JUNE 2020 | VOL. 2 NO. 3

e-ISSN: 2710-7256

RESEARCH@UCSI

UCSI University

CENTRE OF EXCELLENCE IN RESEARCH, VALUE INNOVATION AND ENTREPRENEURSHIP

OFFICE OF POSTGRADUATE STUDIES

MESSAGE FROM THE DIRECTOR OF OFFICE OF POSTGRADUATE STUDIES

Associate Professor Yim Hip Seng
Director of Office of Postgraduate Studies

Greetings UCSI University colleagues, alumni, students, and industry friends from Research and Postgraduate Office!

It is our pleasure to present to you, our bi-monthly electronic Research Newsletter Volume 2 No. 3 (June 2020). This Newsletter is a way for UCSI University to "go green" in disseminating campus research news and information, and share inspirational stories with you in a manner timelier than ever before. During the past 2 to 3 months, many of us have been working from home due to the Movement Control Order (MCO). This period has affected the research progress of many researchers as well as postgraduate students. Despite the restrictions, many of us have used this opportunity to re-strategise our work and research plans. Active communication still carries on for new opportunities for collaboration, networking, and support. What has not changed is our commitment to support UCSI University researchers and postgraduate students to implement effective strategies and programmes that maximise our ability to accomplish our mission.

To support a more vibrant research culture within UCSI University, we have our inaugural batch of 6 Post-Doctoral Research Fellows (PDRF) on board in May and June 2020. The PDRFs are affiliated to various disciplines (applied sciences, pharmaceutical sciences, business, engineering and computer science) and they will embark on exciting research projects with the support from their supervisors. With the PDRFs on board, we will have a series of activities planned for our UCSI University postgraduate students, and may also expect a list of high impact publications from them.

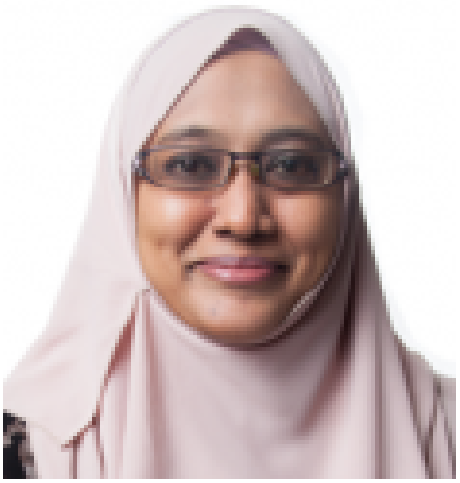
Thank you for taking the time to read our Research Newsletter!

Stay Safe. Stay Healthy.

Content

BLOCKCHAIN MECHANISM IN REFUSE MANAGEMENT SYSTEM

Assistant Professor Dr Rohana binti Sham

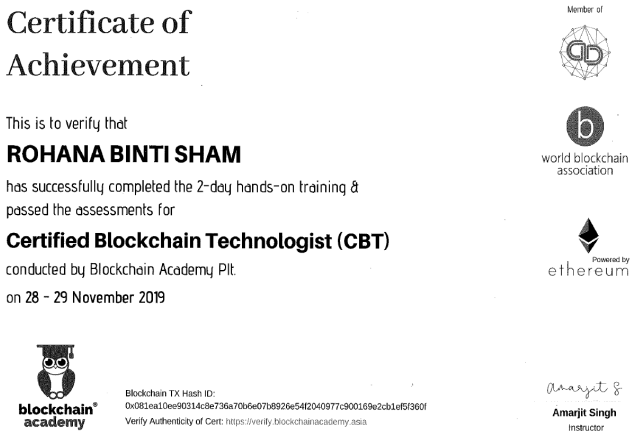


Assistant Professor Dr Rohana binti Sham is currently a lecturer from the Faculty of Business. She obtained her Doctor of Philosophy in Urban and Regional Planning (with a focus on transportation planning), Master of Science in Business Administration (majoring in Transportation and Planning), and a Certificate from Chartered Institute of Logistics and Transport in the UK. . Dr Rohana's research areas range from transport safety, green transport and supply chain, urban transport and road network, environment, and travel behaviour and infrastructure. Currently, she is focusing on the area of refuse management with application of blockchain. She has recently received funding under the Fundamental Research Grant Scheme (FRGS) from the Ministry of Higher Education Malaysia to conduct this research. She is also funded under the FRGS to conduct a study on the digital supply chain in the Malaysian oil and gas industry.

