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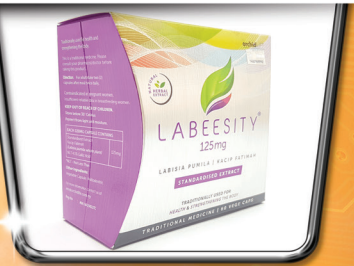
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- ▶ PATENT PENDING (PI 2017000866)
- ▶ TRADEMARK REGISTERED (2014009295)



LABEESITY®: STANDARDIZED NANO FORMULATED EXTRACT OF KACIP FATIMAH FOR WEIGHT REDUCTION

Labesity® is the first scientifically proven *Labisia pumila*-based product for healthier and stronger body that promotes weight loss for both men and women.

Problem Statement

- Obesity is a global health problem affecting wide spectrum of population. It is a complex disease with poorly understood pathways.
- Attempts to correct metabolic disparity of the obese condition, using drugs such as Sibutramine™ and Orlistat™ resulted in undesirable side effects such as dry mouth, anorexia, constipation, insomnia, dizziness and nausea.
- Hence, an urgent need to explore new sources for anti-obesity medicines. Medicinal plants continue to provide humanity with potential medicine candidates for the treatment of various diseases. Our group have investigated the potential of Labesity® as a nano formulated, therapeutically potent and yet safe, anti-obesity product.

Novelty & Inventiveness

- The first invention introduces the potential of *Labisia pumila* as a new herb for anti-obesity offering solutions to the existing worldwide obesity problems.
- Standardization protocol was established to guarantee consistent efficacy, safety and quality of Labesity®.
- Pre clinically tested in vivo against selected commercial products (ZENOCITIL™ and Xenical™) in anti-obesity assays and the results indicated the superior quality of Labesity®.
- Labesity® acts with 4 mechanism: (1) blocks fat storage, (2) inhibits fat cells from growing, (3) blocks dietary fat from being absorbed, (4) an appetite regulator.

Applicability

- Overweight/obese individuals.
- Helps global population by maintaining ideal BMI and thus improve their quality of life.
- Multiple benefits for both men and women.

Product/Technology Readiness

- Technology Readiness Level 9 - Ready for full commercialization.
- Approved by Malaysia Ministry of Health as a Traditional Medicine in 2016.
 - MAL16125021TC (60 mg capsules)
 - MAL16125022TC (125 mg capsules)
- Certified JAKIM HALAL Pharmaceutical (MS2424-20121040-05/2007).

Research Achievement

- 1 national grant.
- 1 published article and 4 International Conferences.
- 1 gold medal awarded for Invention and Innovation at 2014 Malaysia Technology Expo.
- Graduated 1 PhD student.
- 1 Post-doctorate fellow.

Intellectual Property

- 1 patent pending in MyIPO.
- Labesity® trademark awarded.

Business partner

- Orchid Life Sdn Bhd.
- A Perpetual Licensing Agreement is signed between Usains Holding Sdn. Bhd to Orchid Life Sdn. Bhd. on 30th November 2015.
- Later, Orchid Life Sdn. Bhd requested for full ownership of the technology (Labesity®). Thus, an agreement for sale of intellectual property rights is signed on 15th September 2018.

Commercialization status

- Date of Labesity® commercialized: 14th December 2016.
- Commercially available in Malaysia at selected pharmacy outlets throughout Malaysia and is expected to enter global markets beginning with Indonesia end of 2019 and USA early 2020.
- Marketing strategy includes media (social, electronic, printed) and retail programmes, competitive pricing, potential market alliance and trade shows and fairs.
- Undergo strict international acceptance product standards such as GMP and GLP requirements. The product is certified Halal. The final goal is to be labelled FDA approved and Clinically tested.
- Current sales revenue exceeded RM 0.5 million in local market and demand is encouraging.

Level of Impact

- Quality of Life – Malaysia is now the fattest nation in Asia and has the second highest child obesity rate among children in ASEAN.
 - In 2017, overweight and obesity accounted for 13.3% of total health costs, 0.54% of GDP or USD 1.7 billion.
 - Labesity® is one of its kind in the global market.
- Sustainability of Business – Ongoing R&D to turn Labesity® as FIRST Therapeutic Natural Product based on *Labisia pumila* to treat obesity that will be approved and recognized by NPRA Ministry of Health, Malaysia by end 2020.
 - 7 Government Hospitals and Klinik Kesihatan have agreed to participate in the FIRST and the BIGGEST in Malaysia randomized placebo double blind human clinical studies phase III on obesity using Labesity®.
 - The FIRST product to receive clearance from USFDA under the new dietary ingredient notification and generally recognized as safe notification.
 - The FIRST product to receive clearance from European Food Safety Authority under the novel food category.
- Economy – Created multiple jobs in various support sectors for local and global markets.



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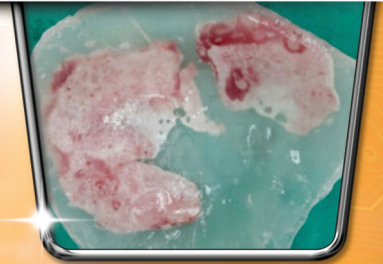
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Dr. Low Peh Hueh

Dr. Johari Yap Abdullah

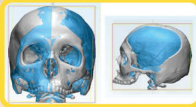
Abdul Manaf Abdullah

Suzana Mohd Yahya



▶ COPYRIGHT (LY2019000404)

A NOVEL COMPUTER AIDED RECONSTRUCTION IN HYBRID CRANIOPLASTY



Introduction:

This invention developed a patient-specific implant hybrid cranioplasty. Cranioplasty is an elective procedure after recovery of life saving procedure of decompressive craniectomy. This reconstructive surgery of cranioplasty is carried out to protect the underlying brain to help ensure the potential for recovery of the injured brain. Current method of cranioplasty is based on the skills of the surgeon whereby most of the small to medium size defect are was topped up with alloplastic material on a free hand basis intra-operatively, which often resulted in inaccurate implant approximation with unsatisfactory cosmetic result.

Novelty & Inventiveness

- Generating virtual 3D implant by mirror imaging, 3D print and form a mould by using a 3D printed model.
- Placement of defect autologous bone in a mould and added with alloplastic material to form hybrid cranioplasty implant.

Applicability

- Trauma patient with cranial defect
- Reduce operating time
- Aesthetic

Product/Technology Readiness

- TRL 7
- Already applied to 13 patients at HUSM, no significant complication was reported

Research Achievement

- Silver Award ITEX 2019, KLCC
- Publications:
 - (a) 3 Scopus, 3 ISI
 - (b) MMed Thesis, "Patient - Specific Reconstruction Utilizing Computer Assisted 3d Modelling For Partial Bone Gap Defect In Hybrid Cranioplasty"
 - (c) Published in Varsiti Inovasi, Berita Harian, 11th July 2019
- Funded by Research University Grant (RUT 1001/PPSG/852004) and (RUI 1001/PPSG/8012241)
- Talent : 1 Graduated MMed Neurosurgeon, Dr Low Peh Hueh

Intellectual Property

- Copyright: LY2019000404

Industry/Business Partner

- USAINS Holding Sdn Bhd

Commercialization Potential

- Road casualties statistics in Malaysia every year is about 400,000 cases (MIROS, 2012) where many of the survivors have to go for craniectomy
- 10 cases/month (HUSM alone)
- All hospitals included general and private hospitals

Level of Impact

- Computer assisted modelling lead to high dimensional accuracy resulting in to an aesthetical implant
- Reduce rejection and donor site morbidity by using patient's own bone (autologous)
- Patient regain self confidence
- Affordable

