UNIVERSITI SAINS MALAYSIA

RESEARCH AND INNOVATION

RESEARCH CREATIVITY & MANAGEMENT OFFICE

RESEARCH

NEWSLETTER

CURIOUSMIND

International Collaboration • Publication in High Impact Journal •
Industry Collaboration • Community

December 2021 • Issue#01

www.research.usm.my

PROF. DATO' IR. DR. ABDUL RAHMAN MOHAMED FASc

SYNTHESIS AND GROWTH STUDY OF ALIGNED CARBON NANOTUBES PRODUCED FROM SPIN COATED CATALYST

OBJECTIVES

- To investigate the effect of different catalyst preparation methods on the distribution of metallic nanoparticles on substrate.
- To investigate the effect of calcination, hydrogen pre-treatment and various substrates on the activity and morphology of the catalyst.
- To investigate the morphology and growth mechanism of the as-produced aligned carbon nanotubes (ACNTs) under a wide range of Chemical Vapor Deposition (CVD) process parameters.
- To optimize and control the process to obtain the highest quality of as-grown ACNTs.

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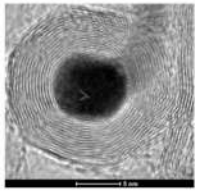
IMPACT TO GOVERNMENT / INDUSTRY / ACADEMIC / SOCIETY

Collaboration with Industry and Government

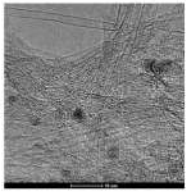
1. **Grant allocated by CREST and Altera**
   Title: Applied research of carbon nanotubes based thermal interface materials for high performance heat dissipation in microelectronic device
   Amount: RM 1,438,656.50
2. **Grant allocated by NanoMalaysia Sdn Bhd**
   Title: Production of High Purity Functionalized Multi-Walled Carbon Nanotubes (CNTs)
   Amount: RM 492,000.00

Product Applications in Research and Industry

1. **Energy Storage:** Hydrogen storage, Batteries, Solar storage, Fuel cell, Electrochemical supercapacitors
2. **Composite Materials:** Conductive plastics, Fibers, Polymers, Aircraft materials
3. **Micro-electronics / semiconductors:** Nanoprobes and sensors, Field emitting devices, Transistors
4. **Biomedicine:** Controlled drug delivery/release, Artificial muscles



Iron carbide (cohenite) with an orthorhombic crystal system.



Single-walled carbon nanotubes (SWCNTs) array oxide substratewere grown on flat silicon s

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PROF. DATO' DR. AILEEN TAN SHAU HWAI, FASc

GREEN AQUACULTURE TO BOOST OYSTER INDUSTRY AND COASTAL COMMUNITIES IN MALAYSIA

HIGHLIGHTS

- This findings of this study are used to ensure that oyster seed production can be done all year round, using the cryo-preserved gametes.
- Oysters can now be continuously spawned artificially and securing the oyster seed supply to sustain oyster farming industry in Malaysia.

OBJECTIVES

To have ready-stock of oyster sperms and eggs for seed production to ensure continuous supply of seed to support oyster industry in Malaysia.

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INDUSTRY

Oyster industry has now expanded to other states due to consistent seed supply.

More investors are venturing into the oyster industry along the food value chain.

EXPANSION

From FRGS to TR@M (RM1,500,000) - Expansion from one community in Kedah to other areas in Malaysia to improve the livelihood of coastal B40

Increased Income ~ RM3,000/Culturist per Month to > 20 Coastal B40 Communities.

COMMUNITY

The coastal communities venturing in oyster farming are still able to enjoy a sustainable income from oyster farming.

Proving a sustainable food supply.