Being a Certified Micro Business Advisor and Certified Blockchain Technologist, Dr Rohana has has made positive contributions towards the development of young researchers through her supervision of both undergraduate and postgraduate students. She is currently working closely with her Master's students, Ms Won Jet Rou and Ms Liew Wei Ling on blockchain in refuse management system. Dr Rohana is also actively involved in consultancy projects with the state and Malaysian government, where she is one of the appointed advisory board members in the Malaysian Transport Master Plan. Her other involvements include conducting research on the environment where she is also a Board Member of the Association of Malaysian Environment-Behaviour Researcher.

Dr Rohana had participated in various national and international research innovation competitions, having collected over 40 awards including The World Inventor Award in South Korea. Recently, she has won The Best Paper Award - Top 8 at the 8th AMER International Conference on Quality of Life. Dr Rohana had also published numerous research papers in SCOPUS and Web of Science indexed journals, and 6 books related to logistics and transport areas.

Dr Rohana's current research interest lies in the blockchain mechanism in refuse management system. Looking at the environmental degradation in Malaysia that is caused by pollution, which greatly impacts the ecosystem service, she wishes to contribute to environmental conservation and address the current issues pertaining to environmental degradation by applying the refuse management system developed by her team.



Certificate of Achievement

Member of

world blockchain association

This is to verify that

ROHANA BINTI SHAM

has successfully completed the 2-day hands-on training & passed the assessments for

Certified Blockchain Technologist (CBT)

conducted by Blockchain Academy Plt.

on 28 - 29 November 2019

Powered by ethereum

blockchain academy

Blockchain TX Hash ID:
0x081ea10ee90314c8e736a70b6e07b8926e54f2040977c900169e2cb1ef5f360f
Verify Authenticity of Cert: https://verify.blockchainacademy.asia

Amarjit Singh
Instructor

Dr Rohana and her team won the Gold Medal Award and Commerce Dot Com Special Industrial Award at the Innovative Research, Invention and Application Exhibition (I-RIA) 2019

Based on Dr Rohana's observation, the current refuse management system applications are under-utilised and not well-maintained. Some of the applications are also facing issues related to the users' identity authentication and personal data protection. She believes that the application of alternative block chain network and mechanism could significantly improve the security and protection to users' data and privacy. The network and mechanism could also overcome the issues in the refuse management system in Malaysia.

The usage of blockchain in other industries has been getting much attention from stakeholders in the refuse management system. Dr Rohana believes that her research could significantly contribute to various industries including information technology (IT), benefitting the stakeholders at large while achieving the United Nation's Sustainable Development Goals (SDGs). With advanced IT, smart and autonomous refuse management system will soon be adopted across industries.

The blockchain system is believed to be able to facilitate the transmission of information. It provides transparency in transactions, maintains the privacy of the users, controls peer-to-peer data exchange, and increases the security of user authentication and protection. The ultimate outcome of Dr Rohana's research would be the integration and utilisation of blockchain mechanism in refuse management system to create a pollution-free environment.

MTE 2020 Invention and Innovation Awards: Silver Award under Social Innovations & Enterpreneur Management

RMK-12: GIVE PRIORITY TO SCIENCE

Professor Dato' Dr Ahmad Ibrahim (Fellow, Academy of Sciences Malaysia)

2021 will be the start of RMK-12, which is the nation's development plan for the next 5 years. A well-thought-out action plan is needed in order to achieve the new vision of Shared Prosperity 2030, which was launched earlier (see Figure 1). Poor implementation has been cited as a major weakness in most past plans. As we move towards RMK-12, we should be mindful of recent events that have struck a strong blow to global health. RMK-12 must prepare the nation well to face future disruptions. Topping the list of the many recent disruptive events, COVID-19 has shaken the world, and thus has been declared as a major threat to development alongside other global pandemics, with plans of fighting the disease included in the RMK-12.