Presentation and Other Strength

- Poster Presentation:
 - (a) APASTB 2018 in Conjunction with 3rd Regional Biomaterials Scientific Meeting (RBSM), Bangi-Putrajaya Hotel, Selangor, 27-30 August 2018
 - (b) European Association of Neurosurgeon Society (EANS) 2017 Congress, Venice Congress Centre, Venice, Italy, 1-5 October 2017

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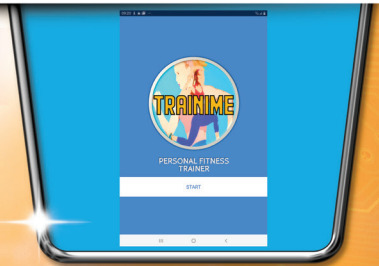
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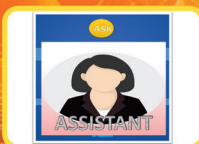
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Assoc. Prof. Dr. Mona Masood

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PERSONAL FITNESS TRAINER



Introduction

TRAINIME is an intelligent virtual fitness trainer that utilized the study on fitness in health education and facilitated with the technologies from the field of Artificial Intelligence (AI) and Virtual Reality (VR).

Inventiveness and Novelty

This app utilized the technology of AI and VR to intelligently suggest the most suitable trainer based on profile submitted (weight, height, age, activity level and gender). There are 8 different 3D virtual trainers with 9 different types of movements for fitness. This app also has an image recognition function, BMI and BMR calculation, Food Nutrition Info, Fitness Activity Log, Intelligent Bot Assistant and Fitness Sensors.

Intellectual Property Status

Copyright Obtained: LY2018006398

Usefulness and Application

It can be used for BMI and BMR calculation, Fitness Log, Food Nutrition Info, Personal Trainers and Built-in sensors for Fitness.

Product/Technology Readiness

TRL 6- Completed, tested, commercially available and can easily set up in any fitness facility.

Research Achievement:

10 research papers: 8 Scopus, 2 Accepted for publication
2 Awards: Knovasi 2019 (Silver), ITEX 2019 (Silver)

Commercial Potential

Ready to be commercialized anytime, niche to the Malaysian and International users, technology transfer ready

Industry/Business Partners

- a) Muslimah GYM and Fitness
- b) Infinity Gym

Grant/Publication(etc)

Short Term Grant (304/PMEDIA/6315301) 1 Master student graduated

Level of Impact

International-Worldwide Available

Presentations and other strength

This product is available as a fitness app and can be easily set up in any participating fitness centers as a virtual fitness trainer. It is equipped with the latest Artificial Intelligent technology, fitness tools, and the trainers were designed based on researches and interviews from actual fitness trainers.

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TRADEMARK APPLICATION IN PROGRESS



MYNYPA SUGAR: DIABETIC FRIENDLY NATURAL SUGAR FROM *NYPA FRUTICANS* SAP



Introduction

In Malaysia, the prevalence of diabetes mellitus (DM) has experienced an upward trend as it remains the second most common chronic illness in the country. In a span of just a decade, there has been an 80% increase in the prevalence of diabetes. This number has exceeded the estimated prevalence of DM for the year 2025.

Problem Statement

The increasing trend of DM seem to have linked to the continued escalation of the availability of added sugar and sweeteners (kg/capita/year) in Malaysia which has risen from 28.8 kg to 48.7 kg, or almost 70% between 1967 and 2017 (FAO, 2017). Consumption of artificial sweeteners such as aspartame, sucralose, saccharine and neotame on the other hand has been promoted as a prevention strategy to replace added sugar. However, the health risks of artificial sweeteners consumptions are still highly controversial topic, which have allegedly been linked to adverse effects such as cancer, weight gain and metabolic disorders.

Novelty & Inventiveness

A novel alternative natural sugar replacer from *Nypa fruticans* sap which could be incorporated into processed foods in developing high dietary fibres and low sugar (low GI) bakery products which are well accepted by customers.

Applicability

- Suitable to be replaced with sugar in processed foods, especially bakery products.
- Slowly digested and hence, causing a lower rise in blood glucose level after consumption.

Product/Technology Readiness

- TRL5/6
- Ready for commercialization (Potential Partner: MKR for up scaling and mass production)

Research Achievement

- Improvement of physico-chemical properties, antioxidant capacity, sensorial acceptability and GI of bakery products by partially substituting sugar with *My Nypa* (Completed).
- MARA Grant, Dana Inovasi Awal Grant, Bridging Grant
- One MSc student.
- Tai, Y. Y., Alina T. I. T. & Rosli, W. W. I. (2019). Improvement of physico-chemical properties, antioxidant capacity and acceptability of carrot cake by partially substituting sugar with concentrated *Nypa fruticans* sap). *PERTANIKA Journal of Tropical Agricultural Science*. 42(3) : 883-902.
- Acceptability of carrot cake by partially substituting sugar with concentrated *N. fruticans* sap. 1st ASEAN Early Career Researcher (ECR) Conference and Networking in Food Science and Nutrition. Singapore 10-11th October 2019.

Intellectual Property

- Trademark of MyNYPA – submitted on June 20, 2019

Commercialization Potential

- Diabetic individuals, obese people, general population.

Level of Impact

- Increase the socio-economic status of farmers while at the same time help to indirectly create jobs.
- Diversify healthy food productions in the market (RTE processed foods etc).



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▶ COPYRIGHT (LY2019002523)



NATURAL GREEN BIOGENIC FOR MOSQUITO MANAGEMENT



Problem statement

Overall, 56.99% of the human populations in the world is exposed to vector-borne diseases such as malaria, dengue, Zika, Chikungunya and Yellow fever. Due to the insecticide resistance in mosquito populations, control effort using chemical approaches is no longer effective and might increase the potential of vector-borne diseases. In Malaysia, premises with breeding sites of Aedes mosquitoes will be fine up to RM500 by the Ministry of Health.

Novelty & Inventiveness

- The invention of the green biogenic formulation is a pesticide free bio-natural product derived from unwanted weed; designed as both larvicide and adulticide.
- The invention also prolongs its effectiveness up to 21 days by one application, and also reduces the number of eggs laid by the adults.

Applicability

- The invention is prepared as a liquid spray. Easy to apply by just spraying the solution straight to the mosquito breeding sites; one press of this liquid natural biogenic spray can cover up to 50cm of water

Product/Technology Readiness

- TRL 4
- Ready to use product and the effectiveness has been tested and proven via seven type of tests

Research Achievement

- Funding: FRGS (203/PBIOLOGI/6711629) & USM Short Term Grant (304/PBIOLOGI/6312026)
- Publications: 5 ISI papers
- Talent development: 1 Ph.D., 2 MSc., and 3 BSc.

Intellectual Property

- Copyright (LY2019002523)

Commercialization Potential

- This product is targeted at people that live in vector-borne disease countries, especially in Southeast Asia, with 59.66% of the world population is at risk of vector-borne diseases.

Level of Impact

- This invention is the only product available that can act as both larvicide and adulticide.
- It is suitable for household use, which can be applied indoor and outdoor areas; in any containers that contain water such as flower pots, small water pools, and drain.

Presentation and Other Strength

- Pesticide-free product using green management technology; which is safe to the non-target organism and mammalian.
- Low cost of production and environmentally friendly

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▶ TRADE SECRET TS/IO/2019/033)



SKY FRUIT STANDARDIZED EXTRACT: A POTENTIAL NATURAL BLOOD PRESSURE LOWERING AGENT



Problem statement

Hypertension is an increasingly critical medical and public health concern. The prevalence of hypertension in Malaysian adults over the age of 18 has increased from 32.2% in 2006 to 32.7% in 2011. Therefore, current study aims to discover a new anti-hypertensive medicine by using Malaysian local herbs – *Swietenia macrophylla* King (Sky Fruit).