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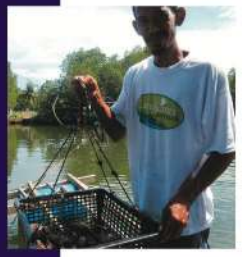
PROF. DATO' DR. AILEEN TAN SHAU HWAI, FASc

EARLY LARVAL DEVELOPMENT AND SHELL FORMATION OF TROPICAL BIVALVES UNDER NEAR-FUTURE PREDICTIONS OF CO_2-DRIVEN OCEAN ACIDIFICATION



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A TASTE OF FRENCH OYSTERS IN MALAYSIA

KEDAH
Kampung Batu Besi, Semeling
Pengkalan Tiram, Sg Dedap

TERENGGANU
- Setiu

SABAH
- Tuaran
- Kudat

Penang

PERAK
- Kuala Pasir Hitam, Trong
- Kuala Gula, Kerian
- Telaga Nenas

JOHOR
- Muar

SELANGOR
- Pulau Ketam
- Sabak Bernam
- Tanjung Karang

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PROF. DATO' DR. AILEEN TAN SHAU HWAI, FASc

EARLY LARVAL DEVELOPMENT AND SHELL FORMATION OF TROPICAL BIVALVES UNDER NEAR-FUTURE PREDICTIONS OF CO_2-DRIVEN OCEAN ACIDIFICATION

image credit
https://www.mentalfloss.com/

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OYSTERS CULTURE

IMPACTS

From sales of Oysters
Income from RM450 increased to RM1,300 per month

From Tourism Package
Charging RM3 per pax for visit to oyster platform
Charging RM10 per pax for visit to platform inclusive of light meals
RM15 for 3 pieces of oysters

Opportunities for womenfolks
Generating a minimum of RM300 per month for cooking

Opportunities for school children
Avoid "Budaya melepak" during school holiday
Cleaning trays, obtaining daily salary about RM20 per day

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DR. KUMITAA THEVA DAS

USING ZINC FINGER NUCLEASE (ZFN) TO STUDY THE EFFECTS OF INDELS ON HIV-1 REPLICATION AND VIRULENCE IN PNL4-3, AN HIV MODEL SYSTEM

OBJECTIVES

- Designing and evaluating safety and efficacy of ZFN and CRISPR (gene editing tools) against HIV-1.
- Characterizing HIV subtypes in patient samples to determine prevalence of HIV strains in Malaysia.
- Studying effects of mutations caused by gene editing tools on host-pathogen interaction.
- Evaluating effect of the gene editing across ethnicity, gender, age and HIV strains to determine clinical impact.

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IMPACT TO GOVERNMENT / INDUSTRY / ACADEMIC / SOCIETY

GOVERNMENT

- Invited by the Ministry of Environment and Water to share knowledge to establish guidelines for gene editing in lab, field and for commercial purposes. Invited as a guest speaker by MARDI and trainer by ABI, MOSTI in gene editing work.

INDUSTRY

- Approached by CryoCord Sdn. Bhd. to be their consultant in gene editing.

INTERNATIONAL

- Invited by Georgetown University, US, and the International AIDS Society to develop target product profile to establish gene editing as a gene therapy in low and middle income countries.

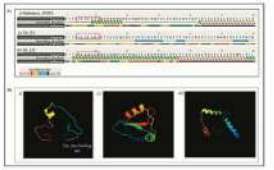
VISITING SCIENTIST & LECTURER

- Appointed as a visiting scientist at University of Oxford to expand on this research.
- Invited as a guest lecturer to speak on gene editing at AIMST and UM.

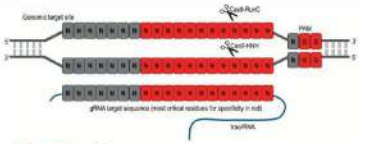
INTERNATIONAL AND EXTERNAL GRANTS

- The results from this work led to securing international and external grants.

Changes in HIV Protein



CRISPR Gene Editing System



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ASSOC. PROF. TS. DR. MOHD ROSLI MOHD HASAN

CHARACTERIZATION OF ADHESION COATING AND MOISTURE-RELATED DISTRESSES OF ASPHALT MIXTURES BASED ON AGGREGATE PROPERTIES THROUGH MULTI-PARADIGM ANALYSIS

HIGHLIGHTS

- Improved road safety - pavement with better resistance to moisture-induced damage.
- Addressing a national issue - solution for "Zero Potholes" and eliminate unforgiving road conditions.