Professor Dato' Dr Ahmad Ibrahim
Faculty of Engineering, Technology and Built Environment

We saw how COVID-19 has disrupted everything in its path. World leaders grapple with the decisions in dealing with the pandemic. A few came out with their own delirious recipes for cure. Fortunately, Malaysia pursued a more sound strategy. The nation's health professionals have been given more autonomy to take charge. The approach has worked well, to the point of gaining international recognition. Success in managing the pandemic is another clear testimony that our civil servants are no pushovers. Given enough space to manage, they can always rise to the occasion and deliver. It is high time our civil servants receive the credit and respect they deserve.

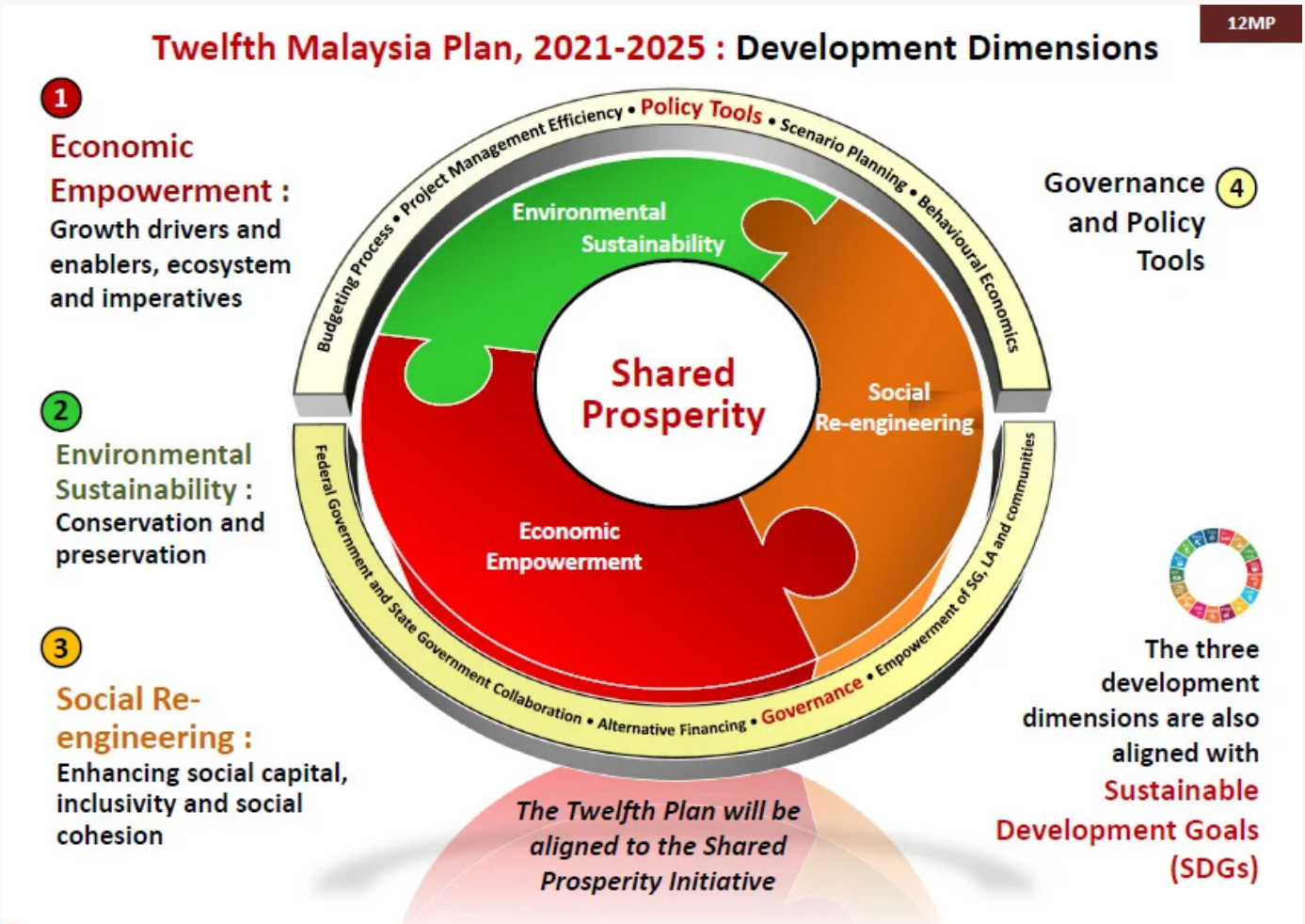
There is no denying that the science of infectious diseases is now better understood. Few would disagree that science literacy among the common man has been significantly raised. As a result of the massive publicity created by various media channels, the public is more aware about genome sequencing, chloroquine, the complex stages of vaccine development, and the importance of clinical trials for any new remedy to ensure safety and efficacy.