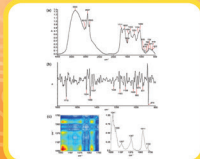
Novelty and Inventiveness

Sky Fruit was successfully proven in laboratory experiments to have the potential of becoming an effective blood pressure lowering agent or as treatment regimens for hypertension in the near future in human patients. Besides, it is set apart from other types of traditional medicine as one of the only Malaysian local herbs that is backed by scientific results and evidences to be an effective treatment for hypertension through recognized methodologies that gives accurate measurable output that can be used to make medical decisions for future industrial adaptation.



Applicability

Contrary to conventional western medications for hypertension that usually only triggers single pathway for treatment, Sky Fruit employs multiple pathways of mechanisms that dictate the vasculature to varying degree in the descending order of effectiveness from calcium and potassium channels, G-protein-coupled receptors, and followed by NO/sGC/cGMP signaling mechanism pathways. This holistic effect and no report of side effect or organ damage gives Sky Fruit the advantage to be the potential candidate for replacing current anti-hypertensive drug.

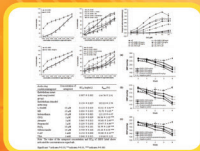


Product/ Technology Readiness

Sky Fruit can be readily made into various forms of consumables such as capsules, sachets or tea bags which proves its versatility and commercial readiness from product developmental standpoint.

Research Achievement

Outputs: scientific publication (3 ISI journals, 2 scopus journals), graduated a MSc student and 2 PhD students. This product is financially supported by USM-Bridging Grant (304/PFARMASI/6316009) and Fundamental Research Grant Scheme (FRGS) (1001/PFARMASI/8011030)

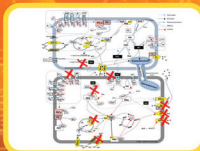


Intellectual Property

Trade secret protection under USM.

Commercialization Potential

Besides its anti-hypertension properties, Sky Fruit will lead the blood pressure medicine by setting an industry defining criteria for future drug discoveries such as multi-pathway efficacy and final product versatility to allow better treatment, lower product development costs and also minimal side effects. The demand for such a product has long been available and currently Sky Fruit seems like the only prospect that will be able to fulfill the gap alongside the golden opportunity in the timing of rising concerns over hypertension drug industry's multiple weaknesses.



Level of Impact

The field of traditional and complementary medicine will greatly benefit from these evidence based findings adhering to global scientific standards and bolster the Malaysian herbal medicine industry to compete at the international level.

Environmental Friendliness

Sky Fruit manufacturing protocol adheres strictly to Good Manufacturing Practices (GMP) as well as in compliance with all industrial-wide enforced environmental guidelines as suggested by the government.

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- ▶ PATENT GRANTED (MY-157270-A)
- ▶ COPYRIGHT (CRLY00011591)
- ▶ COPYRIGHT (CRLY00015015)
- ▶ COPYRIGHT (CRLY00015014)



PPO WASTE WATER TREATMENT TECHNOLOGY FOR SUSTAINABLE AQUATIC ENVIRONMENT



Introduction

PPO is a physico photo-oxidation effluent treatment technology to treat textile dye effluents with 99.99% efficiency. It removes colour, heavy metal and solid suspended particles from effluent. The prototype is ready and has been installed in textile industry and proven that the discharge quality has met DOE requirement.

Problem Statement

- The estimated total effluent discharge from textile plants is 625 million gallons per day (EPA).
- In Kota Bharu alone, 50 to 70 thousand litres of dye effluents are released daily into the river from Batik industries (SME) and only has five per cent level of compliance
- The untreated textile wastewater is high in color, chemical oxygen demand (COD), biochemical oxygen demand (BOD), suspended solids (SS), heavy metals, pH and turbidity thus toxic to aquatic ecosystem and environment

Novelty and Inventiveness

- A simple and affordable effluent treatment system for SME with low maintenance cost
- System that utilizes consumables made of waste and advanced materials
- The efficiency of PPO meets the DOE standard requirement of effluent discharge quality

Applicability & Benefits

- PPO has broad prospects of applications in textile production and other industrial effluents. The benefits are as follows:
- Improves the BOD and COD level up to 99.99%.
 - It adsorb the heavy metal and mineralize the pollutants by decomposing or transforming into less harmful substances in the presence of hybrid photocatalyst and light that operated at room temperature.
 - Can recycle the water after decolorizes the dye
 - Simple maintenance

Product/Technology Readiness:

- Technology Readiness Level: 6 (in Relevant Environment)

Research Achievement

- ISI Publication-7 (Nanotechnology, Thin Solid Films, JALCOM, Materials Chemistry and Physics)
- Financial support by FRGS, RUI, PPRN
- Talent Development: 3 MSc, 3 PhD graduated

Intellectual Property Status

- 1 patent granted-MY-157270-A
- 3 copyrights- CRLY00011591, CRLY00015015 and CRLY00015014

Industry/Business Partner

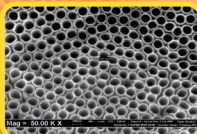
- Process Tech Design Sdn Bhd (Fabrication of PPO Systems)
- Ayu Fashion Sdn. Bhd. Kelantan (Client)
- QDOS Flexcircuits Sdn. Bhd. Malaysia (Client)
- PT Dalong Bioteknologi, Indonesia-ongoing

Commercial Potential

- In Malaysia, there are 600 registered SME textile industries-10% per year would be able to create revenue of RM1,200,000 per year.

Impact of the product

- Improved water quality, conserve aquatic ecosystem to ensure safe food supply to mankind
- Reduce large quantity of sludge production and non-toxic compound thus contribute to Green Environment
- Create new business-sell the system and consumables made from waste materials- POFA-AC & Photocatalyst.



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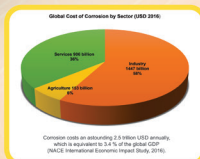
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▶ COPYRIGHT (LY2019002111)



RUSTY-X: ECO-FRIENDLY RUST REMOVER



Novelty and Inventiveness

- RUSTY-X is formulated using eco-friendly ingredients
- Novelty check on SCOPUS: Novel
- Exploiting mangrove bark tannins as a green ingredient to formulate a novel bio-based rust remover
- Plays a positive role in rust removal and chemical corrosion protection owing to being green, efficient and sustainable.
- Doping mangrove bark tannins of a composition of invention into the base formulation
- The formulation is free from generating any toxic by-products

Applicability

- RUSTY-X can be serviceable on any metal and alloy
- The product easily removes rust without damaging the surface
- The product shows a high rust transformation of more than 90%

Product Readiness

- TRL 6 : Done field test in related industry
- Has undergone complete R&D
- Field testing: Completed in collaboration with IGL COATINGS and EXCEL RIM SDN. BHD
- Prototype available

Research Achievement

- Publications:
3 articles in ISI-cited journals
- Recognition:
Gold Medal in SIRIM Invention, Innovation & Technology Expo (SI2TE) 2019
Research/Innovation Fund: USM Short Term Grant (304/PKIMIA/6315100)
Talent Development: 2 PhD ongoing, 1 student MSc and 1 BSc Graduated

Intellectual Property

- Copyright filed (LY2019002111)

Industry/ Business Partner

- IGL COATINGS
- EXCEL RIM SDN. BHD.

