Annual General Meeting

The 54th IKM Annual General Meeting (AGM) was held on 27 March 2021 at One World Hotel, Bandar Utama, Petaling Jaya, Selangor. IKM President, Datuk ChM Dr Soon Ting Kueh welcomed members to the 54th AGM of IKM. A total of 111 members attended the AGM. The 54th AGM was held under strict compliance to SOP issued by the National Security Council.

The President presented PowerPoint slides describing IKM activities for the term 2020/2021. The year 2020 was described as a difficult but sustained year for IKM due to COVID-19 pandemic. IKM Hon. Secretary, Assoc Prof ChM Dr Juan Joon Ching, presented the PowerPoint slides of the Annual Report. IKM Hon. Treasurer, ChM Dr Malarvili Ramalingam presented the Annual Statement of Accounts and Auditor’s Report for 2020. Datuk ChM Dr Soon Ting Kueh informed that IKM Law Hieng Ding Foundation was successfully registered with Suruhanjaya Syarikat Malaysia (SSM) on 22 October 2020 and the inaugural Board of Directors meeting was held on 31 December 2020. The final version of Chemist Rules 2021 is with MOSTI’s legal unit & the Attorney General Chambers of Malaysia. The approval is expected to be obtained by mid-2021.

International Congress on Pure and Applied Chemistry (ICPAC) Kota Kinabalu 2020 and 20th Malaysian International Chemistry Congress (20MICC) was postponed to November 2021. A number of IKM Professional Centre courses were cancelled. The IKM Joint Technical Committee (IKM-JTC) is working closely with Malaysian Qualification Agency (MQA) to develop Malaysian Chemistry Programme Standard for local universities and is expected to be ready by end of 2021. The President informed that 2021 will be a challenging year for IKM due to slow recovery from COVID-19 pandemic in Malaysia & the rest of the world. The highlight of the AGM was the election of 5 Council members to fill vacancies created by retired Council members. The AGM ended at 4.48 pm. Immediately after the AGM, 316th Council meeting was held to elect principal office bearers for 2021/2022 term. This was followed by appointments of Committee/Division Chairpersons.

Elected Council Members for 2021 - 2024
ChM Dr Malarvili Ramalingam
Datin ChM Dr Zuriati Zakaria
DCP(R) Assoc. Prof. Dato’ ChM Dr Yew Chong Hooi
ChM Halimah binti Abdul Rahim
Datin ChM Maimonah Sulaiman

IKM Council 2021/2022

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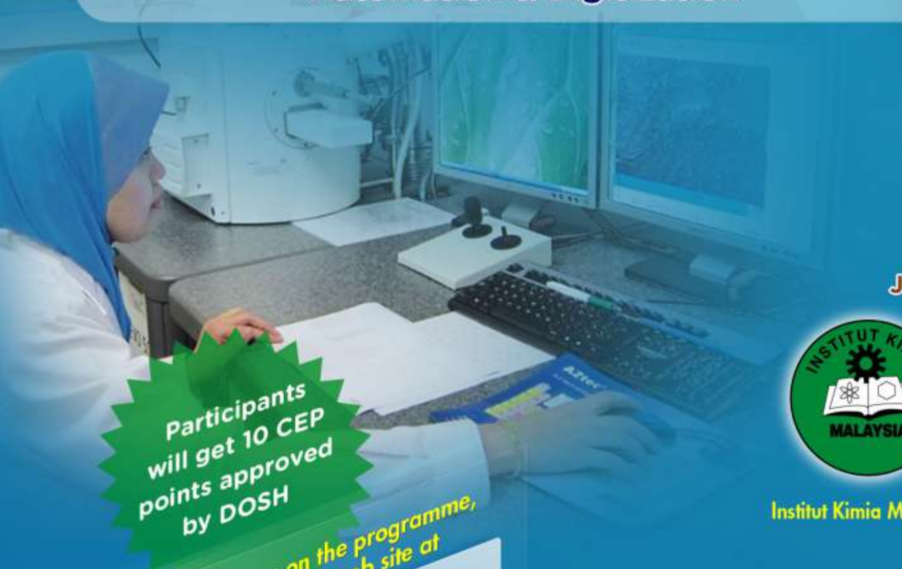

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Environmental Preservation and Innovation Centre Sdn Bhd

INTRODUCTION

Symposium on Best Practices & Innovations in Laboratory Management (BPI-LAB) 2021, jointly organized by Institut Kimia Malaysia with Department of Chemistry Malaysia and in collaboration with the Department of Standards Malaysia, Department of Occupational Safety and Health, National Water Research Institute of Malaysia and Environmental Preservation and Innovation Centre Sdn Bhd.. It will be held in conjunction with LabAsia 2021. This year Symposium is a rebrand of Symposium on Total Laboratory Management (QSEL) which is held biennially and covers topics in major aspects of laboratory operations and management. The event will convene in Kuala Lumpur, Malaysia on 20 & 21 October 2021 at Kuala Lumpur Convention Centre.

Highlighting the theme Advancing Excellence & Best Practices in Laboratory Operations and Management, BPI-LAB 2021 will focus on Green Chemistry & Sustainability, Laboratory Safety & Chemical Hazards, Laboratory Science Education & Quality, Disruptive Technologies and Automation & Digitization.

OBJECTIVE

“The laboratory industry is constantly evolving with new technologies, regulations and ways of working. BPI-LAB 2021 aims to help attendees keep up-to-date with these developments. Invited speakers will share their knowledge and new ideas about the best practices which are essential for smooth running of laboratories, making a positive impact for quality laboratory performance.”

SECTORS SERVED

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- Energy
- Environmental
- Food Science & Agriculture
- Forensics & Toxicology
- Industry & Manufacturing
- Life Sciences
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- Pharmaceutical
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- Spectroscopy
- Chromatography
- Spectrometry
- Electrochemistry
- Laboratory Automation
- Informatics
- Physical Measurements
- Sensors
- Quality Management
- Safety Management

EXHIBITION

In conjunction with BPI-LAB 2021, an exhibition entitled **LabAsia 2021** will be held at the same venue. **LabAsia 2021** will showcase latest analytical techniques and laboratory services including instrumentation, laboratory safety, management and information systems, environment and waste management, chemicals and scientific publications.

LabAsia 2021 is managed by Informa Markets Malaysia Sdn Bhd. Please refer to the website: **www.lab-asia.com** for more information.

WHO SHOULD ATTEND

Scientists, laboratory managers, supervisors, testing personnel, laboratory technicians / technologists, marketing executives, safety officers and consultants from industries, research organizations, government laboratories, private laboratories as well as academicians and educators from institutions of higher learning.

CALL FOR PAPERS

Those who are interested to give oral presentation at the BPI-LAB 2021 symposium are required to submit a soft copy of an abstract to the following email: **bpilab2021@ikm.org.my**

Abstract submission deadline: **31st July 2021**

REGISTRATION FEE

PARTICIPANTS	FEE
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Non-IKM Members	RM1100.00
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The registration fee includes attendance to all symposium sessions, symposium materials, certificate of attendance and presentation, coffee breaks, lunches, joint symposium/conference dinner and LabAsia.

ACCOMMODATION

Visit hotels' website or hotel booking sites like Booking.com to search for available options and make direct bookings. Below are a few suggestions:

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Impiana KLCC Hotel	0.6 KM	4
Maya Hotel	0.5 KM	4
Corus Hotel	0.4 KM	4

ENQUIRES

For enquiries, registration and further information, please contact Symposium Secretariat (Puan Siti Maziah or Puan Aliah Nur Fatehah):

Institut Kimia Malaysia
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60000 Kuala Lumpur
Tel: 03 77283272 Fax: 03 77289909
Email: **bpilab2021@ikm.org.my**

REGISTRATION

Symposium on Best Practices & Innovations in Laboratory Management (BPI-LAB) 2021
20-21 October 2021
Kuala Lumpur Convention Centre (KLCC)
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I would like to register for BPI-LAB 2021.

Name: Prof/Assoc Prof/Dr/Mr/Miss*______________________________

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Payment may also be made by direct bank transfer into the following account:

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Signature:______________________________Date: ________________

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Feeding the World in a Time of Climate Change

by Gary W. vanLoon and Atanu Sarkar

Maintaining a plentiful and high-quality food supply is essential to enable humans to survive and flourish in the coming decades. In 2019/20, an estimated 2.71 Gt of food grains have been produced worldwide. This fundamental food source is alone enough to supply sufficient nutritional kilocalories for the entire current global population. And nutrition is supplemented by the many other crops, livestock and sea food that are part of the overall food system. Yet, in the same year, it is estimated that around 821 million people, more than one tenth of the 7.6 billion people in the world were chronically hungry. There are many reasons for this. Waste—the FAO estimates that around one third of food produced is wasted—is certainly one, but also important are the inequities in the food production and supply system. While much can and should be done to correct these two critical problems, sustainable agriculture remains as the core feature of a healthy food supply.

More than any other human activity, agriculture is dependent on a stable and well-understood climate. The connection between climate and the cultivation of crops is a two-way process with temperature and rainfall determining the success of crop growth and growing crops themselves affecting carbon dioxide relations and water behaviour in the soil and atmosphere. Understanding these relations is essential in order to develop an efficient and sustainable agriculture and food system that can feed the world in decades to come.

Climate change

The major cereal crops, maize, wheat and rice, have consistently displayed the capacity to cope well under the predicted mean average temperatures; at least up to the average temperatures predicted by 2050. What is worrying to scientists is the fact that the expected greater frequency of temperature extremes will expose these crops to occasional high temperatures so far not experienced. Temperature extremes at vulnerable stages (such as anthesis, the flowering period of grain production) of crop reproduction cycles have been shown to have devastating effects, especially in strategic agricultural production areas in developing countries.

Africa and parts of Asia are warming faster than the global average and by the end of this century, growing season temperatures are predicted to exceed the most extreme seasonal temperatures recorded in the past. Latin America, home to the largest tropical forest on the planet, is also being impacted negatively by increasing temperatures. While there may be some instances of increased crop production in cooler regions, it is widely considered that for maize and other crops in many areas including the American corn-belt, the Middle East, west and south Asia, and northeast China there will be increasing risk from yield losses due to heat stress, most especially during the reproductive stage of their life cycle. Climate change will, therefore, severely test farmers' resourcefulness and adaptive capacity.

In line with greater frequency of extreme temperature events, changes in rainfall distribution are also hard to predict and differ widely between geographic regions. There is, however, a general consensus that, together with extreme temperatures, drought will be more frequent in the near future and will severely limit crop production. Importantly, smallholder farmers in the tropics and sub-tropics will be much less able to cope with climate change because they have far fewer adaptation options open to them compared to farmers in developed countries.

Climate change may increase the negative impact of pests and weeds by expanding geographic ranges, invading new suitable zones and allowing their establishment in these new areas. Even in 2020, the 'desert locust', a highly dangerous migratory pest is wreaking

havoc in Africa and parts of West Asia. The magnitude of this plague is attributed in part to changes in temperature and wind patterns and increased rainfall in Oman's deserts, conditions that are conducive to locust breeding in that area.

In addition to increasing temperatures and increasingly erratic rainfall, global warming is contributing to sea level rise. While sea level rise is not predicted to affect maize and wheat production in any meaningful way, it will impact rice production in mega-deltas and coastal zones through uncontrolled flooding and soil salinization.