What has become clear is that it takes a pandemic like COVID-19 to stir public interest in science. For years, we have been hosting festivals and carnivals to promote science. As people always say, pain is the surest way to bring about change. Now we see evidence of this in the virus attack, which has inflicted pain on the entire global community. There is a saying by a Japanese novelist that goes, "We must embrace pain and use it as fuel for our journey".

RMK-12, a national formula for progress, is our chance to demonstrate change for the present and the future, not only within the sphere of our economy, but also progress in the quality of life for all. This is what sustainable development is about. Sustainable development requires advancement in the fields of science.

These fields of science include climate-friendly energy production, health management, sustaining key resources such as water, food production, and keeping the environment safe. Their progress, which is equitably shared, as articulated in the Shared Prosperity Vision 2030, is not an understatement. Pursuing progress is about overcoming threats and capturing opportunities. Poverty, which is one of the threats that we need to tackle, has been further impacted by the spread of COVID-19, much to the concern of many. One of the ways to address the issue is through creation of more jobs, with a strategic plan to capture emerging opportunities included in the RMK-12.

Many of these jobs will be introduced in the fields of science, particularly in health science. New roles in biotechnology, especially those linked to medical research, are now becoming more relevant. Vaccine development, for example, is closely tied with the study of genomic science. Next is digital science, which has also become increasingly critical. Digitalisation is a key ingredient to business competitiveness with the exponential rise in e-commerce and the work from home arrangement. Internet and broadband science has emerged as a discipline deserving attention, especially with more investment being made into broadband support. Cybersecurity is another branch of science, which is high in demand as a result of rising cybercrimes. In regards to the field of information technology, the growing demand for expertise in artificial intelligence (AI) and big data has become increasingly evident. Environmental and climate science is no exception as the field remains critical to any development planning. It is therefore crucial for us to nurture the right talent and invest in relevant R&D projects to strengthen the nation's expertise in such disciplines. Improving the infrastructure and ecosystem through these fields of science should be given priority in RMK-12.



Breakdown of RMK-12 components focusing on SHARED PROSPERITY

UNDERSTAND THE APPLICABILITY OF MAGNETIC NANOPARTICLES FROM MACRO- AND MICROSCOPIC-LEVEL PERSPECTIVES

Assistant Professor Dr Yeap Swee Pin

Assistant Professor Dr Yeap Swee Pin
Department of Chemical & Petroleum Engineering, Faculty of Engineering, Technology and Built Environment

Nanoparticles, known as particles with one of their dimensions being less than 100 nm, have been widely employed in various engineering applications. Owing to its extremely tiny size, a nanoparticle exhibits greater specific surface area as compared to its micron- or macron-sized counterparts. Despite that, each type of nanoparticle has its own unique characteristics. One of the well-known nanoparticles is the magnetic nanoparticle (MNP). As the name implies, this type of nanoparticle is unique as it is highly responsive to magnetic fields. This characteristic has made MNPs attractive candidates for wastewater and water treatment applications. Morover, the ability of MNPs to undergo magnetophoresis has eased up the downstream separation process after the treatment application.