Commercialization Potential

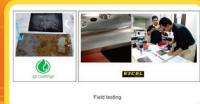
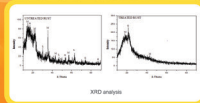
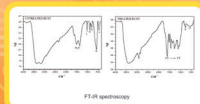
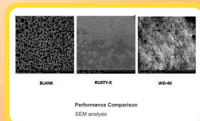
- RUSTY-X has a high potential to be commercialized since the ingredients being used are eco-friendly, affordable, and readily available and it easy to use.
- Target industries include: Oil and Gas, Automotive, and Building construction sites.
- Received purchase order worth RM10,000.00

Level of Impact

- Maximizing savings due to the impact of corrosion by efficient rust removal and improved corrosion protection
- RUSTY-X is designed to improve the shelf life of steel products

Presentation and other strengths

- RUSTY-X is a plant-based rust remover: non-toxic, and harmless to humans and the environment
- Prepared using a green organic inhibitor which is water based
- The formulation is non-flammable and non-corrosive
- Comparative studies revealed that RUSTY-X yields better performance compared to some commercially available rust removers
- Cheap compared to commercial brand (RM40 / litre)



Contact Person:
DR. MOHD HAZWAN HUSSIN

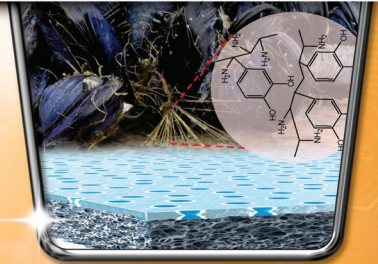
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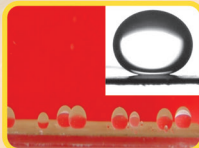
Researchers:

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 Farazlehan Senusi
 Dr. Syahida Farhan Azha
 Shazlina Abd. Hamid

— COPYRIGHT (LY2019000406)
 — PATENT SEARCH: NOVEL, INVENTIVE, INDUSTRIAL APPLICABLE



OLEOPHOBIC-HYDROCOATING MEMBRANE

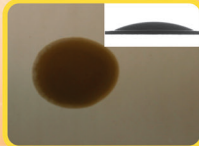


Problem Statements

- Improper disposal of oil and stable emulsion droplets, affect the environment and human health.
- Severe fouling problem due to hydrophobicity properties of the organic polymer membrane.

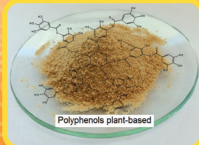
Novelty & Inventiveness

- Oleophobic-Hydrocoating Membrane inspired by adhesive of mussel foot.
- Formulated using low-cost natural polyphenols derived from plants.
- Possess hydrophilic and underwater oleophobic surface with low oil adhesion.
- Chemically stable with high permeability and efficient removal of emulsion oil.



Applicability

- Facile method for membrane surface modification process.
- Process can be applied without high-end equipment and no new equipment required for the existing plant.
- Process can be implemented for any types of membrane modules either commercialize membrane or own fabricated membrane.



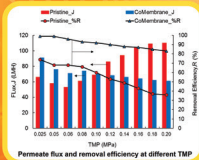
Polyphenols plant-based

Product/Technology Readiness

- TRL 4: Lab-Scale.

Research Achievement

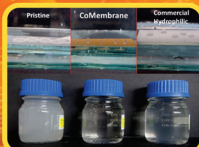
- Research Achievement
 - Journal Publication (8) - International Journal of Environmental Science & Technology, Chemical Engineering Journal, Applied Clay Science, Dyes & Pigments, Journal of Industrial & Engineering Chemistry, AIP Conference Proceeding (ISSN), Journal of Water Process Engineering.
 - Book Chapter (1) - Springer International Publishing (2018)
 - Research Fund (3) - R&D Fund Grant (2017-2019), RUI (2015-2018), FRGS (2013-2016)
 - Talent Development (8) - 3 PhD, 3 MSc, 2 Undergraduates
 - Participation in international Conference (6) - ISGET 2019, ICENV 2018, AIC 2019, ISCE 2016
 - Award (2) - 1 Gold and 1 Bronze (Si2TE 2018)



Permeate flux and removal efficiency at different TMP

Intellectual Property

- Copyright: LY2019000406
- Patent Search: Novel, Inventive, Industrial applicable



Commercialization Potential

- Performances comparable with commercial membrane product.
- Membrane fabricator industries and environmental service companies as potential partners.

Level of Impact

- Reduce the cost of membrane modification and emulsion oil treatment process.
- Improve the quality of water and environment for the society.

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Yeoh Xue Li

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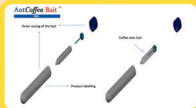
Abd Hafiz Abd Rahim

▶ TRADE SECRET (TS/10/2019/048)

▶ PATENT NOVELTY SEARCH: NOVEL, INVENTIVE & INDUSTRIAL APPLICABLE



A DUAL ACTION COFFEE-BASED ANTS BAIT: IMPLICATION FOR SUSTAINABILITY GREEN PEST MANAGEMENT



Problem Statements

- Household ants are a significance household pest, where baiting is considered a more effective measure as it can eliminate the entire colony through trophallaxis among the individual ants
- The replacement of synthetic products that is impregnated within the gel bait with coffee extract (plant-based products) which possess similar insecticidal and repellence properties, can reduce environmental issues that brought by the synthetic products

Novelty and Inventiveness

- The Arabica coffee extraction used in this product which is plant-based bio-pesticide, do not pose any toxic effect to human or animals and it is biodegradable
- The Arabica coffee contain natural compound known as "undercane" which is known as a natural attractant for the ants

Applicability

- This product is a dual action bait, which can work as repellent and attractant, to the household ants
- Environmentally friendly and targeted solely to household ants

Product/Technology Readiness

- TRL 5: Large scale prototype

Research Achievement

- Five scientific publications (3 SCOPUS/ISI Journal and 2 Non-ISI Journal)
 - Journal of Asia Pacific Entomology (2)
 - Journal of Tropical Agriculture Science (1)
 - Journal of Entomology and Zoology Studies (1)
 - International Journal of Entomology Research (1)
- Graduated students: 1 Ph.D, 2 Master and 4 Undergraduates
- Financial supported by
 - KPM-FRGS (203 / PBILOGI / 6711360) RM 89,800 (National)
 - RUI Grant (1001/PBIOLOGI/811241) RM 150,000 (University)
 - Industry Grant (304 / PBILOGI / 6501012/ A147) RM 9,225 (Industry)

Intellectual Property

- Trade secret protection under Universiti Sains Malaysia (USM)
- Patent novelty search: novel, inventive and industrial applicable

Commercialization Potential

- This product can be produced in high quantity with very low-cost manufacturing
- The selling price will be cheaper compared to the current commercial product in the market
- The product can be a potential competitor to other existing product for controlling household ant's infestation
- Industry collaboration with HESRC Sdn.Bhd & Ensysstex Sdn Bhd (Industrial Partner)

Level of impact

- The used of coffee extract from Arabica coffee as the inner active ingredient with delayed toxicity can guarantee maximum distribution of the bait within the colony before the ants start showing signs of mortality
- This product is an example of green and eco-friendly technology product
- This product could open new opportunity for SMEs with consolidation of both food market and pest control industries (unique on its own)

Presentation and Other Strength

- This product show a significant reduction of household ant's infestation up to 60 days after treatment whilst no significant difference is shown with other commercial ant bait product used as comparison

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Dr. Muaz Mohd Zaini Makhatar
Professor Dr. Rokiah Hashim

- ▶ PATENT FILING (PI 2015704214)
- ▶ COPYRIGHT (LY2018005378)
- ▶ TRADE SECRET (TS/IO/2019/050)



Figure C.1: Control in rubber wood decay test by white rot fungus, *P. chrysosporium*

NON TOXIC NATURAL WOOD PRESERVATIVES: A NOVEL WASTE DERIVATIVE



Figure C.2: Control in rubber wood decay test by white rot fungus, *T. merizae*



Figure C.3: Control in rubber wood decay test by white rot fungus

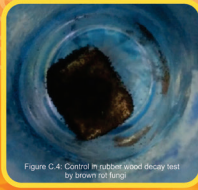


Figure C.4: Control in rubber wood decay test by brown rot fungus



Figure C.5: Wood treated with non-toxic preservative has undergone slow & noticeable wood decay exposed with a few types of fungi

Introduction and Problem statement

- Wood industry needs preservative to protect and increase quality of their products.
- Most wood preservatives in the current market are toxic to human, animal and environment. A few countries have banned those preservatives and they replace oil to protect the wood. However, oil is expensive and just protect the surface area.
- Most preservatives can lead to a decrease in the strength of the wood.
- Most wood preservatives are expensive and are derived from petrochemical and mining industry, and hence, it is unsustainable.