OBJECTIVES

- 5 Papers (WoS)
- 2 Papers Scopus Journal
- 1 Chapter in Research Book
- 3 International Conferences
- 1 PhD student (graduated)
- 3 Innovation Awards
- 1 Copyright

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2019

Received fellowship from Matsumae International Foundation at Taiyu Kensetsu, Japan with Host: Dr. Nakanishi **(JP¥340,000)**

COPY

THE MATSUMAE INTERNATIONAL FOUNDATION

Gmc 19G15
December 3, 2018

GRANT LETTER

Dear Dr. Mohd Rosli BIN MOHD HASAN,

It is our great pleasure to inform you that the Board of Screening Committee of the Matsumae International Foundation (MIF) has decided to offer you a research fellowship as follows:

Period: For 3 months, from 6/1/2019, to 8/31/2019.
Host scientist in Japan:
Director Hiromichi NAKANISHI, Engineering Research Laboratory of TAIYU Kensetsu Co., Ltd.

2018-2019

NSFC China (CNY 340,000) with Host: Prof Wang – Chang'an University, Xian, China

Grant number	51750110491
Date received	

Research Plan for NSFC Awarded Project

Category International (Regional) Cooperation and Exchange Projects

Program Research Fund for International Young Scientists

Title of the awarded research project

Development and Characterization of Methanol-Foamed Asphalt Binders and Mixtures through Multiphase Assessment

2017-2019

Wax additive for porous asphalt pavement construction on PLUS Highway Collaboration with Dr. Nakanishi from Taiyu Kensetsu, Japan & KPP Sdn. Bhd.

大有建設株式会社
TAIYU

TAIYU KENSETSU CO., LTD.
5-14-2, Kanayama, Naka-ku, Nagoya-city, Japan, Zip code 460-8383
Phone: +81-52-881-1581 Fax: +81-52-881-1761

Date: August 3, 2016

The Managing Director
Usains Holdings Sdn. Bhd.
Level 2, Block C
Sains@USM
No 10, Persiaran Bukit Jambul
11900 BAYAN LEPAS
PULAU PINANG
MALAYSIA
(Attn: Professor Dr. Meor Othman Hamzah)

Dear Professor Meor,

Re: Letter of Appointment for Research Contract on Mix Design and Plant Trial of Japanese TPS Porous asphalt

2017

Material tested and Moisture conditioning approaches adopted for construction on PLUS Highway (Southbound c.a. 188 km).

Photos of 1st Field Trial at North-South Expressway South bound, Fast lane (June 14, 2017)

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Industry Collaboration

PROF. MOHD ZAID ABDULLAH

RAPID IN-LINE INSPECTION OF SILICON SOLAR WAFERS AND CELLS

OBJECTIVES

- To develop machine vison system for in-line inspection of crystalline silicon wafers and cells.
- To investigate the luminescence technologies for defect detection.

TT-Vision Technologies has entered into agreements with USM:

1. **Memorandum of Agreement (2019)**
   Objective: To prototype micro-crack inspection system based on optical transflection.
   Total Funding: RM204,857 (TT-Vision Technologies).
2. **Memorandum of Agreement on Industrial Master/PhD (2013)**
   Objective: To provide platform, support and technical expertise needed for Master/PhD students to do research on solar wafer/cell inspection.
   Total Funding: RM335,200 (CREST).
3. **Collaboration Agreement (2011)**
   Objective: To explore collaborative research on solar wafer/cell inspection.

To-date this collaboration has resulted in 1 IP, 3 PhD Scholars, 1 MSc Scholar, 11 scholarly articles and 12 conference proceedings.