In fact, myriads of laboratory studies employing similar strategy have been published in an extensive manner after the seminal work of Yavuz et al., titled "Low-Field Magnetic Separation of Monodisperse Ferroso Ferric Oxide Nanocrystals", published in the top journal, Science (DOI: 10.1126/science.1131475) had demonstrated the purification of anarsenic-contaminated water using MNPs and the possibility of separating the spent MNPs using a cost-effective low magnetic field gradient (< 100 T/m). However, there is still a lot that needs to be accomplished for a full realisation of this technology to date. In particular, MNPs suffer from poor colloidal stability, namely agglomeration (Figure 1(a)). More importantly, the complex relationship between the particle agglomeration and their magnetophoresis behaviour subject to a magnetic field is ill-defined. Such research gaps need to be addressed through understanding the interparticle interactions and magnetophoresis behaviour from a molecular-level view.

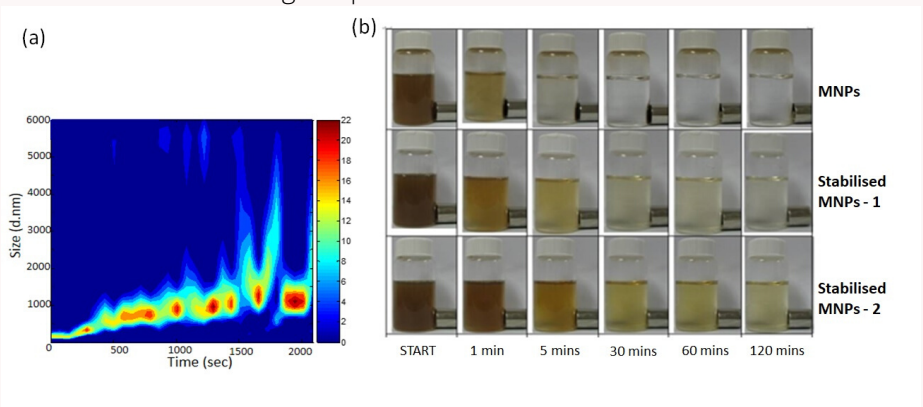


Figure 1. (a) Agglomeration of MNPs, (b) Effects of MNP stabilisation on its magnetophoresis rate

Our work aims to address the influence of colloidal stability towards the magnetophoresis of MNPs. The colloidal stability of MNPs was successfully improved after a surface modification with a strong polyelectrolyte, poly (sodium 4-styrenesulfonate) (PSS) was made. The formed PSS/MNPs are stable due to the electrostatic and steric repulsion forces that overwhelm the magnetic dipole-dipole attraction when the interparticle distance is less than 97 nm and 50 nm, respectively.

Interestingly, we found that the initial short magnetophoresis separation time of MNPs (8 minutes) has been extended to more than one hour upon stabilisation (Figure 1(b)). It appears that the more colloidally stable the MNOs, the harder for them to be magnetically separated. Such conflicting effect is undesirable in the field of Chemical Engineering where quick separation is required.

To further understand the underlying mechanism that leads to such conflicting effect, our team has carefully tracked the magnetophoresis profile of MNPs via macroscopic and microscopic studies. A macroscopic study showed that MNPs undergo a typical cooperative magnetophoresis whereby the relationship between the separation time and the initial particle concentration is best explained by an empirical power law (R2~0.9811). In contrast, the magnetophoresis of stablilised MNPs was found to not obey the typical cooperative mechanism (R2 ~ 0.1897) (Figure 2(a)). For the latter, a time-lapse dynamic light scattering analysis revealed that the stabilised MNPs were experiencing sizeable fractionation-based magnetophoresis, which is a consequence of the presence of distribution of particle sizes in the suspension.

Meanwhile, in a microscopic study, it was found that the MNPs self-assembled into irregular fractal structure of various patterns and dimensions under the earth's magnetic field; while the stabilised counterpart self-oriented into thread-like structures that distributed evenly in the water.