Novelty & Inventiveness

- A process to produce useful chemicals from leachate via biological process.
- A method to extract useful chemicals from fermented leachate.
- A technique and method to convert useful chemicals to act as a preservative to natural wood.

Applicability

- Replace harmful preservative to treat fresh wood
- To treat furniture which is infected by fungus and this preservative is non-toxic to human/animal/environment and is sustainable.

Product/Technology Readiness

- TRL 5
- R&D- 100% completed
- Up scaling-100% completed
- Ongoing commercialization effort with industry/partner to the product.

Research Achievement

- 6 journal papers have been published (ISI and Scopus)
- 2 published books (Springer and USM publisher)
- Talent Development : 4 MSc students
- Grant- 1 FRGS grant (RM 79K-2014), 1 PRGS (RM 135K-2015), 1 RUI (RM 145K-2015) and 1 DIA (RM 26K-2019)

Intellectual Property

- Patent filing: A process for the production of acetic acid and butyric acid (PI 2015704214)
- Copyright: Separation Acetic and Butyric Acid by Activated Carbon (October 2018)
- Trade secret: Process of convert acetic and butyric acid to become wood preservative.

Commercialization Potential

- Opteraz Sdn Bhd

Level of Impact

- In line with Sustainable Development Goal (SDG)'s policy - SDG 6 Clean water and SDG 12 Responsible consumption and production
- *This project is beneficial to the community because it reduces the exposure of community with carcinogenic material.
- * This project is beneficial to the country because it reduces the pollution in the environment and it has potential to support the economy.

Presentation and Other Strength

- Most preservative will reduce (5%-15%) strength and structure of wood. However this preservative will increase strength and structure of wood by almost 5-15%.
- This preservative is not harmful to human, animal and environment.
- Derive from leachate - price is cheaper than current preservative in the market.

Contact Person:

DR. HUSNUL AZAN TAJARUDIN

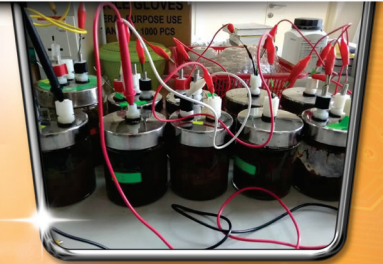
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 Prof. Dr. Norli Ismail

PATENT SEARCH (NOVEL, INVENTIVE, INDUSTRIAL PRACTICAL)



RECOVERY OF ENERGY AND SIMULTANEOUSLY TREATMENT OF DEWATERED SLUDGE USING MEMBRANE-LESS MICROBIAL FUEL CELL



Problem Statement

- Depletion of natural resources
- Global warming
- Fluctuation price of fossil fuel
- High cost of sludge disposal management and limited space for landfills
- Annual increase in volume of sludge at wastewater treatment plant

Novelty & Inventiveness

- air cathode**
It is a good innovation because there would not need the air sparging. Common Microbial Fuel Cell, they are using pump to supply air.
- Membrane-less**
The innovation shows that dewatered sludge played a dual role, acting both as the nutrient-rich anodic and as a pseudo membrane to separate anode and cathode. In the Typical MFC, they use expensive Proton Exchange Membrane (PEM) for that purpose. Besides that PEM also contributed to the proton transfer efficiency, thus reduce the power generation.
- Mediator-less**
A mediator is not needed to transfer the electrons in this invention. Commonly, expensive mediator such as methylene blue and neutral red is used for this purpose. In this invention, there exists active bacterium that will electrochemically transfer the electrons to the electrode inside the dewatered sludge.
- Co-culture (Synergy Strain A and Strain B)**
The presence of Strain in this invention has the ability to transfer electrons as they secrete phenazine-based metabolites at the surface of the anode, thus improving the generation of energy. Additionally, Strain B acts as a good biocatalyst for Membrane-less microbial fuel cell (ML-MFC) and generate stable energy.

Applicability

Energy generated by the ML-MFC give the alternatives of natural resources hence reduce the fossil fuel dependency. It also can power small devices such as LED torchlight, fans and can act as a power bank.

Product/Technology Readiness

TRL 4 – Small scale prototype (built in laboratory environment)

Research Achievement

- 1st Runner up in Novel Research Innovation Competition 2015 (NRIC), project title "Generating green Electricity from Sewerage Sludge Using Microbial Fuel Cell".
- Grant
 - Research University (RU) Grant entitle "Electricity Generation in Microbial Fuel Cell for Biological Treatment of Sewage Wastewater" (RM135,000.00)
 - Fundamental Research Grant Scheme (FRGS) entitle "Investigating the effects of process parameters on Electrogenic Bacteria from Dewatered Sludge for Electricity Generation using Membrane-less Microbial Fuel Cell" (RM139,464.00)
 - Short Term Grant (STG) entitle "Electricity Generation from Dewatered Sludge Using Microbial Fuel Cell" (RM43,288.40)
- Talent development- 1 PhD, 1 MSc, 1 Undergraduate
- Journal - 3 (ISI, Q2, Q3 and Scopus).
- 2 Conferences Proceeding, 1 Book Chapter, 4 invitation speaker

Intellectual Property

The USM patent agent already declared that the use of Strain A and B are novel in ML-MFC

Commercialization Potential

The success of energy recovery from dewatered sludge has created a potential collaboration opportunity as many industries have wastewater and produce sludge daily. It also includes companies that are working with garbage disposal at the residential area. Currently Bioprocess Technology Division, from the School of Technology USM is going to sign a contract research agreement with E-Idaman Sdn Bhd to trial out this technology.

Level of Impact

INDUSTRY: alternative renewable energy for electricity and wastewater treatment, opportunity for industries to generate their own electricity supply

ECONOMIC: alternative cheap renewable energy from wastes instead of from non-renewable resources

SOCIETY: a cheaper renewable energy which is green and clean. By recycling biosolids, pollution due to its disposal can be reduced and provide free-pollution to the environment.