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TTVISION

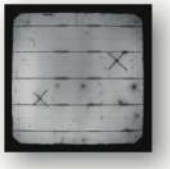
PRODUCT APPLICATIONS IN RESEARCH AND INDUSTRY

- **Optical Transmission Inspection:** Micro-crack, inclusion, and pinhole inspection on as-cut silicon wafers.
- **Electroluminescence:** Micro-crack, broken fingers, inactive regions, and dark spot inspections on fully completed crystalline silicon solar cells and PV modules.
- **Photoluminescence:** Contactless micro-crack, broken fingers, inactive regions, and dark spot inspections on in-process and fully completed silicon solar cells.
- **Transflection Imaging:** Contactless high clarity micro-crack inspection on all production process stages of a crystalline silicon solar cell.

Optical Transmission

Electroluminescence

iWS-T4000 Wafer sorter



Photoluminescence

Transflection

iCT-2400 Cell sorter

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ASSOC. PROF. DR. NG SHA SHIONG

INVESTIGATION OF InN-BASED SEMICONDUCTORS PREPARED USING SOL-GEL SPIN COATING METHOD

OBJECTIVES

- To explore the growth of undoped and doped InN thin films prepared by sol-gel spin coating technique. This includes the investigation of the influences of the growth conditions (i.e., growth temperature, growth duration, and precursor concentration) on the quality and properties of the deposited films.
- To investigate the influences of the p-type doping concentration on the fundamental properties of the InN thin film.

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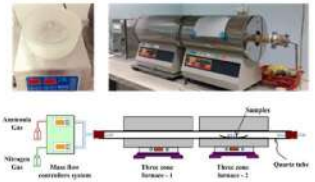
The research track record and the output from FRGS grant resulted:

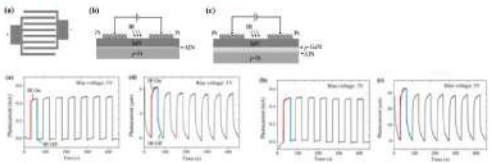
- An international funding (Nippon Sheet Glass Foundation for Materials Science and Engineering) with amount of RM 20,251.70 was secured.
- Papers published from this grant were cited 20 times (cumulatively).
- Editors from ISI-/SCOPUS indexed journals invited me to review few related manuscripts.
- International conference organizer (i-TREC 2019) invited me as Invited Speaker.
- Researcher from Iran contacted to get some advise about the research project.

Summary of Research Output

Main equipment and the reaction setup for synthesizing InN thin films



MSM metal mask, and InN-based photodetectors and its photoresponse properties at bias voltages of 1 and 3 V.



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PROF. DR. NOOR HAZLINA AHMAD

MODELLING GREEN ENTREPRENEURSHIP PROCLIVITY FOR GREEN ECONOMY AMONG GENERATION Y NASCENT ENTREPRENEURS

OBJECTIVES

- To investigate the reasons for low green entrepreneurship proclivity among Malaysians.
- To investigate how green orientations (i.e. green attitude and green value) affect perceptions (i.e., perceived desirability and perceived desirability) among Gen Y nascent entrepreneurs.
- To investigate how cultural factors (i.e., social norm and government legislation) affect perceptions (i.e., perceived desirability and perceived desirability) among Gen Y nascent entrepreneurs.
- To examine how perceptions (i.e., perceived desirability and perceived desirability) affect green entrepreneurship proclivity among Gen Y nascent entrepreneurs.
- To examine if green entrepreneurship education moderates the relationship between perceptions and green entrepreneurship proclivity among Gen Y nascent entrepreneurs.
- To develop the assessment metrics on the green entrepreneurship proclivity among Gen Y nascent entrepreneurs.
- To develop a training module for green entrepreneurship proclivity among Gen Y nascent entrepreneurs.