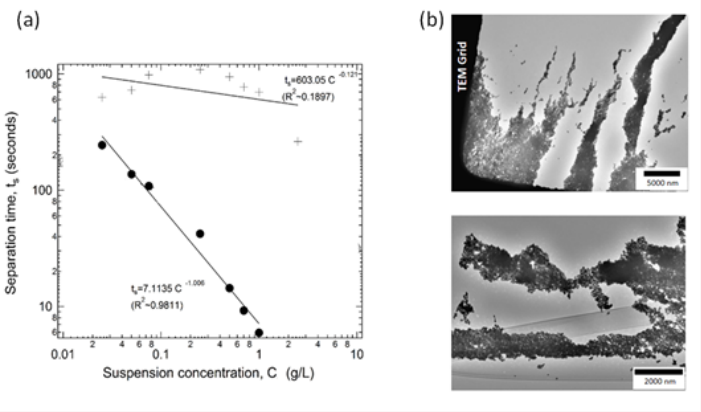


Figure 2. (a) Correlation of cooperative magnetophoresis, (b) magnetic field-induced assembly of stabilised MNPs into fat chain-like structures

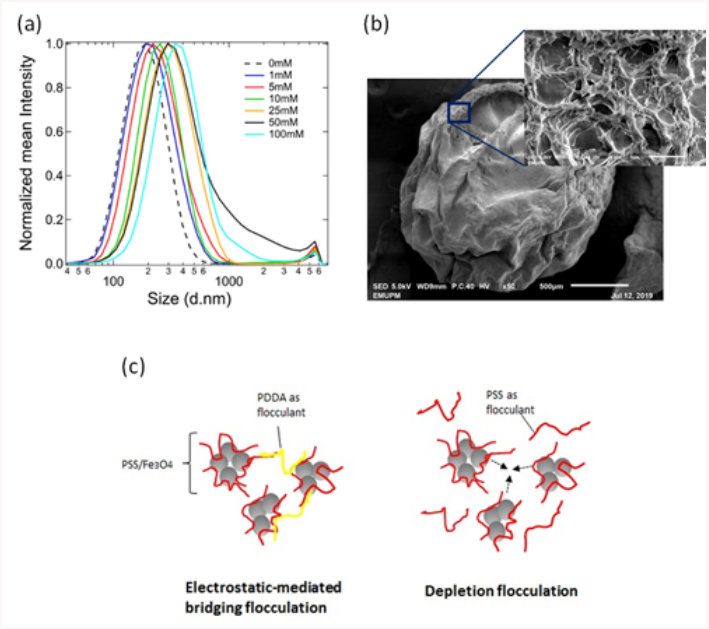


Figure 3. (a) A design of stabilised MNPs with controlled cluster sizes, (b) Encapsulation in macro-bead, (c) Promoting bridging and/or depletion flocculation-assisted magnetophoresis

When exposed to externally applied magnetic field, these thread-like structures further assembled into parallel fat chains and simultaneously moved to the location where the external magnetic field was applied (Figure 2(b)). Interestingly, it was found that the fat chains experienced (i) a sudden bending and (ii) splitting upon removal of the external magnetic field. This unique feature explains the soft magnetic material characteristic attained by the MNPs having been stabilised with PSS.

Based on both the macro- and microscopic studies, our team has developed several strategies to solve the issue associated with slow magnetophoresis of stabilised MNPs. These include (i) designing a stabilised MNP cluster with the size factor balancing both colloidal stability and magnetophoresis rate (Figure 3(a)), (ii) encapsulating the MNPs into macro-bead for rapid separation (Figure 3(b)), as well as (iii) introducing free polymer into the suspension to promote bridging and/or depletion of flocculation-assisted magnetophoresis (Figure 3(c)). In any of the strategies, our team has successfully shortened the magnetophoresis time of the stabilised MNPs to a scale of few minutes. Currently, our team is also looking into the magnetophoresis behaviour under real environmental medium - a more complex system where various ionic substances are present.