SUSTAINABLE DEVELOPMENT: reduce utilization of non-renewable resources (gas/fossil fuels) for electricity and reduce pollution potential

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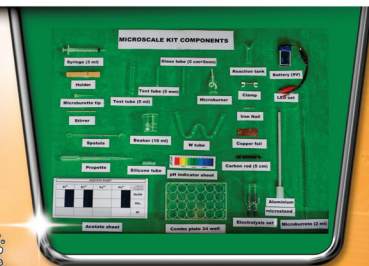
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Ramlee Abd Wahab
Mohd Fahmi Mohd Yusoff
Noor Haida Mohd Kaus
Nur Farhana Jaafar
Nor Hasniza Zulkepli

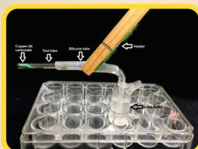
Mohd Nazeef Ahmad
Wan Zullawati Wan Zulkupli
Ami Mardiana Othman
Nur Ainina Abdollah
Alia Syazana Roslan
Lim Gin Keat

▶ COPYRIGHT (LY2018003836)
▶ COPYRIGHT (LY2018003837)
▶ COPYRIGHT (LY2018003838)
▶ COPYRIGHT (LY2018003839)
▶ COPYRIGHT (LY2019004144)

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▶ COPYRIGHT (LY2019004149)
▶ COPYRIGHT (AS2019004141)

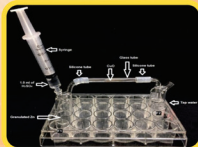


MYCHEM KIT



Problem Statement

Interest in science among students in Malaysia continues to decline over the past years. To a certain extent this has something to do with how science subjects are taught at school. Hands on session can help to develop the interest and increase their understanding to otherwise “difficult” science subject. However, many teachers no longer conduct chemistry experiments due to the lack of facilities, expensive chemicals and safety issues.



Novelty & Inventiveness

- Introduces the concept of learning and teaching chemistry using miniaturized apparatus and chemicals in small amount.
- Adapted to Malaysian Standard Curriculum syllabus (Forms 4 & 5)



Applicability

- Safe and economical
- In pair or individually
- Anywhere, in a lab or a classroom



Product/Technology Readiness

- TRL 7
- Sold more than 54 kits



Research Achievement

- 2 Grants: University-Community Engagement Grant (1001.PKIMIA.AUPSE00116) and MRUN-Translational Research Grant (304/PKIMIA/656205/K145)
- 1 Paper: International e-Journal of Community and Industry Engagement (IeJCIE)-(May 2019);
- 2 Oral Presentations at International Conference
- Advisor to Schools-Akademi Sains Malaysia-USM STEM Projects
- 1 PhD student graduated
- Gold Medal in 4th International Innovation Design and Articulation, i-IdeA2018

Intellectual Property

- 9 copyrights

Industry/Business Partner/Academic Partner

- N/A

Commercialization Potential

- Secondary and tertiary education levels
- Asean countries with similar interest in STEM education

Level of Impact

- Used and adapted in USM Chemistry Practical Year 1 courses
- National STEM programme

Presentation and Other Strength

- Conducted more than 40 workshops and hands on sessions

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Dr. Garry Kuan
Dr. Faruque Reza
Dr. Jason Tye

▶ COPYRIGHT (LY2019000365)
▶ COPYRIGHT (LY2019000360)
▶ COPYRIGHT (AR2019000362)



DIAGNOSTIC LANGUAGE TOOL AND MUSIC INTERVENTION FOR ADOLESCENTS WITH DEVELOPMENTAL LANGUAGE DISORDER (DLD)



Introduction

This research introduces language diagnostic tool in educational settings, with particular reference to the needs of adolescents with Developmental Language Disorder (DLD). It summarises the objectives and functions of language diagnostic, including formative assessment. The diagnostic language tool (syntactic test) included syntactic structures and tasks that proved to be the most sensitive for the detection of syntactic DLD in previous studies. This research also illustrates some ways in which music intervention can be used to engage adolescents with DLD and suggest that music intervention is a crucial medium that enables positive transfer from music to language impairment.

Problem statement

- Developmental Language Disorder is an invisible, under diagnosed condition that affects over 70% of children
- 2 in 30 children have Developmental Language Disorder, that's two kids in every classroom.
- Between 5-7 million children in the US are affected.
- 15-20% of 2-year-old children show speech delay but they show the proficiency after reaching 4-5-year-old. However, 5-8% of the children still display the language disorder.

Novelty & Inventiveness

- Modify and develop diagnostic language tools for adolescents with DLD.
- New techniques, activities and processes within the music therapy are designed to meet their needs.
- Music therapy applied within a supportive relationship is an effective tool that has the potential to be used therapeutically by matching rhythmic patterns with speech patterns.

Applicability

- The existing application can be used by educators in either primary or secondary school and by speech therapists in either clinic or hospital settings.
- The diagnostic language tools can help the educators or therapists to identify their language difficulties.
- To overcome this language impairment music therapy is an effective tool that has the potential to be used therapeutically by matching rhythmic patterns with speech patterns.
- The diagnostic language tools and the modules of music therapy are also useful to others, especially patients with expressive aphasia.

Product/Technology Readiness

The prototype had been developed and tested in relevant environment such as clinical setting and school.

Research Achievement

(i) Publication

Nurul Nazhah Zaidi, Tahamina Begum, Rozaida Abdul Rauf, Jong Hui Ying, Faraj Al-Marri, & Faruque Reza. (2018). Syntactic Language Processing among Women- An EEG/ ERP Study of Visual Pictorial Stimuli. *2018 IEEE-EMBS Conference on Biomedical Engineering and Sciences (IECBES)*. ISBN: CFP1826K-POD 978-1-5386-2472-2.

Jong Hui Ying dan Rozaida Abdul Rauf (2015). Pemahaman Klausu Relatif Tanpa Tikas dalam kalangan Pesakit Afasia Broca Agramatik dan Wernicke Bahasa Pertama Bahasa Malaysia, in Rogayah Rajak & Radiah Yusoff, *Tuari Sintaksis Bahasa Melayu*, Dewan Bahasa dan Pustaka.

Jong Hui Ying dan Rozaida Abdul Rauf (in press)(2019). Kesan Minimaliti dalam Pemahaman Kecelaruhan Bahasa Spesifik Sintaksis, in Rozaida Abdul Rauf (ed.), *Neuropsikolinguistik*, Penerbit Universiti Sains Malaysia.

(ii) Research Innovation fund

SCHMIDT BioMedTech Sdn Bhd.

(iii) Talent development

1 Master student graduated

(iv) Recognition

Winner of 'Information Technology and Communication' with project entitled 'Creating self-assessment in Psychology Software tools for Student with Visual and Hearing Impairments in e-Novel Research and Innovation Competition 2019 on 10th – 21st April 2019

Intellectual Property

- Copyright : Modul Pengajaran & Pembelajaran Terapi Muzik (LY2019000365)
- Copyright : Model Tiga Tahap & Tiga Prosedur dalam Muzik & Linguistik (LY2019000360)
- Copyright : Tugasan Pemadanan Ayat dengan Gambar (AR2019000362)

Industry/Business Partner

- DanMedik Sdn Bhd

Commercialization Potential

- Study being carried out, feedback from clinical staffs, teachers, and students.

Level of Impact

- Impact of the invention may contribute to the improvement of community, especially the language development among children or adolescents with developmental language disorder (as well individuals with Broca's aphasia).



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▶ TRADEMARK (TM2019026029)
▶ PATENT SEARCH: NOVEL, INVENTIVE, INDUSTRIAL APPLICABLE



BOTANY Nutri Essence



BOTANY NUTRI BALANCE



Introduction

Botany Nutri Balance is the breakthrough in plant nutrition, that contains complete, balanced and stabilized macronutrients, micronutrients and specific bio-extract as growth booster and natural pesticides for fast yielding food crops. This unique invention has been supported by a full assessment of changing biochemical and physiological characteristics, enzymatic activities and defense mechanisms, and the associated health risks evaluation.