Population

The global population is expected to increase from 7.6 billion in 2017 to 8.5 billion by 2030, and, perhaps, over 9.5 billion by 2050. In some regions, such as Sub-Saharan Africa, the population is likely to double by 2050. In a world with a growing population, it is certain that the number of undernourished persons will increase due to general economic malaise, displacement of agricultural workers, and overstressed health systems especially when facing global health problems like SARS, Ebola and the COVID-19 pandemic.

While uncontrolled population growth is posing a major challenge to continuing efforts in improving global food security; climate change has begun to pose its own formidable threat to our surrounding agro-ecosystem.

In response to malnutrition around the world, in 2015 the global community pledged to eliminate hunger by 2030 as one of its sustainable development goals (SDGs). IUPAC itself has made a moral commitment to support these goals. In particular, SDG-2 (end hunger, achieve food security and improved nutrition, and promote sustainable agriculture) clearly focuses on strengthening capacity to ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems and that progressively improve land and soil quality.

Adaptation and mitigation

Actions required against food insecurity due to climate change can be categorized as either adaptation or mitigation. According to the FAO, 'adaptation' to climate change involves deliberate adjustments in natural or human systems and behaviour to reduce the risks to people's lives and livelihoods. Adaptations require comprehensive and holistic scientific research that establishes new ways of doing agriculture that will achieve goals of sustained and increased food production without adding to resource and environmental stresses.

Adaptations take into account the changing realities of local climates. Recognizing present and future

Food security, peace and stability go together

On 9 Oct 2020, the Norwegian Nobel Committee has decided to award the Nobel Peace Prize for 2020 to the World Food Programme (WFP). The World Food Programme is the world's largest humanitarian organization addressing hunger and promoting food security. In 2019, the WFP provided assistance to close to 100 million people in 88 countries who are victims of acute food insecurity and hunger. See full text release @ https://www.nobelprize.org/prizes/peace/2020/press-release/

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weather patterns, new agricultural management practices are developed. Importantly, these adaptations may or may not have a complementary effect on the overall agroecosystem. The ability to adapt should, at the very least, not be an impediment to efforts directed at stabilizing climate systems and other aspects of the environment.

Adaptations also require knowledge of the socio-economic environment—the human resources available in the region—and therefore the strengths and limitations of the population in its ability to modify agricultural practices. There is clearly a 'capacity building' component to any adaptation strategy.

Mitigation involves practices that can reduce the rate of climate change or counteract some of the negative consequences that result from changes already occurring. An important type of mitigation is action to reduce greenhouse gas emissions and sequester or store carbon, and development choices that will lead to low emissions in the long term. Mitigation refers to changes in practice that are able to reduce agriculture's own negative impact on the environment. At best, mitigations will bring about positive impacts on the surroundings so that local and even global stresses are moderated. Like adaptation, mitigation requires both scientific/technical innovation as well as development of human capacity to activate the innovation.

Adaptation and mitigation activities take into account overlapping and mutually supportive ideas. Facing the challenges of climate change means taking sustained action in both areas.

Strategies for adaptation and mitigation in soil management

Estimates of the contribution that agriculture makes to the global yearly release of greenhouse gases are in the range of 10 to 15 %. Any adaptations in agricultural management practices that reduce this contribution will also have a mitigative effect on the causes of climate change.

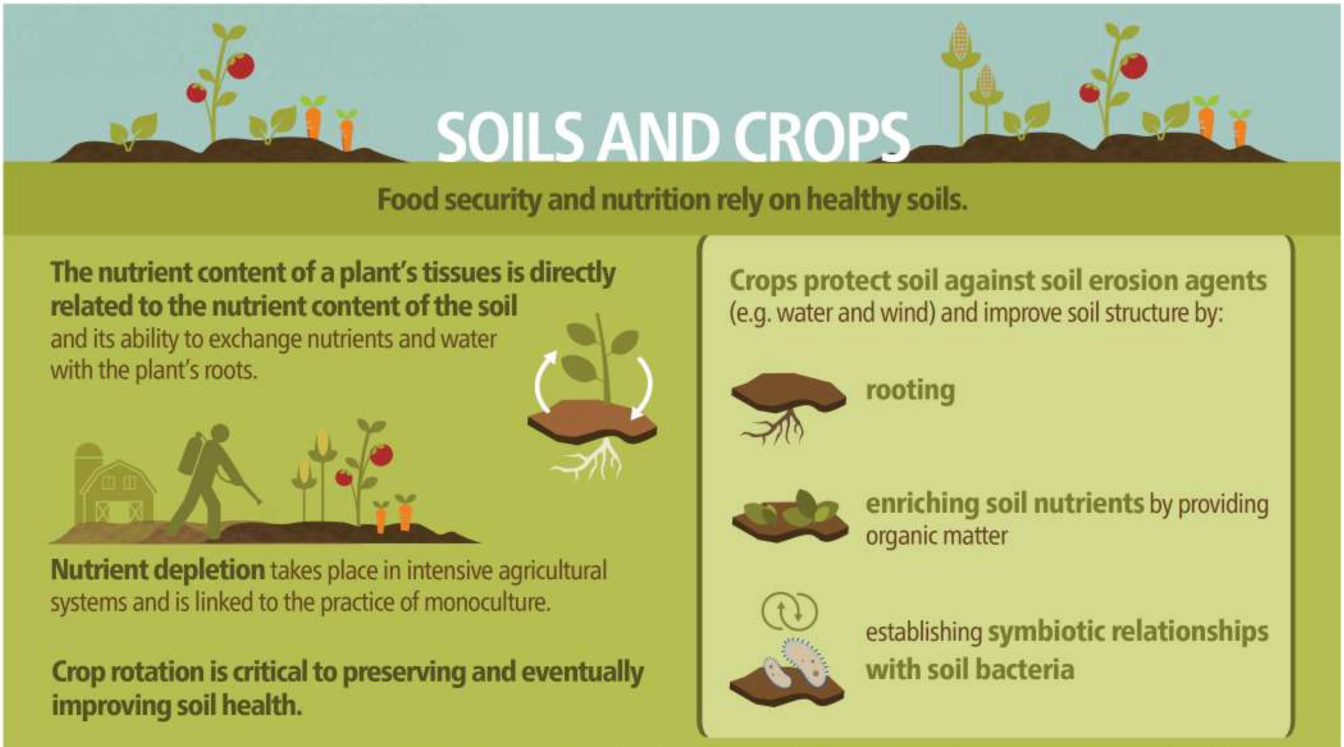
Methane—Around 35% of global anthropogenic emissions of methane are associated with agriculture. Ruminants, including cattle, buffalo and goats are responsible for a significant portion of this release, through breathing and eructation. There are investigations into minimizing this by making changes in diet type, in particular through reducing the high-cellulose content of feed. Unfortunately, this counteracts the benefits that ruminants bring to a food system of being able to covert lower quality feed sources, like grasses, into a nutritious product. This creates a shift from pastoral agriculture, with high values for its ecosystem services through landscape biodiversity, to feedlot systems where there are loss of traditional grazing and associated local environmental challenges.

Stored saturated manure can also release methane and this calls for minimizing storage times or using a contained system to enable capture of the methane and use as a fuel for heating or cooking or for electricity generation.

The other important source of methane emissions is from methanogenic bacteria operating on organic material in water-saturated fields under reducing (typically flooded) conditions. This points to the importance of establishing good drainage to prevent flooding and water-logging. Rice cultivation using submerged conditions is a special case and can be a major source of methane emissions into the atmosphere. Ongoing research is developing options like alternate wetting and drying, direct-seeded rice and the system of rice intensification where the period of submergence is reduced or even eliminated. Beyond agriculture, natural wetlands are also sources of methane.

Nitrous oxide—The current nitrous oxide mixing ratio in the atmosphere, is about 16 % above preindustrial levels; the increase can primarily be attributed to agriculture. Reactive nitrogen derived from mineralized soil organic matter, animal manures and synthetic fertilizers undergoes a complex process, involving nitrification and ultimately denitrification that leads to the production of nitrous oxide. These nitrogen reactions especially nitrification, are essential requirements, contributing to transforming nitrogen into plant-available forms, so it is not desirable to try to inhibit them. However, the production of nitrous oxide is favoured when excess amounts of reactive nitrogen compounds over what are of immediate need to the growing crops are present. This means that calibrating the application of nitrogen sources to the actual needs of the crop is particularly important. There are also obvious co-benefits in terms of cost savings and reduced nutrient contamination of surface or ground water.

Organic matter and carbon dioxide—There are clear sustainable options that can minimize the production and release of carbon dioxide during agricultural management and these are of the greatest importance in terms of adaptation/mitigation in agriculture. The global store of soil organic matter is estimated to be about 1500 Pg, an amount that is held in approximate balance by inputs of organic amendments and releases into air and water through decomposition, dissolution and erosion. Sequestering carbon and mitigating carbon dioxide release can then take the form



reproduced from <http://www.fao.org/resources/infographics/infographics-details/en/c/325860/>

of building up the store of organic material, converting it to stable forms and, at the same time, minimizing its decomposition to small volatile (principally carbon dioxide) or soluble molecules.

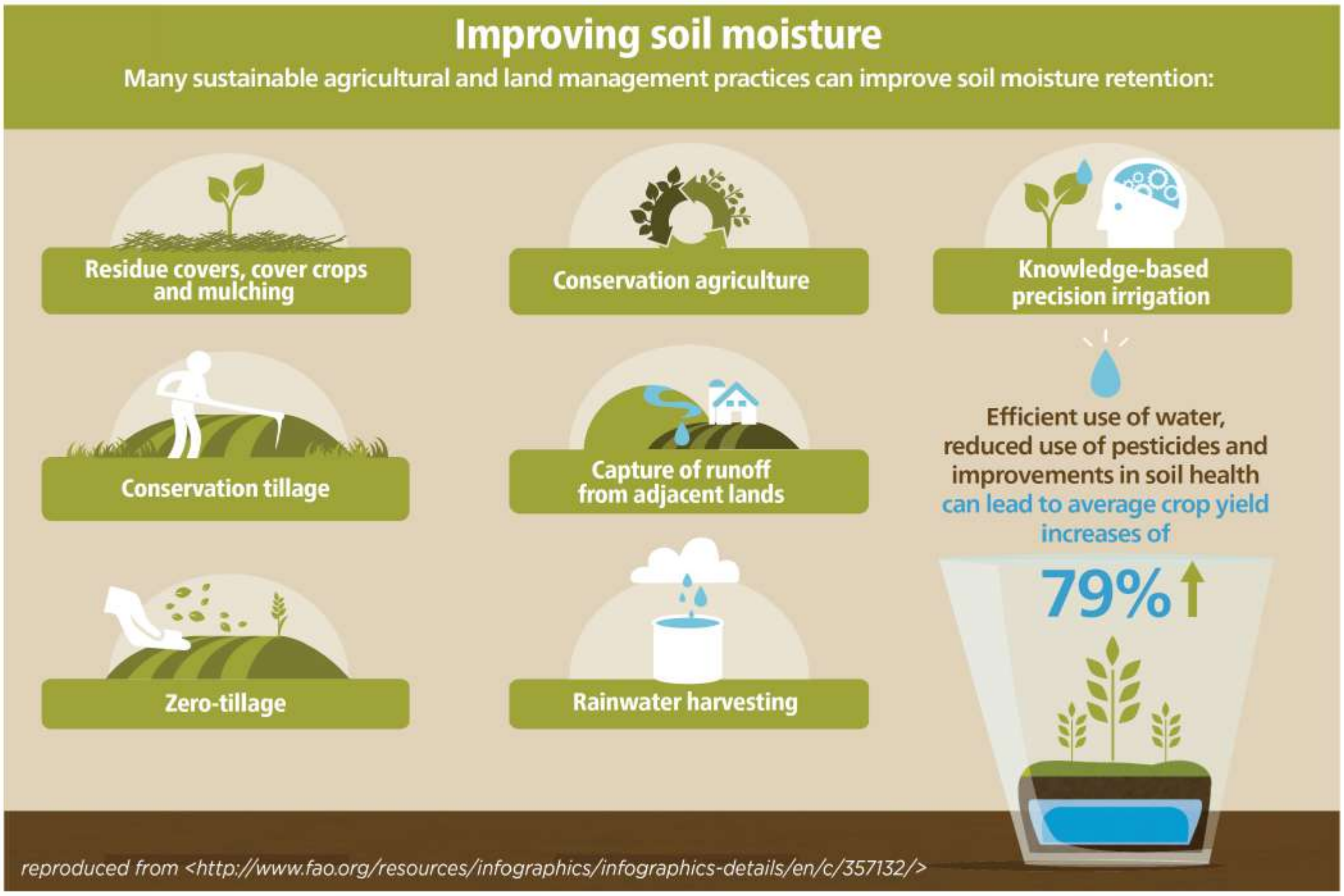
There are additional merits associated with increasing the organic matter content of soils. In order to ensure the ability of soil to remain fertile and capable of withstanding stresses of erratic rainfall, flooding and drought, proactive initiatives are required. Organic matter is able to contribute to structural stability and fertility while retaining water and controlling its flow, thus minimizing nutrient losses due to leaching and erosion. Composted manure and other secondary organic 'wastes' are appropriate as additions to soil. Careful collecting, storage, and timely application of manure are needed to prevent emissions of methane and nutrient loss particularly of nitrogen through ammonia and nitrous oxide.