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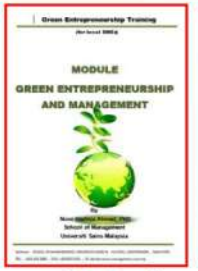
IMPACT TO GOVERNMENT / INDUSTRY / ACADEMIC / SOCIETY

- Collaboration with GreenTech Malaysia to train local SMEs on Green Entrepreneurship and Management in 2015
- Consultancy work on Green Entrepreneurship funded by GreenTech Malaysia (RM69,000)
- Developed Green Entrepreneurship Index for SMEs called GREEN SCORE Conduct Green Entrepreneurship Coaching on 23 selected SMEs in the Greentech Malaysia database.
- Conduct Green Entrepreneurship Seminars to the SME Owners funded by Greentech Malaysia (RM16,000)
- Development of "Green Entrepreneurship Readiness Handbook – to train local SMEs on Green Entrepreneurship Awareness

Green Entrepreneurship Seminar to Local SMEs



ASSOC. PROF. DR. RAA KHIMI SHUIB

THE MECHANISM OF DAMPING IN MAGNETORHEOLOGICAL ELASTOMER (MRE)

HIGHLIGHTS

To investigate the role of waste nickel-zinc ferrite and rubber matrix in damping mechanism in elastomer

OBJECTIVES

- 8 Published WoS/SCOPUS Indexed Journals
- 2 Graduated MSc Students
- Gold Medal at International Invention Innovation Competition, Canada
- Special Award Malaysia Technology Expo 2019
- 2 Copyrights (Intellectual Property) - MyIPO

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2021

Awarded MOSTI TED1 grant - **RM450,000** for prototypes development & field test.

SULIT

MOSTI.D (S) 600-4/18/6 ( ) /19 Julai 2021

YBhg. Prof. Dato' Ir. Dr. Abdul Rahman Mohamad
Timbalan Naib Canselor (Penyelidikan & Inovasi)
Aras 6, Bangunan Canselori
Universiti Sains Malaysia
11800 PULAU PINANG

YBhg. Prof. Dato' Ir. Dr.,

TAWARAN DANA PEMBANGUNAN TEKNOLOGI 1 BAGI PROJEK *DEVELOPMENT OF PUNCTURE PROOF SELF HEALING TYRE* (TDF03211032)

Dengan hormatnya saya merujuk kepada perkara di atas.

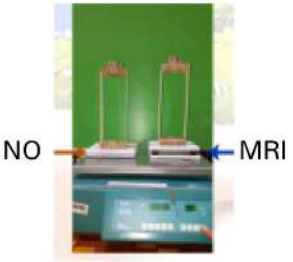
2. Sukacita dimaklumkan bahawa Kementerian Sains, Teknologi dan Inovasi telah meluluskan permohonan pihak YBhg. Prof. Dato' Ir. Dr. untuk mendapatkan pembiayaan di bawah Dana Pembangunan Teknologi 1 bagi projek ***Development Of Puncture Proof Self Healing Tyre*** **(TDF03211032)** berjumlah **RM450,000.00** dengan tempoh

2018

Collaboration with JEBCO (M) Sdn. Bhd.
Product: automotive vibration parts

2019

Collaboration with **Petrogroup Sdn Bhd.**
Fabricate rubber parts for oil & gas environment.



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Industry Collaboration

ASSOC. PROF. DR. RAFIDAH ZAINON

INVESTIGATION OF MATERIAL DECOMPOSITION TECHNIQUE FOR QUANTIFYING MATERIAL IN SPECTRAL COMPUTED TOMOGRAPHY WITHOUT THE USE OF CONTRAST AGENT

OBJECTIVES

- To establish material decomposition technique for quantifying materials in spectral CT without the use of contrast agent.
- To investigate the efficacy of the material decomposition technique for quantifying materials in spectral CT.

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- Translation of fundamental physics knowledge in quantifying material composition in Spectral CT imaging into human tissue characterisation.The material differentiation in spectral CT imaging will assist the clinician specially in lesion characterisation.

Research grant

- International Collaboration Fund from Saudi Arabia with a total amount of $1.68 million. SAR 450,000 is allocated for USM.