Novelty, Inventiveness and Intellectual Property Status

- Long Shelf Life
- Versatile
- Growth Booster
- Pest Control
- Health Assurance
- Simplicity of Application
- Economic Feasible
- Protected under Trademark and patent application in progress

Applicability and Commercialization Potential

- Soilless Cultivation
- Germination
- Feeding Seedlings
- Transplants and Clones
- Foliar Feeding
- Pest Control

Product and Technology Readiness

- TRL 8 First of kind commercial system
- Successful Innovation of A Complete, Balanced, and Stabilized Nutrient in A Single Formulation
- Integration of Bio-Extract for Fast Yielding Food Crops
- Scientifically Driven Analysis for Safe and Nutritious Food Crops Production

Research Achievement

- Publications: UNESCO Publishing, Book Chapter; iMIT-SIC Book Chapter; Journal of Cleaner Production; Journal of Water and Health; 37th International World Congress, Kuala Lumpur, Malaysia; 9th International Conference in Challenges in Environmental Science and Engineering (CESE), Kaohsiung, Taiwan; 2nd International Conference on Advances in Biotechnology, Kuala Lumpur, Malaysia
- Research/Innovation Fund: Research University Individual (RUI): (1001/PREDAC/814272); MTSF Science and Technology Research Grant: (304/PREDAC/6050358/M126)
- Talent Development: 1 master and 1 PhD graduate
- Recognition: Gold Medal, International Malaysia-Indonesia-Thailand Symposium on Innovation and Creativity (iMIT-SIC)

Industry/ Business Partner/ Level of Impact

- Sustainable Food Security Management
- Knowledge Enhancement
- Wealth Creation
- This New Invention Would Benefit the Bottom Billions, for A Better Crop Yield and Quality Particularly Farmers and Cultivators Who are Facing Interference Due to Climate Change, Season, or Adverse Natural Events.

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TRADE SECRET (TS/IO/2019/033)



RAPID PRODUCTION OF FIG PLANT STOCK VIA NOVEL TISSUE CULTURE TECHNIQUES



Novelty & Inventiveness

- The current project is the first in Malaysia to have successfully produced high-quality fig plant stocks via tissue culture for commercial purposes.
- Universiti Sains Malaysia is the only distributor for high quality tissue cultured fig plants

Applicability

- Plants can be grown in the local fields and fruits can be harvested for fresh fruits and for various industries.



Product/Technology Readiness

- TRL 5/6
- Product is available for commercialization. Plants are being sold to SUPERFRUIT Valley Perlis and to local nurseries at RM 15-25.



Research Achievement

- SILVER medal in the 30th International Invention, Innovation & Technology Exhibition 2019
- Model project in the IM-TGT University Network Strategic Action Plan Project Development Workshop 2016

Intellectual Property

- Protected by trade secret

Industry/Business Partner

- Fig Direct Sdn. Bhd.



Commercialization Potential

- High demand in Malaysia and the ASEAN region for novel fig plant stocks for the establishment of farms.
- High demand of fresh fig fruits from the supermarkets and from the fruit juice industries.
- Demand from Sunnah related and pharmaceutical industry

Level of Impact

- Supply disease free novel fig plant stocks to the agriculture sector of Malaysia
- Assist in the establishment of fig farms in Malaysia
- Create new job opportunities, increase income generation of local growers and encourage entrepreneurs in various industries
- Establish efficient planting and harvesting of fruits via precision farming incorporated with IoT
- Project is funded by the Innovation Seed Fund and Research University Top Down Grant.
- 4 Publications in various scientific journals and write-ups.



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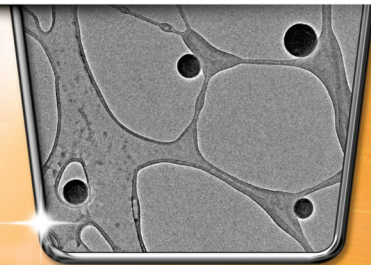
Researchers:

ASSOC. PROF. IR. DR. LEO CHOE PENG

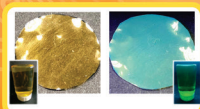
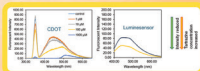
Melvin Ng Hau Kwan

Dr. Lim Gin Keat

▶ TRADE SECRET (TS/IO/2019/049)



LUMINESENSOR



Luminesensor is a photoluminescence sensor incorporating carbon quantum dot in biodegradable thin film. It can detect food colorant, tartrazine with concentration as low as 10 μM using photoluminescence spectroscopy without any other chemical.

Novelty & Inventiveness

- Accurate and quantitative measurement
- Simple dip and scan
- Affordable
- Biodegradable materials
- Small and thin like a coin
- On-site measurement
- Data storage

Applicability

- Heavy metals (Fe^{3+} , Cu^{2+} , Hg^{2+} , Ag^+ , Cr^{6+}); Low-molecular weight thiols (glutathione and cysteine); Glucose; Nitroaromatic explosives; Drugs; Vitamins; Pesticides;

Product/Technology Readiness

- TRL 4, complete prototype testing in laboratory

Research Achievement

- 1 international grant (Royal Society)
- 4 related publications
Progress in Organic Coatings 132 (2019) 70-75 (ISI IF: 3.420)
Colloids and Surfaces A: Physicochemical and Engineering Aspects 578 (2019) 123590 (ISI IF: 3.131)
Journal of Environmental Chemical Engineering, In press, DOI: [10.1016/j.jece.2019.103187](https://doi.org/10.1016/j.jece.2019.103187) (Selected for Publication)
Carbohydrate Polymers, Submitted. CARBPOL-D-19-03771
- 1 Best Poster Award

Intellectual Property

- Trade Secret

Commercialization Potential

- Food and beverage, healthcare, chemical industries and more.

Level of Impact:

- Green Chemistry - Eliminate harmful chemicals and expensive equipment used in water, soil and food analysis
- Science Outreach - Reach the bottom billions and rural communities with limited access to analytical chemistry
- Big Data - Allow data mining and storage for environmental protection, humanity and economy grow

Other Strength

- Industrial Partner, Borregaard AS from Norway

Contact Person:

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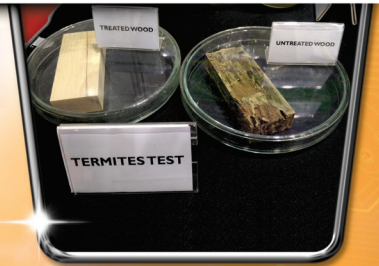
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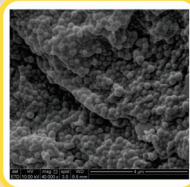
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Dr. Mohamad Nasir Mat Arip
Teng Teck Jin

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NANOBIOCIDE AS WOOD PRESERVATIVE FOR WOOD INTERIOR AND EXTERIOR APPLICATIONS

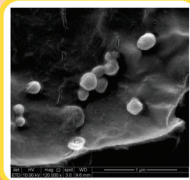


Problem Statements

- Chromated copper arsenic (CCA) is toxic - There is a need for alternative wood preservative to replace CCA
- Chlorothalonil (CTL) has poor water solubility (<0.81 mg/L).
- A challenge to be applied in the water-based vacuum preservative treatment

Novelty & Inventiveness

- To promote the use of organic biocide as an alternative to conventional toxic wood preservatives such as chromated copper arsenic
- Polylactic acid (PLA) nanoparticles act as carriers to deliver a hydrophobic organic biocide CTL into tropical wood
- Low production cost, excellent solubility in water, better penetration into wood structure, and provide comparable biological resistance to wood



Applicability

- Apply treatment directly on wood structure before utilising it on interior (furniture) and exterior (decking) applications
- Suitable for water-based industrial preservative treatment
- Low production and treatment cost

Product/Technology Readiness

- Technology Readiness Level 4
- CTL-loaded PLA nanoparticles - 128.6 ± 4.5 nm.
- Nanoparticles delivered into rubberwood via vacuum pressure treatment based on Malaysia Standard (MS360:2006)
- Treated wood showed high resistant towards wood destroying organism based on international standard (ASTM, EN and AWPA)



Research Achievement

- Two publications (1 Q2 paper, 1 full paper proceeding)
- Silver Medal in ITEX 2019
- 2018 Ron Cockcroft International Award by International Research Group on Wood Protection – The only Asian out of 13 recipients
- Third prize in Pertandingan Projek Penyelidikan Nanoteknologi Peringkat Kebangsaan 2017
- Completed a MSc. student and an undergraduate student
- Fundamental Research Grant Scheme (203/PKimia/6711532)
- MoA with Forest Research Institute Malaysia (FRIM) since 2016



Intellectual property

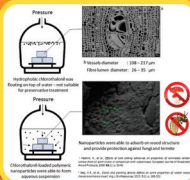
- Copyright (Application number: LY2018002244)

Commercialization Potential

- Pioneer in Southeast Asia
- Suitable for global wood market
- Letter of Intent from Tong Sim Wood Industries Sdn. Bhd.