Of growing importance is the practice of ensuring continuous ground cover by using perennial crops, including perennial grains, or building a cover crop into the fallow period of a yearly rotation. The roots of the growing crop serve as a host for mycorrhizal and other organisms which, in turn, participate in decomposition of fresh organic residues and contribute to production of a relatively stable humic material. Cover crops also lessen water drainage from the field, reducing erosion and protecting waterways. Because their roots penetrate deep into the soil, cover crops allow water to infiltrate to a greater depth, thus contributing to water conservation.

Enhancement of organic matter is also encouraged by reducing the amount and level of tillage where organic residues of secondary material from a crop are allowed to remain on and in the soil. Subsequently in the next planting cycle, little or no tillage is employed and the new crop is planted directly into the matrix of soil and organic litter. The limited use of heavy machinery at the same time minimizes soil compaction and also reduces carbon dioxide emissions from fuel use as well as that emitted during manufacture.

Besides maintaining quality of the soil itself, integrating agroforestry into an agricultural area can serve many benefits. Practices include alley cropping and other uses of trees and bushes to create a 'patchy landscape'. These practices can work to minimize wind and water erosion. In addition, the added biodiversity serves as an additional source of forage, and also as a reservoir of species like hover flies that often act as predators of harmful insects and arachnids. The species refuge aspect will become increasingly important in the future as warmer conditions are expected to result in larger populations of pest species.

Nutrients—The production, transport and storage of nutrients, whether synthetic or natural, all involve energy use and emissions of greenhouse gases. Production of synthetic fertilizers can be especially significant in this regard. The case of urea, manufactured from natural gas, is an important example of high energy use and associated carbon dioxide emissions. Adaptive agriculture then indicates that, as much as



possible, synthetic inputs should be replaced by natural ones such as animal manures and retained crop residues as noted above. Whether inputs are natural or synthetic, steps should be taken to minimize waste and especially to consider losses that contribute to GHG releases during storage and application. In the case of animal manures, losses associated with decomposition during storage can contribute to emissions of methane and ammonia and once applied to release of nitrous oxide if consideration of application time is not taken into account. Likewise, when applying synthetic fertilizers, precision application techniques are increasingly being used to efficiently maximize the uptake of nutrients. The use of precision agriculture can be implemented either via sophisticated GPS nutrient mapping and controlled-delivery systems or, in low-income countries, through accurate small scale mapping and careful manual application of chemicals. Crop rotations, in particular where nitrogen-supplying legumes are a component can contribute to maintaining soil fertility and minimize nutrient mining by the continuous planting of a single species.

Low input agriculture and ultimately organic farming are designed to ensure efficient use of nutrients and, in the organic farming case, to eliminate use of synthetic chemicals. Often, animal husbandry is part of the overall system where animals make use of the secondary materials of crop production for food while producing manure that is then used as a soil amendment. For pest control, integrated pest management employs natural means of control where possible, and this is enhanced when the farming area is more diverse both in terms of the crop patterns and the natural surroundings.

Efficient water management—Good water management is important in order to limit waste of water through evaporation or excessive drainage. Around the globe in various locations, there are serious issues of water over- or under-supply and careful planning and management are needed to ensure its equitable and timely distribution. Especially critical are the drought-prone regions of low-income countries where it is becoming more and more difficult for farmers to sustain a viable agricultural operation. Climate change is exacerbating the problem, in part because of the high level of unpredictable variability that is accompanying the changes.

Besides water scarcity, there are many instances of excessive extraction leading to declining water tables and also growing instances of overuse and poor drainage leading to salinity of soils in formerly high productivity areas. Together all these factors point to a growing critical need to manage water resources carefully.

Adaptation to limited availability of water resources then points to a need to efficiently collect green water (rain water) through large and small scale infrastructure interventions, minimizing losses through delivery by using such methods as subsurface drip irrigation, or its low-tech equivalents, and application of appropriate amounts so that there is limited loss through runoff or evaporation.

Conservation agriculture

Conservation agriculture describes an integrative approach that makes use of many of the principles described above in order to sustain soil biological activity and crop production while minimizing damage to the environment. It is being applied widely with aspects unique to each specific area. The following features are common to all the versions of conservation agriculture:

- Limited tillage to avoid disturbing the soil and in order to minimize soil compaction. This also serves to maintain optimal conditions in the root zone, enhancing water retention and flow.
- Employing permanent soil cover or using organic matter additions through preserving crop residues and/or planting a cover crop during fallow periods. In this way soil biological activity is increased and nutrients can be captured, retained and gradually made available to growing crops.
- Promoting biodiversity by employing crop rotation including legumes. This is done to maintain fertility and avoid nutrient mining, and as support for biological pest control.
- Weed, pest and disease control is a challenge when employing a full complement of conservation agriculture features. In part, these challenges can be minimized by maximizing biodiversity in the rotation and at any one time within the crop itself and in the surrounding environment.

Conclusion

What we have described here are management practices that are required to protect and improve the soil and other resources so that productive agriculture can continue and even expand. These practices are widely applicable in low- and high-income countries and on small and large farms.

Supporting the work of farmers are new scientific developments, most notably through the practice of plant breeding to create crops that are able to make more efficient use of resources and that can adapt to defined stresses. This means crops that are heat resistant, flood or drought resistant, resistant to newly-encountered pests and have the ability to flourish in the changing environment. Salt tolerant rice species, for example, have been developed and are being planted in low-lying coastal areas where sea rise is creating increased salinity in the soils.

Further essential support comes from social and economic sources within society so that new ideas are disseminated and promoted, making implementation feasible. The broader backing from science and society is important, but most vital is the continuing work of farmers to maintain and improve the natural resources available to them.

Further reading and notes

1. J. M. Cloy, R. M. Rees, K. A. Smith, K. W T. Goulding, P. Smith, A. Waterhouse and D. Chadwick, Impacts of Agriculture upon Greenhouse Gas Budgets. In Environmental Impacts of Modern Agriculture, Eds. R.E. Hester and R.M. Harrison, Royal Society of Chemistry, 2012; https://doi.org/10.1039/9781849734974
2. Climate Change and Food Security: a Framework Document. The Food and Agriculture Organization of the United Nations, 93 pp, Rome, 2008. (http://www.fao.org/3/k2595e/k2595e00.pdf)
3. Jane M.-F. Johnson, Alan J. Franzluebbers, Sharon Lachnicht Weyers, and Donald C. Reicosky, Agricultural Opportunities to Mitigate Greenhouse Gas Emissions, Environmental Pollution 150, 107-124, 2007; https://doi.org/10.1016/j.envpol.2007.06.030
4. Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge. National Sustainable Agriculture Coalition 70 pp, November 2019. (https://sustainableagriculture.net/wp-content/uploads/2019/11/NSAC-Climate-Change-Policy-Position_paper-112019_WEB.pdf)
5. Atanu Sarkar, Suman Ranjan Sensarma and Gary W. vanLoon eds. Sustainable Solutions for Food Security: Combating Climate Change by Adaptation. Springer Nature, Switzerland AG, 549 pp, 2019; ISBN 978-3-319-77878-5
6. In time for 2015 for the International Year of the Soils, the Food and Agriculture Organization (FAO) has released a collection of infographics: http://www.fao.org/soils-2015. The infographics reproduced in this feature are reproduced from that collection.

Gary W. vanLoon is an Emeritus Professor of Chemistry at Queen's University, Canada and currently a member of IUPAC Committee on Research Applied to World Needs, CHEMRAWN. Atanu Sarkar serves as Assistant Professor of Environmental and Occupational Health at Memorial University of Newfoundland, Canada.

Cheryl Chow Shu Wei

Institut Kimia Malaysia (IKM) would like to congratulate **Cheryl Chow Shu Wei** for being presented the Top in the World Award in Chemistry of the International General Certificate of Secondary Education (IGCSE) examination 2020, beating a million other students from all over the world.

Cheryl has also won many other awards including being the top participants in the Mangahigh East Asia Maths Challenge 2019 beating 14,240 students from Japan, South Korea, Singapore and other countries from East Asia.

IKM would like to convey our heartfelt congratulations to Cheryl and wishes her great success in her further education. It is our sincere wish that she will take up Chemistry in her higher education and finally becoming a top chemist recognized all over the world.

IKM Special Merit Award 2021

Miss Cheryl Chow Shu Wei has been nominated for the IKM Special Merit Award 2021 for her Top in the World Award in Chemistry of the International General Certificate of Secondary Education (IGCSE) examination 2020 presented by the Cambridge Assessment International Education.

The Award carries a cash prize of RM300 and a Certificate.

2 **Nation** THE STAR, TUESDAY 4 MAY 2021

King proud of Malaysia's 'Top In The World' student for Chemistry

KUALA LUMPUR: Yang di-Pertuan Agong Al-Sultan Abdullah Ri'ayatuddin Al-Mustafa Billah Shah has congratulated Cheryl Chow Shu Wei, of Beaconhouse Sri Inai International School, for receiving the "Top In The World" award for the International General Certificate of Secondary Education (IGCSE) examinations in Chemistry.

His Majesty also expressed his happiness and pride over Chow's accomplishment, saying that the outstanding achievement by the 17-year-old student had made the country famous at the international level.

Al-Sultan Abdullah also expressed the hope that Chow's success would be an inspiration to others, especially students and youths, to continue to work hard and strive to achieve outstanding success in their respective fields.

"Indeed, Cheryl Chow Shu Wei's success once again proves that Malaysia is capable of producing students and individuals of quality, are competent and of international standard.