Research networking

- Ongoing international collaboration with Imam Abdurrahman bin Faisal University and KLU Belgium for characterisation of tissue microenvironment in molecular imaging for accurate diagnosis and prognosis.

جامعة الإمام عبد الرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY

KU LEUVEN

Talent

- Graduated 2 research students.

Publications:

- Published 2 chapters in research book.
- Published 3 papers in citation-indexed journals.

Award:

- 1 international award

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Industry Collaboration

PROF. IR DR. SRIMALA SREEKANTAN

INVESTIGATION ON THE DURABILITY, GROWTH MECHANISM AND BONDING INTERACTIONS OF SUPER-HYDROPHOBIC SURFACES MADE FROM WASTE MATERIALS

OBJECTIVES

- To investigate the effect of surface functionalizing agents (DMDEOS and SA) concentration, drying time, temperature on the surface free energy and roughness of the micro-structure.
- To investigate the bonding interactions between DMDEOS, SA and paper waste ash which affect the strength and durability
- To examine the fundamental growth mechanism involved in the formation of super-hydrophobic surface using POFA waste, SA and DMDEOS.

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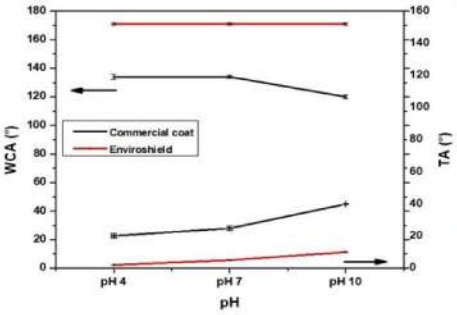
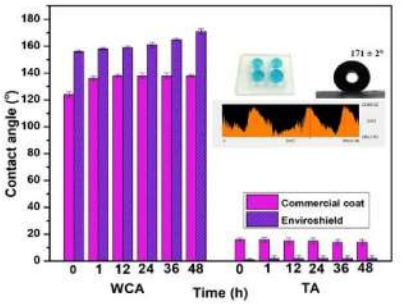
Excellent Durability in various environment



Invasive fungal infections has caused adverse health effect & business loss

No coating With coating

Invasive fungal infections has caused adverse health effect & business loss



Coating from POFA waste has WCA of 171o to protect you from fungus

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Industry Collaboration

ASSOC. PROF. DR. SUZYLAWATI ISMAIL

CHARACTERIZATION AND INTERACTION EVALUATION ON THIN-COATED ADSORBENT LAYER CONCEPT

OBJECTIVES

- To characterize the thin-coated adsorbent layer
- To study the adsorption interaction of thin-coated adsorbent layer with adsorbent
- To analyse thin-coated adsorbent layer with adsorbent

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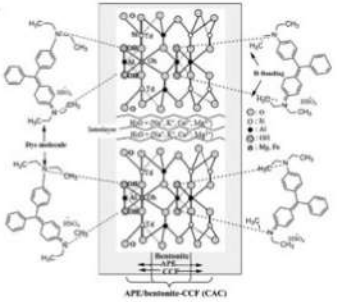
FRGS create opportunities for researchers to scientifically discover a fundamental concept. For example, this research leads to the development of a special formulated paint, works as thin-coated adsorbent layer with novelty in its application. This product contributes to an affordable and effective treatment of contaminated industrial effluent. It is highly potential for commercialization, which will start a new wealth creation for Malaysian. Besides driving the nations towards sustainability by applying this product for relevant industries.