MALAYSIA TECHNOLOGY EXPO MERIT AWARD 2020

Cocoa Butter-Based Fast Melt Tablets

Assistant Professor Dr Ashok Kumar Janakiraman, Assistant Professor Dr Shiek Abdul Kadhar Mohamed Ebrahim Habibur Rahman, and Associate Professor Dr Mogana Sundari Rajagopal

The research team members (from left) Assistant Professor Dr Shiek Abdul Kadhar Mohamed Ebrahim Habibur Rahman, Ms Pearly Chia Zhi Qing, and Assistant Professor Dr Ashok Kumar Janakiraman

Cocoa butter-based fast melt tablets innovation is a product innovation of Faculty of Pharmaceutical Sciences. This product innovation has won the **Silver Award under the Asian Youth Innovation Award in the 19th Malaysia Technology Expo (MTE) 2020**. The research team that created this product was formed by Assistant Professor Dr Ashok Kumar Janakiraman , Assistant Professor Dr Shiek Abdul Kadhar Mohamed Ebrahim Habibur Rahman, Associate Professor Dr Mogana Sundari Rajagopal, and Ms Pearly Chia Zhi Qing from UCSI University; as well as Assistant Professor Dr Liew Kai Bin from University of Cyberjaya. The product innovation idea provides an advantage, particularly for paediatric and geriatric populations who have difficulty in swallowing conventional tablets and capsules.

The fast melt tablets innovation is a new oral dosage form that could dissolve within 3 minutes inside the patient's mouth. This product comprises of cocoa butter, which is inexpensive, easily available, and melts easily at normal human body temperature. Cocoa butter is also rich in natural plant compounds called phytochemicals, which will not increase a person's cholesterol level. Other ingredients of the product include fillers and superdisintegrants, which can enhance the disintegration and mechanical strength property of the tablet. The inclusion of cocoa butter will create a synergistic effect with other ingredients and further promote the melting properties of the tablet.

The cocoa butter-based fast melt tablets were produced using a simple freezing method that is rapid, simple, inexpensive, and highly productive. Further research will be conducted to to add active drug excipients into the product. The cocoa butter-based fast melt tablets hold a great potential in improving the palatability of oral pharmaceuticals, as well as patient compliance and convenience. This is one of the many formulations in a research conducted by UCSI University's Faculty of Pharmaceutical Sciences, which is in line with innovation in drug design.

Cocoa Butter-Based Fast Melt Tablets

MTE 2020 Asian Youth Innovation Awards: Silver Award under the Healthcare, Personal Care Technology, Biotechnology and Life Sciences category

OUR YOUNG ACHIEVER

Loh Wai Leng Carmen

Master of Science (Applied Sciences) By Research

Supervisor: Associate Professor Dr Grrace Ng Hui Suan

- Awarded with **UCSI Trust Graduate Scholarship from 2018 to 2020.**
- Won the **Best Paper Award** (1st Place under the Oral Category) in the 2018 Green Sustainable Biotechnology Symposium, held at National Tsing Hua University, Taiwan (22 January 2018).

- Won the **2nd Prize of Oral Competition Award** in the 2018 International Symposium on Novel and Sustainable Technology, held at Southern Taiwan University of Science and Technology, Taiwan (on 4 to 5 October 2018).

- ·Won the **Best Poster Presentation Award** in the 10th Symposium on Innovative Bioproduction Taichung (iBioT 2019) held at Tunghai University, Taiwan (on 7 to 9 November 2019).

- Awarded with **travel grant** to attend and conduct an oral presentation at the 71st Annual Meeting of the Society of Biotechnology of Japan (SBJ), held at Okayama University, Japan (on 16 to 18 September 2019).

LIST OF NATIONAL AND INTERNATIONAL GRANTS

No.	Grant Name	Closing Date	Link
1.	International Collaboration Fund, MOSTI (Cycle 3)	31 July 2020	https://edana.mosti.gov.my
2.	Arts & Humanities Research Council (AHRC) Global Challenges Research Fund (GCRF) Urgency Grants Pilot	31 October 2020 (4:00 pm Malaysian time)	https://ahrc.ukri.org/funding/apply-for-funding/current-opportunities/ahrc-global-challenges-research-fund-gcrf-urgency-grants-pilot/?_ga=2.182166625.710577898.1592213106-270988140.1587697584
3.	UKRI GCRF/Newton Fund Agile Response call to address COVID-19	None-apply at any time	https://www.ukri.org/funding/funding-opportunities/ukri-gcrf-newton-fund-agile-response-call-to-address-covid-19/
4.	Rufford Small Grant	None-apply at any time	https://www.rufford.org/rsg/criteria

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