"It also proves that with commitment and hard work, Malaysians are able to compete and succeed on the international stage," according to a statement issued by Istana Negara on Facebook yesterday.

In wishing Chow good luck in her future endeavours, His Majesty prayed that she would achieve more success and continue to bring glory to the country.

Chow earned the prestigious award from the Cambridge Assessment International Education after beating nearly a million other students from around the world during the Outstanding Cambridge Learner Awards event recently.

She obtained the highest standard marks in the IGCSE examination for the subject of Chemistry.

The student was also the top participant in the Mangahigh East Asia Maths Challenge 2019, beating 14,240 students from Japan, South Korea, Singapore and other countries in East Asia.

Chow also bagged a gold medal at the national-level Kangaroo Math Competition and was a top achiever at the University of St Andrews Competition in 2019 besides being awarded a gold medal in the Queen's Commonwealth Essay Competition in 2019 and 2020. — Bernama

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5 OGOS 2021

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KHAMIS

MASA
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Institut Kimia Malaysia
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Taman Tun Dr Ismail,
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K_3M 2021

Borang Penyertaan K_3M 2021

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Poskod : | | | | |

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	5		
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IUPAC 2021 News

In 2021, IUPAC will be having its 51st General Assembly (51GA) and 48th World Chemistry Congress (48WCC) in Montreal, Canada. Unfortunately, due to the global COVID-19 pandemic, these two IUPAC global events will be held virtually over the internet.

IUPAC Special Council Meeting on 5th May 2021

IUPAC organized a virtual IUPAC Special Council Meeting on 5th May 2021 to consider the following motion:

MOTION: *"Council approves Modification of the IUPAC Statutes and Bylaws to enable Council meetings to be held without the necessity for in-person meetings and to allow electronic voting in real time."*

A total of 130 delegates attended this virtual meeting and IKM was represented by Datuk ChM Dr Soon Ting Kueh, Datin ChM Dr Zuriati Zakaria and Prof ChM Dr Melissa Chan Chin Han.

The Meeting unanimously approved the Motion.

Below are screenshots of the Meeting in progress:

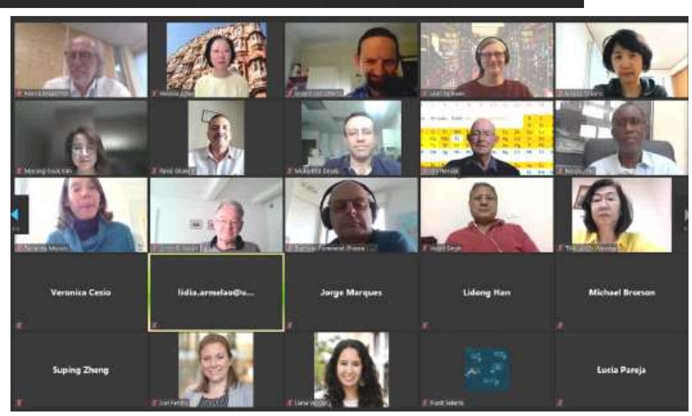
The Schedules of IUPAC 51GA and 48WCC 2021 are as followed:

Divisions & Committees Meetings
9 – 12th August 2021

51st General Assembly (51GA)
13 – 15th August 2021

48th World Chemistry Congress (48WCC)
15 – 20th August 2021
Registration for 48WCC: **https://www.cheminst.ca/conference/ccce2021/registration/**
(Early-bird registration closes on 12th July 2021)

World Chemistry Leadership Meeting (WCLM) 2021
17 – 18th August 2021
WCLM (Malaysia) 2021
18th August 2021 from 9.00 – 11.00 am



IUPAC 2025

At the IUPAC 50th General Assembly (50GA) held in Paris, France in July 2019, IKM won the bid to host the 53rd General Assembly (53GA) and 50th World Chemistry Congress (50WCC) in Kuala Lumpur, Malaysia in 2025.

As soon as the joy of this good news has settled down, IKM started to prepare for the long route to these very challenging grand events ahead. By early 2020, we started working with our partners including the Ministry of Science, Technology and Innovation (MOSTI), Malaysia Convention & Exhibition Bureau (MyCEB), Kuala Lumpur Convention Centre (KLCC), Grand Hyatt Kuala Lumpur and a few others.

In early 2021, we established the IUPAC 2025 Protem Committee headed by IKM President, Datuk ChM Dr Soon Ting Kueh. The Committee started to prepare a promotion and marketing campaign specially for the coming IUPAC 51st General Assembly (51GA) and 48th World Chemistry Congress (48WCC) to be held virtually from Montreal, Canada this August.

The Committee decided to produce a video on **"IUPAC 2025 – We welcome you to enchanting Malaysia"** to be broadcasted at the 51GA. The Committee met several times and went on to shoot the video on 8th May at Cloud Events in Subang Jaya.

After several rounds of editing, a 8-minute video on **"IUPAC 2025 – We welcome you to enchanting Malaysia"** was produced. This will be shown at the 51GA in Montreal, Canada.
At the same time, IKM is organizing the Malaysian leg of the World Chemistry Leadership Meeting (WCLM) as part of 51GA on 18th August 2021 to be broadcasted from Subang Jaya, Malaysia. Members of IKM will be invited to this WCLM (Malaysia) live broadcast.

IUPAC 2025 Protem Committee:
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Datin ChM Dr Zuriati Zakaria
ChM Chang Hon Fong
ChM Dr Malarvili Ramalingam
Assoc Prof ChM Dr Juan Joon Ching
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Biosensors For Home Testing of COVID-19

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Coronavirus disease 2019 (COVID-19) is now causing a pandemic worldwide and does not have any specific treatment. For the detection of the virus causing the pandemic, currently available technologies are generally sensitive and selective. But they require well-trained persons to perform the test, and this usually involves lab-based instrumentation. Therefore, simpler, rapid, sensitive and selective devices or test kits such as biosensors have been developed recently for rapid diagnosis on-site (point-of-care, POC device). In this article, the potential of biosensors as point-of-care devices for the testing of SARS-CoV-2 (COVID-19) is discussed. The possibility of their future as home-based test kits for COVID-19 will be evaluated.

Coronavirus belongs to the subfamily Orthocoronavirinae in the family of Coronaviridae in the order Nidovirales [1,2]. It is typically hidden in mammals and birds and is common in camels, cattle, cats, bats and other animals [1]. Most recently, a novel coronavirus has been ongoing worldwide, causing a pandemic. The virus is a COVID-19, a short form for the Coronavirus disease in 2019 and was given by the World Health Organization (WHO). The International Committee on Virus Taxonomy named the virus SARS-CoV-2. But a group of virologist from China called the virus human coronavirus 2019 (HCoV-19) [3]. Coronavirus is an enveloped beta-coronavirus with a single-stranded positive RNA genome and can be observed in humans and other mammals [4]. The genome of 2019-nCoV partially resembled SARS-CoV and MERS-CoV. Generally, COVID-19 had a high reproductive number, a long incubation period, a short serial interval and a low fatality rate (much higher in patients with comorbidities) than SARS and MERS [2]. But with the mutation of the virus, the fatality and infection capability have increased. The scale of COVID-19 spreading is higher than SARS and MERS-CoV [5]. This virus was first reported and spread widely in Wuhan, China, affecting other Asian and non-Asian countries [6]. According to WHO, this disease has been announced as a pandemic disease on 11th March 2020 [7,8]. Symptoms can vary drastically; include fever (99%), chills, dry cough (59%), sputum production (27%), fatigue (70%), lethargy, arthralgias, myalgias (35%), headache, dyspnea (31%), nausea, vomiting, anorexia (40%), and diarrhea. Some carriers may be asymptomatic, whereas others can experience acute respiratory distress syndrome (ARDS), infection in the gastrointestinal area and death [1,2,9]. Because of this, World Health Organization advised on the performance of extensive diagnostic testing of SARS-CoV-2 to control the spread of the virus. Testing is important to gain more understanding of the outbreak epidemiology. But fast diagnostic testing is also essential in making prompt decisions with respect to treatment and isolating an infected population. This could eventually curb the transmission of this infectious virus. In an attempt to control the pandemic, global health companies are putting critical attempts to investigate different parts of treatment improvement and are giving specific consideration to explore the requirement for smart demonstrative devices for quick and particular identification of the COVID-19 protein [10].

Diagnostic Testing of SARS-CoV-2

The screening of symptoms, testing, and contact tracing aims to identify SARS-CoV-2 infections, and this may form part of a strategy to reducing virus transmission. The success in stopping and preventing the spread of SARS-CoV-2 that causes COVID-19 depends very much on a robust testing infrastructure. SARS-CoV-2 testing is essential in slow down transmission and stop the spread of the virus. Several key issues for testing are [11]:

- Diagnostic testing should be performed on persons with symptoms of COVID-19
- For asymptomatic cases where the transmission levels are high, rapid and point-of-care serial screening will be useful.
- For selecting a SARS-CoV-2 test and results interpretation, it should be based on the prevalence of the virus in the test population
- The results of the test are not affected by prior vaccination of COVID-19 vaccine.

For the testing platforms of this virus, several types of diagnostic tests are being used. For example, chest computed tomography (CT) scan (including clinical indications); viral RNA assay with reverse transcription-polymerase chain reaction (RT-PCR) and lateral flow assay (LFA) techniques. The lateral flow assay could be used to determine antibodies by incorporating chemiluminescence and enzyme-linked immunosorbent detection systems [12].

CT scan diagnosis is mostly limited to large hospitals and required experienced radiologists for data interpretation. Despite that, the scanning method is not specific, i.e. it cannot distinguish between infection by SARS-CoV-2 and other viruses. The commonly used method of antibody testing for this virus could not confirm immediate infection. The antibody response of the infected patients only appears at about the 10th day after the onset of symptoms. Thus, early identification of the asymptomatic infected individuals is not reliable with antibody testing. In addition, test on the antibody is susceptible to false-positive results because of other proteins present in the test samples [12]. Viral **tests** such as nucleic acid amplification tests (NAATs) are also used as diagnostic tests for SARS-CoV-2 **infection** and as screening tests to reduce the transmission of SARS-CoV-2 by identifying infected persons. NAAT, such as RT-PCR is the best diagnostic test for the confirmation of COVID-19 infection. This method has good sensitivity and specificity. It can detect even a tiny amount of virus [13]. According to some reports, rRT-PCR assays based on specific TaqMan probes have detection limits as low as 4-10 copies of RNA template per reaction [14]. Well-trained personnel are required to conduct multiple-step and time-consuming procedures involving expensive reagents. A technical error can lead to false-negative results [15]. False-negative test results of the patients could lead to healthy individuals' infection and thus prevent a proper infection control. However, RT-PCR method requires at least 3 hours to provide results, and it needs a very experienced specialist for sample preparation and to handle the instrument [16]. Most RT-PCR analyses are laboratory-based. The technique is hence not suited for rapid and portable diagnosis of COVID-19. A summary of the various characteristics and advantages/disadvantages of the currently accepted testing strategies based on NAATs and antigen tests for SARS-CoV-2 is shown in Table 1 [11]:

	NAATs	**Antigen Tests**
Intended Used	Detect current infection	Detect current infection
Analyte Detected	Viral Ribonucleic Acid (RNA)	Viral Antigens
Specimen Type(s)	Nasal, Nasopharyngeal, Oropharyngeal, Sputum,	Saliva Nasal, Nasopharyngeal
Specificity	High	High
Test Complexity	Varies by Test	Relatively Easy to Use
Authorised for Use at the Point-of-Care	Most are not; some are	Most are, some are not
Turnaround Time	Most 1-3 days. Some could be rapid in 15 minutes	Ranges from 15 minutes to 30 minutes
Advantages	Most sensitive test method available Short turnaround time for NAAT POC tests, but few available Usually does not need to be repeated to confirm results	Short turnaround time (approximately 15 minutes) When performed at or near POC, it allows for rapid identification of infected people, thus preventing further virus transmission in the community, workplace, etc. Comparable performance to NAATs in symptomatic persons and/or if culturable virus present, when the person is presumed to be infectious
Disadvantages	Longer turnaround time for lab-based tests (1–3 days) Higher cost per test A positive NAAT diagnostic test should not be repeated within 90 days since people may continue to have detectable RNA after the risk of transmission has passed.	May need confirmatory testing Less sensitive (more false-negative results) compared to NAATs, especially among asymptomatic people. The decreased sensitivity of antigen tests might be offset if the point-of-care antigen tests are repeated more frequently (i.e., serial testing at least weekly).