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Industry Collaboration

DR. TAN JOO SHUN

INFLUENCE OF POLYMER PHASE-STRUCTURE FUNCTION PROTEINS COMPLEX ON EXTRACTION BEHAVIOR OF BIOTECHNOLOGICAL PRODUCTS IN NOVEL TUNABLE AQUEOUS POLYMER-PHASE IMPREGNATED RESINS TECHNOLOGY

OBJECTIVES

- To investigate the role of polymer that impregnated into resin on the interaction mechanism of polymer and two different protein species, bacteriocin and lipase by measuring partition coefficient.
- To investigate the extraction behaviors of two different protein species, bacteriocin and lipase, to focus on impregnation in terms of stability and phase system via protein-impregnated resin interactions in TAPPIR system.
- To show the effect of extraction process parameters of TAPPIR system on two different proteins, bacteriocin and lipase, using response surface methodology and artificial neural network for enhancement of the performance of TAPPIR system in combination with flotation system.

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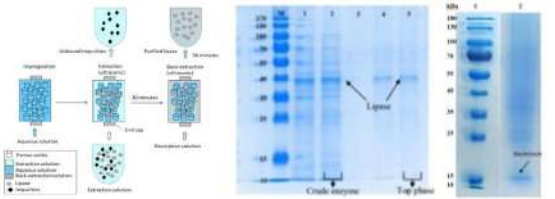
Tunable Aqueous Polymer-Phase Impregnated Resins Technology



Impregnation of dyed PEG into XAD4 resins

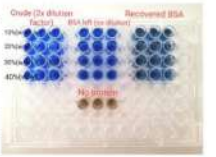
1) One phase of polymer

2) Polymer is being adsorbed into the Amberlite XAD4

3) The Amberlite XAD4 is fully impregnated with PEG

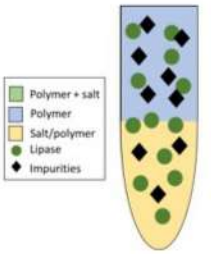
Recovery of bovine serum albumin (BSA) using AIRS

		Amberlite XAD4
Weight of resin immersed in 5g of 40% PEG 4,000		2.5 g
Leaching factor (%)		<1%
Total BSA recovered (mg/g)		0.293
Extraction time	Sonication	30 minutes



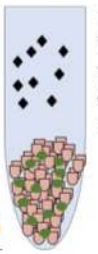
Polymer phase impregnation and extraction behavior of protein

AQUEOUS TWO PHASE SYSTEM



In ATPS, purification fold of 3.4 and recovery yield of 93% were obtained for lipase protein.

TAPPIR



In TAPPIR, purification fold of 7.6 and recovery yield of 89% were obtained for lipase protein.

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Publication in High Impact Journal

ASSOC. PROF. DR. TAN JUN JIE

DECIPHERING SIGNALING CUES CONTROLLING VENTRICULAR GROWTH AND COMPACTION BY PROEPICARDIAL CELLS USING HUMAN INDUCED PLURIPOTENT STEM CELLS

OBJECTIVE

Human induced pluripotent stem cells can generate pre-epicardial cells (PEC) that can stimulate heart cell growth, spatially organize them in the dish and improve their contractility.

The mechanism underlying the increased heart cell proliferation is partly by the retinoic acid / insulin-like growth factor mediated signaling. The collective effects from PEC on heart cells shows their important role especially in heart tissue engineering for regenerative purposes.

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2021 Paper published in Nature Communication with Prof. Harald Ott from Harvard University, USA

nature communications

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ARTICLE

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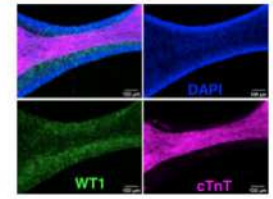
Human iPS-derived pre-epicardial cells direct cardiomyocyte aggregation expansion and organization in vitro

Jun Jie Tan, Jacques P. Guyette, Kenji Miki, Ling Xiao, Gurbani Kaur, Tong Wu, Liye Zhu, Kathria J. Hansen, King-Hwa Ling, David J. Milan & Harald C. Ott

Ongoing Collaboration with Massachusetts General Hospital, Harvard Medical School, USA



The iPSC-derived preepicardial cells (green) spatially organized the heart cells (Magenta) to forma tube-like structure spontaneously in the dish

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