Level of Impact

- Reduce cost of preservative treatment – reduce energy and time needed
- Reduce impact on environment - low dosage and fully biodegradable



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Air Itam Laksa
★★★★★ / 13 reviews
 🍴 Food ★★★★★ / 13
 🍷 Service ★★★★★ / 13
 💰 Pricing ★★★★★ / 8
 🌿 Ambience ★★★★★ / 13
 🧑🏻 General ★★★★★ / 9
 Food Court

YUMME: INTELLIGENT RESTAURANT META-REVIEWER USING SENTIMENT ANALYSIS AND VISUALIZATION



Introduction

• YumMe is a restaurant meta review system (includes a web browser extension and web application) capable of performing aspect-based sentiment analysis and visualization on large amounts of textual reviews to help tourists make more informed and quick decision on what and where to eat.

Problem Statement

• Choosing what and where to eat are some of the most common dilemmas encountered by tourists especially when visiting a new place. Restaurant review websites help people make such a decision, but most of them offer only a generic overall rating for each restaurant and thousands of user-generated reviews, making it difficult and time-consuming for tourists to glean quick insights of the food quality, pricing, etc., and for restaurant owners to know what their customers look for.

Novelty & Inventiveness

• Leverages natural language processing and machine learning to quickly analyse and visualise sentiment towards food, service, pricing, ambience and general aspects of a restaurant from thousands of textual reviews.
 • First restaurant “meta” review application powered by artificial intelligence (AI).

Applicability

• Aids tourists to find suitable restaurants based on aspects of interest instead of depending only on the star rating of a restaurant.
 • A more economical method for business owners to analyse customer feedback to increase profit and reduce wastage.

Product/Technology Readiness

• Technology Readiness Level: 6 (Fully working and system-tested prototype)

Research Achievement

• Funded by Research University Grant (RUI) “Detection of User Opinion and Emotion in Online Product Reviews” (RM 88,800)
 • Publications: 5 (4 Journals + 1 Conference)
 • Talent Development: Graduated 1 PhD, 1 Masters & 1 Undergraduate
 • Gold Medal in Novel Research and Innovation Competition (NRIC) 2019

Intellectual Property

• Copyright (LY2019004760) YumMe: Aspect-based Sentiment Analysis and Visualization for Restaurant Reviews

Commercial Potential

• Huge potential market of existing restaurant review website users, e.g. Yelp, the largest restaurant review website globally, has approximately 1.5 million visitors daily
 • Multiple business models possible:

- Standalone restaurant review website
- Aspect-based sentiment analysis API service
- Strategic partnership with existing restaurant review website, e.g. Yelp

Level of Impact

• Contributes to a more sustainable food and tourism industry through better decision making by tourists and restaurant owners

Presentation and Other Strength

• Best Presenter Award in NRIC 2019



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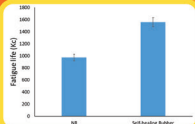
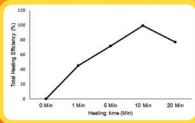
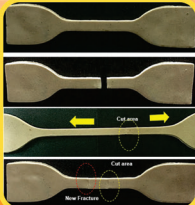
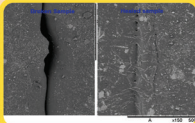
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▶ TRADE SECRET (TS/IO/2019/046)



SELF-HEALING MAGNETORHEOLOGICAL ELASTOMER FOR SMART AUTOMOBILE TYRES



Problem Statement

- Statistics from the National Highway Traffic Safety Administration, US estimate that tire blowouts cause over 78,000 accidents every year. This results in approximately 10,000 injuries and 400 deaths.
- In Malaysia approximately 20% of road accident root cause is due to tyre blowout
- Tyre blowouts can occur in a variety of situations. Debris such as broken glass and nails can compromise the integrity of a tyre, increasing the chances that it will blow out while on the road.
- Rubber is the main material for tyre manufacturing. Indeed the properties of rubber can sustain large deflections with little or no permanent deformation, rubbers still fail through fracture, puncture and fatigue.

Novelty and Inventiveness

Self-healing Magnetorheological Elastomer (MRE) for Smart Automobile Tyres engineered in this invention has the capability to repair itself and to recover functionality when it is damaged without the need for detection or repair by manual intervention of any kind.

The material was developed based on natural rubber and industrial waste nickel zinc ferrite particles and vulcanized using self-developed self-healing curative agent.

Applicability

Self-healing MRE forms a sealing layer, which is placed inside the tyre in the area corresponding to the tread pattern.

In case of penetration by external objects such as nails, there is no need for immediate roadside tyre changes, the material seals immediately with the hole and, in most cases, its fast and effective action means that the driver would not even realize that the tyre has been punctured

The material immediately repair itself, recover the tyre functionality and blocks every possible air leakage in the event of a puncture that passes through the tyre, with or without an external object still present.

Self-healing MRE can be used to manufacture new tyre or adhered into inner layer in existing tyre and does not need special rims or Tyre Pressure Monitoring System; it can be used on any kind of vehicle tyres and tyre sizes.

Product/Technology Readiness

TRL 4
Research had been validated in lab scale

Proof of concept

- Self-healing MRE as inner layer for automobile tyre- Malaysian Rubber Board (MRB)
- Self-healing MRE as seal layer in existing tyre- USM Rubber lab

Research Achievement

Publication published in 8 ISI Journals

Research Funds

FRGS (RM138,180.00)
Raa Khimi Bin Shuib, The mechanism of damping in magnetorheological elastomers, 01/08/2016-31/01/2020

USM Short Term (RM33,348.40)

Raa Khimi Bin Shuib, Fabrication and Characterization of Magnetorheological Elastomers for Vibration Damping 15/06/2016-14/06/2018

Talent Development

Graduated 2 MSc and 4 B.Eng students

Intellectual Property

- Copyright granted by MyIPO (LY2019004343)
- USM Trade Secret [Formulation of self-healing crosslinker] - TS/IO/2019/046

Commercialization Potential

- Self-healing MRE material cost is 20-28% lower compared with conventional rubber products. (MRE= RM 5.07/KG vs Conventional Products = RM 6.50-RM 7.10/KG)

- This material has huge potential to be applied to all automotive rubber parts such as hose, seals, gasket, interior panel and etc.
- Industrial collaborators- Malaysia Rubber Board (MRB), JEBCO, PETROGROUP and ACME

Level of Impact

ECONOMIC	SOCIAL	ENVIRONMENT
Extended lifetime Reduction of maintenance costs	Increased reliability Enhanced safety Fewer accidents Prevent catastrophic failures	Energy saving Cuts in pollutants-less rubber waste

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