Table 1. Consideration for planning for diagnostic or screening of SARS-CoV-2 with NAAT and antigen tests (Adapted from CDC, USA) [11]

Given the limitations of the currently available diagnostic tools for SARS-CoV-2, it is clear that a rapid, portable, highly sensitive and inexpensive diagnostic device will be useful. Such a device is preferably able to incorporate telemedicine for COVID-19 assessment, including identification of a patient's infection status. Until now, commercially available test kits give mostly qualitative results. But quantitative and telemedicine-based POC diagnostic tool will be useful for predicting disease severity in the course of the infection. For the development of POC devices for Covid-19, simple, safe, and effective sample collection is another important factor to be considered. This is the main challenge due to the existing assay requirements. Thus, a saliva-compatible POC analytical device may be advantageous because saliva collection is straightforward and non-invasive [17]. Therefore, a fast, portable and point-of-care but highly sensitive, specific and cost-effective POC device are very much anticipated in this critical pandemic era. Early detection of COVID-19 is crucial to stop or decrease the virus's spread and prevent exhaustion of medical resources, especially ventilators and ICU beds. Biosensor-based approaches may provide such POC technique. Electrochemical biosensors are advantageous for portability and telemetry friendly because of rapid detection and simplicity for remote point-of-care applications.

Biosensors As Diagnostic Tool for SARS-CoV-2

The technology platform behind testing using biosensor is the biorecognition elements binding to the target molecules from the virus. The signals from the chemical binding could then detected by various transduction methods. Electrochemical biosensors are potential diagnostic tools for rapid diagnosis of SARS-CoV-2 because it allows sample preparation-free sensing in various types of biological fluids and remote detection via wireless actuation [12]. Therefore, biosensors are small devices that utilize biochemical reaction by biomolecules such as enzymes, DNA and antibodies. Generally, a biosensor comprises three main components: a bio-recognition element, a transducer and an electronic system (Figure 1). It can be divided into four bio-recognition elements: nucleic acid or DNA-based, enzymatic, antibody or antigen-based and whole cell-based. Depending on the transducer type, biosensors detect targets based on optical, electrical, thermal, and other transduction signals. A biosensor can be classified as electrochemical biosensors (amperometric, potentiometric, field-effect transistor (FET) and impedimetric biosensor), optical biosensors, thermal biosensors and piezoelectric biosensors [18]. Other categorization can be made on the biorecognition principles.

The bio-recognition elements for the construction of biosensors for SARS-CoV-2 determination involving biomarkers such as single -stranded viral RNA, viral structural proteins, e.g. S, M, E, and N proteins (as antigens) and specific antibodies to SARS-CoV-2 present in the serological samples from the patients who have been exposed to SARS-CoV-2 [12]. The single-stranded RNA and nucleocapsid (N) proteins of the SARS coronavirus are important biomarkers for construction of biosensors targeting SARS-CoV-2. Aptamers seem to be an appropriate response to the presence of N proteins hence the virus itself. Aptamers are single-strand nucleic acid molecules consisting of DNA or RNA that bind to single atoms or to a wide range of proteins. Aptamers are characterized by high specificity and binding affinity to the target molecule [19]. They can be produced by SELEX (Systematic Evolution of Ligands by Exponential Enrichment) method. The aptamers contain all possible nucleotides sequences with a particular length (within 20–90 nucleotides). During production, they are usually incubated with the target molecule, leading to a high binding affinity of the nucleic acids to the intended target [20]. Aptamers are particularly useful because of their chemical stability, cost-effectiveness offering greater flexibility in the design of novel biosensors. They

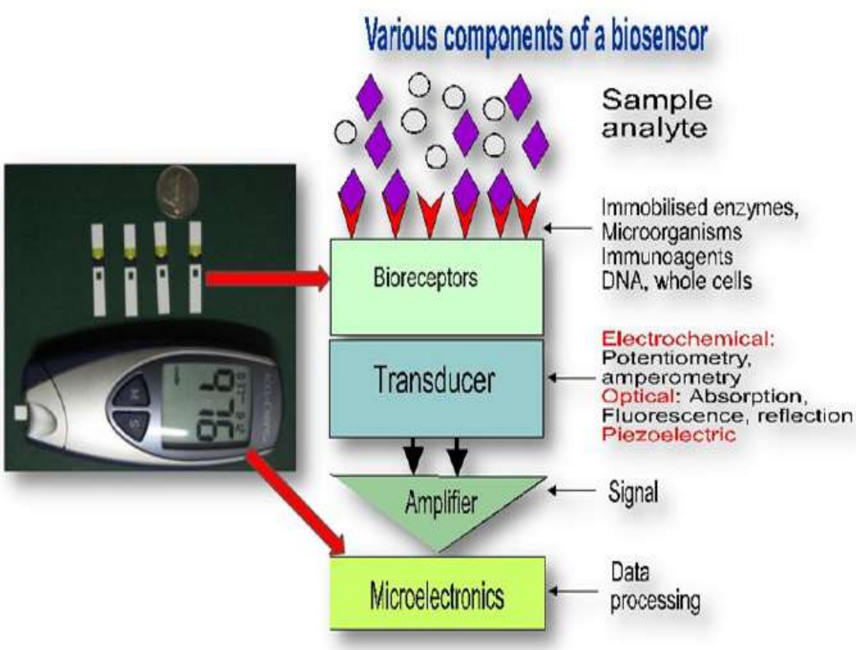


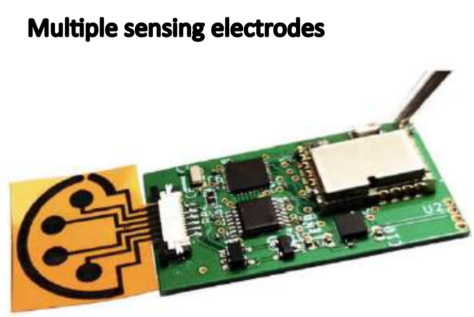
Figure 1: Various components of a biosensor device

tend to enhance detection sensitivity and selectivity [21-22]. Because of their high specificity, the affinity of binding to any viral proteins and DNA, the use of biosensors equipped with aptamers can allow for detection of both early (genetic material DNA, viral proteins) [23] and late (own host antibodies) infection. Many biosensors reported so far for SARS virus are based on aptamers [19]. A biosensor is a suitable and promising method for determining COVID-19 for early diagnosis and monitoring as they meet the characteristics required, i.e. sensitive, specific, portable and immediate measurements. Several biosensors for coronavirus using virus proteins/genomic biomarkers have been reported. The majority are based on optical/piezoelectrical methods [24-27] and electrochemical methods [16, 28-29].

An example of a portable, wireless electrochemical biosensor for ultra-rapid detection of SARS-CoV-2 is the RapidPlex biosensor device (Figure 2) [17]. This newly biosensor is portable, multiplex and wireless for the detection of COVID-19. With the biosensor device, it is possible to detect quantitatively SARS-CoV-2 nucleocapsid protein (NP), specific immunoglobulins (Igs) against SARS-CoV-2 spike protein (S1) (S1-IgM and S1-IgG), and the inflammatory biomarker C-reactive protein (CRP) in both blood and saliva. The biosensor electrodes are based on mass-producible laser-engraved graphene electrodes. In this electrochemical biosensor, antigens and antibodies are immobilized on low-cost graphene electrodes. 1-pyrenebutyric acid (PBA) acts as a linker to attach the required biorecognition element to the graphene layer. This multi-electrode system could allow a clear distinction between individuals in the stage of infectious, vulnerable, and immune to COVID-19. The RapidPlex device is proven to be low cost but has high sensitivity, ultra-fast detection, wireless, and could determine biomarkers for COVID-19 including viral infection (NP), immune response (IgG and IgM) disease severity via CRP assessment. Another example of biosensor for COVID-19 is based on an optical system is shown in Fig 3. The biosensor for SARS-CoV-2 detection, an immuno-based sensor, could simultaneously determine anti-SARS-CoV-2 IgM/IgG [30]. The biosensor device was claimed to have high sensitivity and possible for real-time detection of the virus. It is designed from a two-channel lateral flow immunoassay (LFIA) test strip (Fig 3) with surface-enhanced Raman scattering (SERS) as the detection transducer. Silica nanoparticles (SERS nanotags), which immobilized with the viral S protein, are used together with the LFIA test strip system as the signal reporter of the immuno-binding event. The test kits provide high sensitivity, specificity and stability in terms of application.

Biosensor based approaches have been shown to work well for the determination of SARS-CoV-2 virus. Many of these biosensors may be adapted readily for POC and hence home-testing applications. Their usefulness as POC or home testing kits for the diagnosis of COVID-19 should be assessed. Diagnostic testing provides prognoses and enables predicting treatment responses. In this respect, POC tests that allow tests to be performed near/at patient care are most useful for patient management. For example, POC tests help to optimize treatment decision-making and reduce referrals to increase the efficiency of care with a decrease in medical costs. This is particularly important under a resource-constrained environment with a weak laboratory infrastructure). The decision on whether a diagnostic test could be used for POC or home test kit will depend on factors such as Affordability, test Sensitivity and Specificity, User-friendliness, Rapid and robustness (ASSURED). These factors can be evaluated via six established procedures [31]:

i) Define the purpose of the test kit.



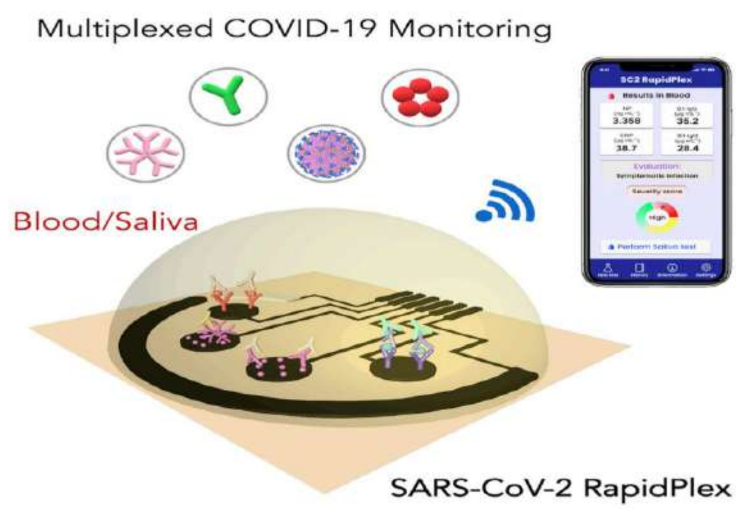


Figure 2. An example of an electrochemical immuno-based biosensor for testing SARS-CoV-2 virus using a multi-sensor concept with the possibility of testing results telemetry from the device (Adapted from [17]).

ii) Check all related products' specifications by reviewing the market
iii) Review any test's regulatory approval related to the test kit
iv) Establish data regarding the accuracy of the test kit under laboratory conditions
v) Obtain data on the accuracy of the test kit in clinical practice
vi) Assess and monitor the test kit performance routinely

Conclusion and future outlooks

For control on SARS-CoV-2 infection treatment and vaccine research, early detection and good diagnosis techniques are essential. Under severe outbreak, hospitals will be overloaded with work, and thus many suspected COVID-19 positive individuals might not be confirmed and isolated timely. Thus, reliable, fast response, affordable and widely accessible diagnostic devices are crucially required. Recent development in biosensor technology has shown the possibility of direct, rapid and portable testing of SARS-CoV-2 virus. Many of these biosensor devices are compatible with the application as POC testing. Indeed the biosensor technology is not new to POC testing. The widely accepted testing kits such as glucose tester (an electrochemical biosensor) and pregnancy test strip (LFIA with optical sensing) have been popular home test kits and marketed for many decades. Both medical professions and consumers much trust them.

Biosensors for SARS-CoV-2 can be used for rapid and on-site testing with a highly sensitive response to the target virus antigen. This provides a good prospect for the early diagnosis of COVID-19. Therefore, they can be used for screening the individual at crowded areas, especially in hospitals and airports. However, for a POC testing for COVID-19 pandemic with biosensors, information on good and independent test performance should be available. The manufacturing process should be reliable enough to produce consistent quality for various lots of POC testing products. Both the quality and quantity of a POC testing device will determine whether policy-makers, laboratories and end-users can accept it. Machine learning-based

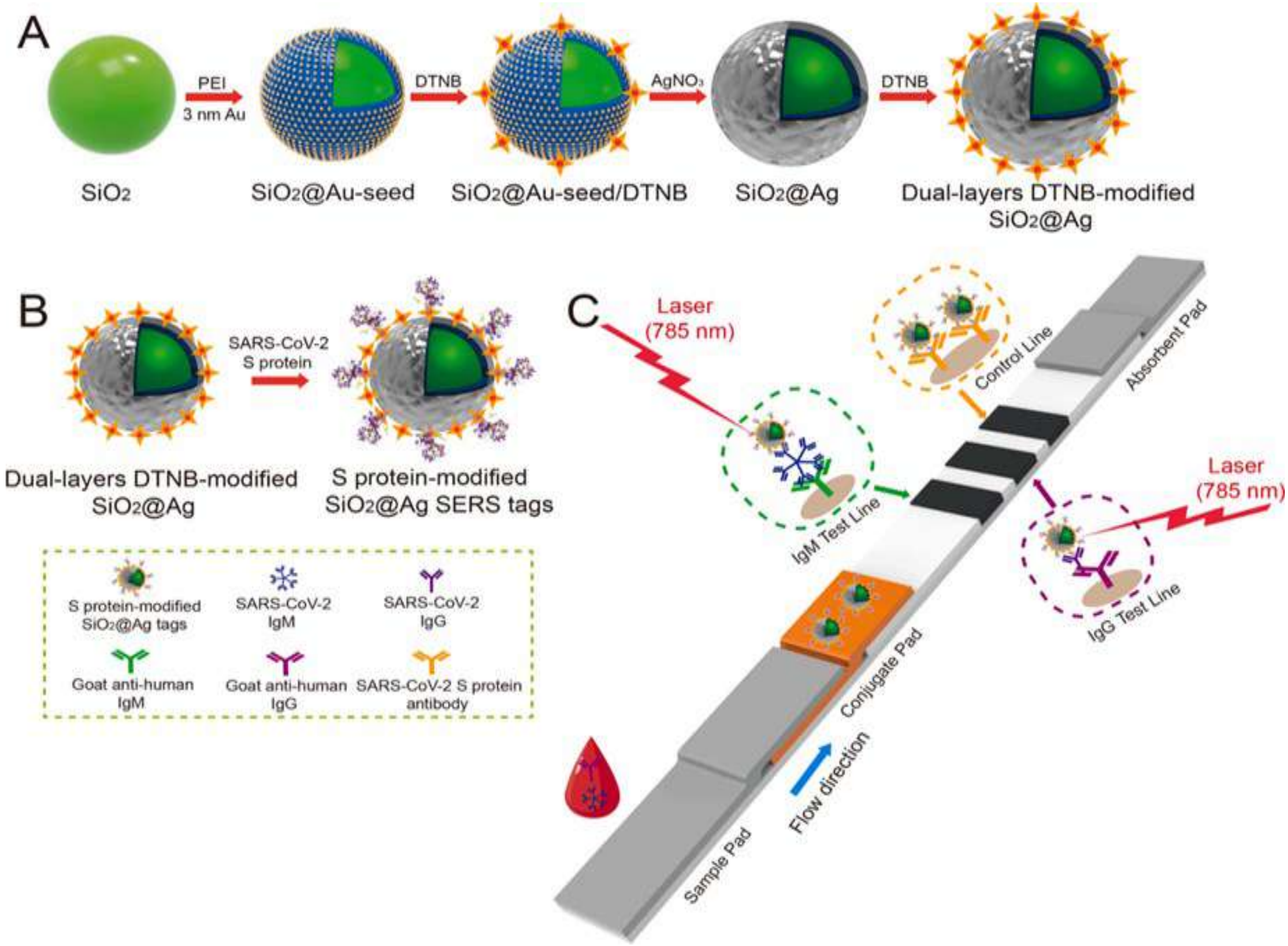


Fig 3. An optical biosensor for the testing of SARS-CoV-2 virus based on lateral flow immunoassay (LFIA) concept. (A) Demonstrating the preparation of modified SiO2 nanoparticles. (B) Preparation of SARS-CoV-2 S protein-modified SiO2 nano-tags. (C) Operating principle of the LFIA device for the simultaneous analysis of anti-SARS-CoV-2 IgM/IgG with LFIA strip and SERS detection system. (Adapted from [30])

signal processing should be developed to improve the reliability and reproducibility performance of the biosensor POC devices. Because of the possibility of SARS-CoV-2 transmission by asymptomatic carriers, readily available home-used biosensors will be useful for everyone to determine any infection by the virus. Colorimetric strips and smartphone-based biosensors based on antibody/antigen appears to have a good potential in home-used POC device for Covid19 testing.

References

[1] Ashour, H.M., Elkhatib, W.F., Rahman, M.M. & Elshabrawy, H.A. 2020. Insights into the Recent 2019 Novel Coronavirus (SARS-CoV-2) in Light of Past Human Coronavirus Outbreaks. Pathogens 9: 186, doi:10.3390/pathogens9030186.

[2] Xie, M. & Chen, Q. 2020. Insight into 2019 novel coronavirus — An updated interim review and lessons from SARS-CoV and MERS-CoV. International Journal of Infectious Diseases 94: 119–124.

[3] Sharma, S., Rathod, P. & Ukey, U. 2020. An overview of coronavirus disease-19 (COVID-19). International Journal of Research in Medical Sciences. DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20202927.

[4] Yethindra, V. 2020. Role of GS-5734 (Remdesivir) in inhibiting SARS-CoV and MERS-CoV: The expected role of GS-5734 (Remdesivir) in COVID-19 (2019-nCoV) – VYTR hypothesis. Int. J. Res. Pharm. Sci. 11(1): 1-6.

[5] Seo, G., Lee, G., Kim, M.J., Baek, S-H., Choi, M., Ku, K.B., Lee, C-S., Jun, S., Park, D., Kim, H.G., Kim, S-J., Lee, J-O., Kim, B.T., Park, E.C. & Kim, S.I. 2020. Rapid Detection of COVID-19 Causative Virus (SARS-CoV-2) in Human Nasopharyngeal Swab Specimens Using Field-Effect Transistor-Based Biosensor. ACS Nano 14: 5135−5142.

[6] Sah, R., Rodriguez-Morales, A.J., Jha, R., Chu, D.K.W., Gu, H., Peiris, M., Bastola, A., Lal, B.K., Ojha, H.C., Rabaan, A.A., Zambrano, L.I., Costello, A., Morita, K., Pandey, B.D., Poond, L.L.M. 2020. Complete Genome Sequence of a 2019 Novel Coronavirus (SARS-CoV-2) Strain Isolated in Nepal. Microbiol. Resour. Announc. 9 (11):e00169-20. https://doi.org/

[7] WHO (2020a). Coronavirus Disease 2019 Situation Report 51 11th March 2020. Geneva: World Health Organization, 2633. doi: 10.1001/jama.2020.2633

[8] WHO (2020b). Laboratory Testing for Coronavirus Disease 2019 (COVID-19) in Suspected Human Cases: Interim Guidance, 2 March 2020. Geneva: World Health Organization. Retrieved from: https://apps.who.int/iris/handle/10665/331329.

[9] Valencia, D.N. 2020. Brief Review on COVID-19: The 2020 Pandemic Caused by SARS-CoV-2. Cureus. doi: 10.7759/cureus.7386.

[10] Laghrib, F., Saqrane, S., El Bouabi, Y., Farahi, A., Bakasse, M., Lahrich, S. &El Mhammedi, M.A. 2020. Current progress on COVID-19 related to biosensing technologies: New opportunity for detection and monitoring of viruses. Microchemical Journal. doi: https://doi.org/10.1016/j.microc.2020.105606.

[11] Centre for Disease Control and Prevention CDC, USA is one of the major operating components of the Department of Health and Human Services. https://www.cdc.gov/coronavirus/2019-ncov/hcp/testing-overview.html

[12] Muhammad Asif, Muhammad Ajmal, Ghazala Ashraf, Nadeem Muhammad , Ayesha Aziz, Tayyaba Iftikhar, Junlei Wang and Hongfang Liu. 2020. The role of biosensors in coronavirus disease-2019 outbreak. Current Opinion in Electrochemistry 23:174–184

[13] Jing Wang. 2020. A new biosensor for COVID-19 virus: Detection in the environment. Science daily. https://www.sciencedaily.com/releases/2020/04/200421112520.htm.

[14] Torabi, R., Ranjbar, R.,Halaji, M. & Heiat, M. 2020. Aptamers, the bivalent agents as probes and therapies for coronavirus infections: A systematic review. Molecular and Cellular Probes 53: 101636.

[15] Liu, R., Fu, A., Deng, Z., Li, Y. & Liu, T. 2020. Promising methods for detection of novel coronavirus SARS-CoV-2. VIEW :1-4, doi: 10.1002/viw2.4.

[16] Seo, G., Lee, G., Kim, M.J., Baek, S-H., Choi, M., Ku, K.B., Lee, C-S., Jun, S., Park, D., Kim, H.G., Kim, S-J., Lee, J-O., Kim, B.T., Park, E.C. & Kim, S.I. 2020. Rapid Detection of COVID-19 Causative Virus (SARS-CoV-2) in Human Nasopharyngeal Swab Specimens Using Field-Effect Transistor-Based Biosensor. ACS Nano 14: 5135−5142.

[17] Torrente-Ro.drıguez, Heather Lukas, Jiaobing Tu, Jihong Min, Yiran Yang, Changhao Xu, Harry B. Rossiter, and Wei Gao, 2020. SARS-CoV-2 RapidPlex: A Graphene-Based Multiplexed Telemedicine Platform for Rapid and Low-Cost COVID-19 Diagnosis and Monitoring, Matter 3, 1981–1998.

[18] Antiochia. R. 2021. Developments in biosensors for CoV detection and future trends. Biosensors and Bioelectronics. https://doi.org/10.1016/j.bios.2020.112777.

[19] Zhou, J., Bobbin, M.L., Burnett, J.C., Rossi, J.J. 2012. Current progress of RNA aptamer-based therapeutics. Front. Genet. 3: 234.

[20] Tuerk, C.& Gold, L. 1990. Systematic evolution of ligands by exponential enrichment: RNA ligands to bacteriophage T4 DNA polymerase. Science. 249: 505–510.

[21] Roh C. and Jo. SK. 2011. Quantitative and sensitive detection of SARS coronavirus nucleocapsid protein using quantum dots-conjugated RNA aptamer on chip. J Chem Technol Biotechnol.86:1475–1479.

[22] Song S, Wang L, Li J, Zhao J and Fan C, 2008. Aptamer -based biosensors. Trends in Anal Chem. 27:108–117.

[23] Mahirah, T; Tan, L.L.; Karim, N.H.A.;Goh, C.T.; Heng, L.Y.; Khalid, B. 2020. Reflectance aptasensor based on metal salphen label for rapid and facile determination of insulin. Talanta, 207, 120321.

[24] Wang, R.& Li, Y. 2013. Hydrogel based QCM aptasensor for detection of avian influenza virus. Biosens.Bioelectron.42:148–155

[25] Tombelli, S.; Minunni, M.; Luzi, E.; Mascicni, M.2005. Aptamer-based biosensors for the detection of HIV-1 Tat protein. Bioelectrochemistry.67:135–141.

[26] Wandtke T, WoÅºniak J., KopiÅ" ski P. 2015. Aptamers in Diagnostics and Treatment of Viral InfectionsViruses.7:751 -780.

[27] Qiu G., Z Gai Z, Tao, Y., Schmitt J., Kullak-Ublick G. A., Wang.J. 2020. Dual-Functional Plasmonic Photothermal Biosensors for Highly Accurate Severe Acute Respiratory Syndrome Coronavirus 2 Detection. ACS Nano, DOI: 10.1021/acsnano.0c02439.

[28] Ruslinda, R.A., Tanabe, K., Ibori, S., Wang, X. & Kawarada, H. 2013. Effects of diamond-FET-based RNA aptamer sensing for detection of real sample of HIV-1 Tat protein. Biosens. Bioelectron.40:277–282.

[29] Labib, M., Zamay, A.S., Muharemagic, D., Chechik, A.V., Bell, J.C. & Berezovski, M.V. 2012. Aptamer-based viability impedimetric sensor for viruses. Anal. Chem. 84: 1813–1816.

[30] Liu, H., Dai, E., Xiao, R., Zhou, Z., Zhang, M., Bai, Z., Shao, Y., Qi, K., Tu, J., Wang, C. & Wang S. 2020. Development of a SERS-based lateral flow immunoassay for rapid and ultra-sensitive detection of anti-SARS-CoV-2 IgM/IgG in clinical samples. Sensors and Actuators:B. https://doi.org/10.1016/j.snb.2020.129196.

[31] Kosack Cara Sa, Anne-Laure Page b & Paul R Klatser. 2017. A guide to aid the selection of diagnostic tests. Bulletin of the World Health Organization.95:639-645.

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The new **Thermo Scientific™ Orbitrap Exploris™ GC-MS** brings high-resolution analysis into everyday testing in a compact and easy-to-use instrument, delivering leading sensitivity and mass resolving power up to 60,000. Analytical testing laboratories performing high-throughput analysis in sectors such as environmental and food safety can benefit from a simplified high resolution accurate mass gas chromatography-mass spectrometer (GC-MS) designed to provide sensitive data efficiently and confidently, allowing laboratories to speed-up turnaround time and expand their capabilities into new analytical avenues.

Through an analytical dynamic range across six orders, the new system can provide accurate quantitation and detection of chemical components at trace and high concentrations, for targeted and non-targeted applications such as quantitative pesticides, persistent organic pollutants, environmental contaminants and nitrosamines.

The capability to acquire accurate mass data in full scan allows for multiple compound identification points, simplifying data acquisition, facilitating retrospective data analysis and accelerating instrument set-up for increased uptime and productivity.

Thermo Scientific™ Orbitrap Exploris™ GC-MS

Learn more about Thermo Scientific Orbitrap Exploris GC-MS at **thermofisher.com/OrbitrapExplorisGC**

Addressing the need for increased flexibility, speed and accuracy in research applications throughout academic and industry laboratories, a new gas chromatography (GC) high-resolution mass spectrometer (MS) with unrivalled mass resolving power, sensitivity and wide dynamic range offers researchers the capability to achieve new depths of analysis and drive scientific understanding.

The **Thermo Scientific™ Orbitrap Exploris™ GC 240 MS** takes research capabilities to a new level with a resolving power of 240,000, for accelerated innovation. As research laboratories require the versatility to answer myriad questions in their studies, the Orbitrap Exploris GC 240 MS also provides the flexibility to tackle a diverse range of analytical challenges including identifying unknown contaminants and extractables and leachables.

By delivering both quantitative and qualitative information from a single injection, the new system enables precise and comprehensive compound identification, allowing researchers to make fast and accurate discoveries with confidence.

Thermo Scientific™ Orbitrap Exploris™ GC 240 MS

Learn more about Thermo Scientific Orbitrap Exploris GC 240 MS at **thermofisher.com/OrbitrapExplorisGC240**

Validated IC-MS/MS Workflow Improves EPA 557 Regulated Drinking Water Analysis

Municipal utility laboratories, contract testing laboratories, and local or regional governing agencies performing water testing can now benefit from a new, validated application workflow using ion chromatography tandem mass spectrometry (IC-MS/MS) to achieve haloacetic acid (HAA) analysis in drinking water in accordance with the U.S. Environmental Protection Agency Method 557 (EPA 557).

The new **Thermo Scientific™ Disinfection By-Products (HAAs) Application Workflow** uses the Thermo Scientific™ Dionex™ ICS-6000 HPIC™ system and a Thermo Scientific™ Dionex™ IonPac™ AS31 column coupled with triple quadrupole mass spectrometry, to deliver a fast, sensitive and simple method, that has been developed for direct analysis of nine HAAs, bromate, and dalapon in drinking water samples.

The robust and validated workflow enables method precision and accuracy, following the EPA 557 regulation, which is paramount to testing drinking water safety. To minimize system downtime, trained field service personnel can provide after sales support for the complete IC and MS/MS system as required.

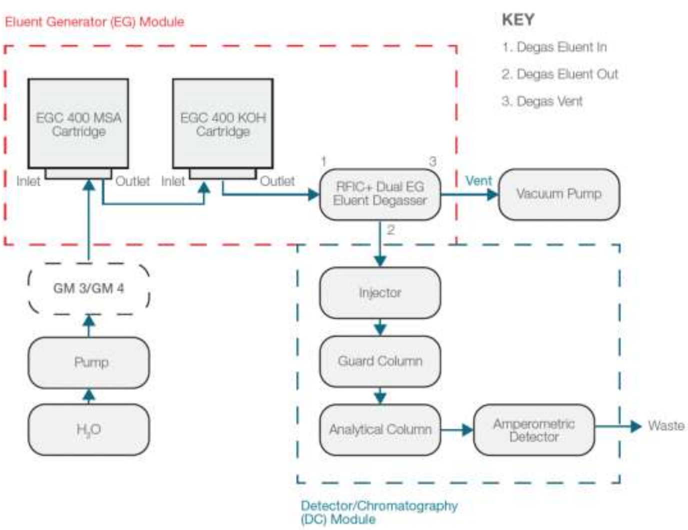
The validated IC-MS/MS workflow enables reliable and reproducible quantitation of target HAAs in drinking water per EPA method 557. Excellent separations of nine HAAs, bromate, and dalapon from common interference anions such as chloride, sulfate, and carbonate are enabled by the unique selectivity of the Dionex IonPac AS31 column. The MS detection method provides high sensitivity and makes it possible to directly inject drinking water samples, therefore eliminating the complexity and variabilities of sample preparation.

These method improvements allow time and cost savings for water testing laboratories and provide results that enable laboratories to more rapidly confirm the safety of drinking water.

To find out more about Thermo Scientific HAA9 analyzer workflow, please visit **thermofisher.com/HAAWorkflow**

Simplify the Complexity in Carbohydrate Analysis

Dual EGC flow diagram



There is a faster, easier way to boost speed and productivity, and improve the reproducibility and accuracy of your results. Using new high-performance anion exchange chromatography (HPAE) workflows with Thermo Scientific™ Dionex™ CarboPac™ columns, you can directly quantify even trace levels of complex carbohydrates with minimal sample prep—and no derivatization.

Thermo Scientific™ Dionex™ "Just Add Water" electrolytic eluent generation technology is an essential and powerful part of Reagent-Free™ Ion Chromatography (RFIC™) systems and this this technology ensures excellent reproducibility and accuracy in eluent preparation. With the latest operating mode for RFIC systems, **Dual Eluent Generation Cartridge (Dual EGC) mode**, this novel option can replace the manual preparation of the sodium hydroxide/sodium acetate (NaOH/NaOAc) eluent gradients required for analyzing complex carbohydrates.

Dual EGC mode is available on supported instruments, such as the Thermo Scientific™ Dionex™ ICS-6000 HPIC™ system and capillary systems, to support the analysis of complex carbohydrates. In Dual EGC mode, RFIC systems employ methanesulfonic acid (MSA) and potassium hydroxide (KOH) Thermo Scientific™ Dionex™ EGC Eluent Generator Cartridges, in series, to electrolytically generate potassium hydroxide/potassium methanesulfonate (KOH/ KMSA) eluents. This operating mode is applicable to capillary (0.4 mm) and analytical (1.0 mm) column formats.

Find out more at **thermofisher.com/complexcarbs**

On-demand: Accelerate Your Pharma Pipeline - From Discovery to QC

In today's unprecedented times, we understand that bio/pharmaceutical manufacturers are facing tremendous pressure to meet global demand. Thermo Fisher Scientific is working to help the scientific community, especially the producers of medicines, to overcome challenges through our series of learning and enablement activities.

Join us for the new on-demand learning session specially developed for the pharmaceutical industry titled **"Accelerate Your Pharma Pipeline - From Discovery to QC"**, part of the **2021 Thermo Fisher Scientific Chromatography Innovation Series**. In this session, leading industry experts have been invited to share new innovations and solutions to empower you to deliver your next-generation drugs to market.

The speakers include:
- Darshan Patel from AbbVie Inc.
- Brian Alliston from Sterling Pharma Solutions
- Dr. Alexander Schwenger from CureVac
- Eric Grumbach, Paul Gamache and Dr. Frank Steiner from Thermo Fisher Scientific

Register now for the on-demand session to learn about novel technologies and innovative solutions to current pharmaceutical challenges:

Knowledge Exchange

Thermo Fisher Scientific is committed to helping scientists, chemists and other laboratory professionals in Malaysia make the world healthier, cleaner and safer. Check out our one-stop resource for the latest technologies, workflow solutions and promotions to help you push the frontiers of science through trace elemental analysis (TEA). Subscribe to our Quarterly TEA eNewsletter *Trace Elemental Matters* by emailing us at **CMD.APACMarketing@thermofisher.com**

SMART NOTE

TQ ICP-MS or SQ ICP-MS - Which Instrument is Right for You?

In this Smart Note, Thermo Fisher Scientific discusses many frequently asked questions such as:

- How is a triple quadrupole different from a single quadrupole inductively coupled mass spectrometer (ICP-MS)?
- What are the functions of the three quadrupoles?
- What is the benefit of having three quadrupoles for interference removal?
- What range of collision/reaction cell gases can be used with the triple quadrupole instrument?
- Which instrument type should I choose: a single or triple quadrupole ICP-MS?

Scan this QR code to access the informative Smart Note now:

ON-DEMAND WEBINAR

Thermo Scientific™ iCAP™ TQe ICP-MS: For samples where single quadrupole performance isn't enough

The issue of spectral interferences in quadrupole ICP-MS and the negative effects these have on trace element data accuracy and detection limits has been known since the early days of the technology.

The development of triple quadrupole ICP-MS in the last few years has provided a solution to many challenges by enabling much more selective interference control.

In part 1 of this this 2-part webinar series, the theory and practice of triple quadrupole ICP-MS in comparison to single quadrupole ICP-MS will first be presented. The presentation will also discuss the performance of a new, workhorse instrument that utilises only He and O2 collision / reaction cell gases to remove the most commonly encountered interferences.

Scan this QR code to register now:

ON-DEMAND WEBINAR

Learn how routine laboratories can benefit from triple quadrupole ICP-MS technology

Triple quadrupole ICP-MS instruments have helped to take the analysis of trace elements to a new level, delivering better interference removal and significantly improved detection limits for key analytes.

Learn about modern triple quadrupole ICP-MS instruments that can help you to overcome initial difficulties with method setup based on straightforward design and intuitive software, allowing all laboratories and all staff levels to access the full potential of this technique.

The webinar will feature key examples from leading industry laboratories on how triple quadrupole ICP-MS has helped them to solve or improve on their challenges with trace elemental analysis.

Scan this QR code to register now:

APPLICATION NOTE

Overcome unexpected interferences and accelerate environmental analysis using triple quadrupole ICP-MS

This application note AN44484 discusses the benefits of triple quadrupole ICP-MS for the analysis of elemental contaminants in waters, waste, soils, and sediments.

Scan this QR code to download now:


thermo scientific

Overcome unexpected interferences and accelerate environmental analysis using triple quadrupole ICP-MS

APPLICATION NOTE

Maximizing laboratory throughput - Robust and accurate analysis of trace metals in food samples with TQ ICP-MS

This application note AN44474 demonstrates the suitability of the Thermo Scientific™ iCAP™ TQe ICP-MS using a single measurement mode for the analysis of trace elements in a variety of food samples.

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Maximizing laboratory throughput: Robust and accurate analysis of trace metals in food samples with triple quadrupole ICP-MS

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Consolidated analysis of soil contaminants

Four-fold increase in the sample throughput with GC-Orbitrap

Aaron Lamb[1], Dominic Roberts[1] and Cristian Cojocariu[1]
[1]Thermo Fisher Scientific, Runcorn, United Kingdom

Polychlorinated biphenyls (PCBs) and polyaromatic hydrocarbons (PAHs) are toxic organic compounds that can contaminate soils, air, sediments, and water as a result of natural and anthropogenic processes.

PCBs and PAHs are resistant to environmental degradation and can be transported over long distances. Moreover, due to their lipophilicity these chemicals can undergo biomagnification and accumulation in the food chain and can pose significant health risks to humans. Their toxicity even at very low concentrations means that their presence in the environment needs to be monitored so that the risk of uptake of these compounds into the food chain and subsequently into human populations is minimized.

More recently, it has become apparent that oxidized and substituted derivatives of PAHs (such as oxy and methyl PAHs) have similar or increased toxicities compared to non-substituted versions; therefore, governments have already began monitoring them in soil and particulate matter.

Nitrogen, sulfur, and oxygen-containing polyaromatic heterocycles (NSO-PAHs) are another class of compounds that have gained interest due to their ubiquitous presence in the environment and lack of data on their toxicities.

PCBs and PAHs (and derivatives) are typically analyzed by gas chromatography (GC) coupled to mass spectrometry (MS). The challenges for the analysis of PAHs and PCBs are the requirement for complicated and costly sample preparation such as Sohxlet extraction. Often long chromatographic separations (>40 min per sample) are required, which overall will result in low sample throughput and high cost of analysis.

To comprehensively characterize an environmental sample, multiple methods are employed for both the sample preparation and GC-MS analysis of these compounds. Having multiple chromatographic methods for the same sample increases the requirement for both labor and instrumentation. Multiple methods and chemists to review the process and report the data add to the time and cost of analysis.

In our application note (AN10731) a consolidated approach for the rapid and cost-effective analysis of sixteen EPA PAHs, seven marker PCBs, three oxyPAHs, ten methylPAHs, and nine NSO-PAHs in soil samples using a sensitive HRMS instrument was employed. For this, a modified QuEChERS sample extraction and clean up was investigated. Chromatographic separation of target compounds was optimized for a <20 min/sample method and detection was achieved using the Orbitrap Exploris GC system.

The evaluation of system robustness and method suitability for PAH and PCB GC-MS analysis was outside of the scope of this application but is discussed in a supporting technical note (TN10728).

The results of the experiments presented in AN10731 demonstrated that modified QuEChERS methods and the TriPlus RSH autosampler in combination with the Orbitrap Exploris GC provides an ideal solution for analytical testing laboratories looking to improve productivity and deliver confident results.

To access the full Application Note (AN10731), please download at **www.thermofisher.com/environmental-soil-gcorbitrap**

Table 2 is extracted from AN10731. For the full information on experimental e.g. sample preparation, GC conditions and data processing, please refer to the application note AN10731.

Table 2. Mass spectrometer conditions

Orbitrap Exploris GC EI GC-MS parameters	
Transfer line (°C)	320
Ion source (ionization type)	ExtractaBrite (EI)
Ion source (°C)	350
Electron energy (eV)	70
Emission current (µA)	50
Acquisition mode	Full scan (FS)
Mass range (*m/z*)	50–550
Mass resolution	60,000 (FWHM @ *m/z* 200, scan speed 7.4 Hz):
Lock mass (*m/z*)	207.03235

Table 2 continued. Mass spectrometer conditions

Orbitrap Exploris GC CI GC-MS parameters	
Transfer line (°C)	320
Ion source (ionization type)	ExtractaBrite (PCI)
Reagent gas type	10% ammonia in methane
Flow rate (mL/min)	0.6
Ion source (°C)	190
Electron energy (eV)	70
Emission current (µA)	100
Acquisition mode	Full scan (FS)
Mass range (*m/z*)	65–690
Mass resolution (FWHM @ *m/z* 200)	60,000 (scan speed 7.4 Hz)
Lock mass	None

ThermoFisher SCIENTIFIC

Olympus Handheld XRF Analyzer

OLYMPUS
Your Vision, Our Future

Malaysia was connected to Malacca Straits Sea which is one of the main sail passage in the world and generate numerous port activities. In November 2019, Marine Department Malaysia have announced IMO 2020 to implement the sulfur limit in fuel to reduce the environmental hazard of SO_2 emitted from Cargo Ship. **OLYMPUS VANTA Handheld XRF** is a rapid and accurate analyzer to determine sulfur (S) concentrations in fuel oil and provide onsite enforcement/spotcheck on the cargo ship. In addition, handheld XRF can aid preventative maintenance programs by identifying and quantifying wear metals in oil.

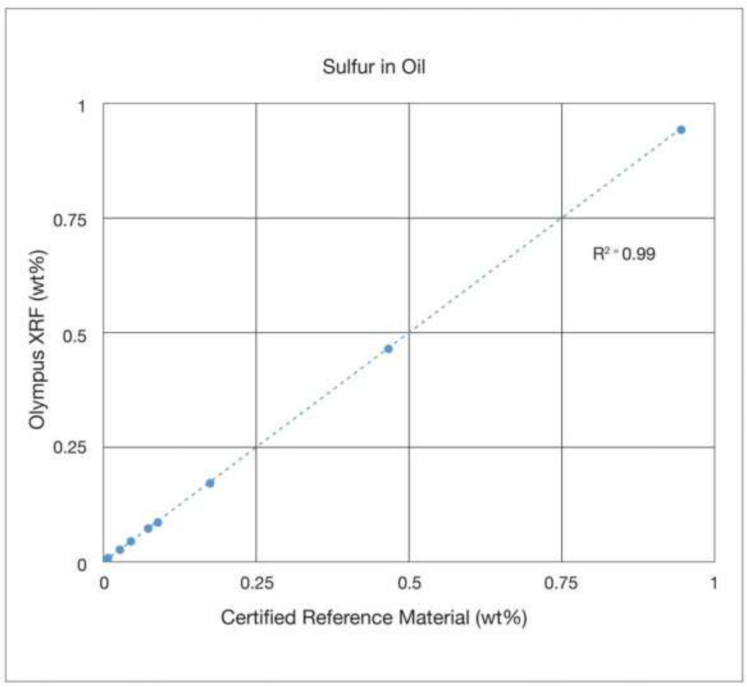
- The latest regulatory update lowers the global cap on sulfur in fuel from 3.5% to 0.5%, while sulfur in fuel from sulfur emission control areas (SECAs) remains at 0.1%. The regulation covers oil used in both main and auxiliary engines, as well as boilers.
- This regulation change leaves ship owners with little room for error and requires refineries to be more stringent in regard to fuel production and blending.
- Olympus handheld XRF instruments rapidly analyze sulfur in oil while meeting international standards like **ASTM D4294 and ISO 8754**. Obtain on-site results at multiple locations from the refinery to the ships.

Oil Analysis from OLYMPUS VANTA.

Where is the Handheld XRF analyzer can be used?

- Onboard vessels.
- Port or Refueling stations
- Regulators and laboratories.
- Suppliers to vessels.
- Analyzing wear metals in oil for preventative maintenance as in Table 1.
- Mercury contamination for Crude Oil tanker.

OLYMPUS VANTA can be used to measure the metal content in oil/lubricant as well to determine and predict the maintenance needed for cargo ship.



*Sulphur value measurement of **OLYMPUS VANTA** versus CRM value.*

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• Collaborate with cloud connectivity
• Powerful and seamless hyphenation with fully integrated software
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Meet the PerkinElmer LC 300, the latest LC to step off our production lines. With features and benefits such as five available detectors, ultraprecise gradient flows, low dispersion, and new Simplicity™Chrom CDS software, our LC 300 systems provide improved workflows, throughput, and usability. Whether you need the ruggedness of conventional HPLC, or the proven benefits of UHPLC, the LC 300 has you covered.
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NexION® 2000 ICP-MS
Titan MPS™ Microwave Sample Preparation System
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LC 300 HPLC & UHPLC
Clarus™ 690/590 GC
TurboMatrix™ HS
TurboMatrix™ TD/ATD
Flexar HPLC & UHPLC
Clarus® SQ 8 GC/MS
Torion® T-9 Portable GC/MS
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