

Refleksi

simbolik ekspresi Nuklear Malaysia



NUKLEAR
MALAYSIA

2021
50th



Refleksi

simbolik ekspresi Nuklear Malaysia

PENERBITAN
Habibah Adnan
Nur Aishah Zainal
Halit Alias

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Zainodin Tunggal

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Bahagian Pengurusan Maklumat (BPM)
Bahagian Teknologi Perubatan (BTP)
Bahagian Teknologi Industri (BTI)
Bahagian Teknologi Pemprosesan Sinaran (BTS)
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MUKA SURAT

PROLOG

Naskhah Refleksi menjadi rentetan terhadap elemen simbolik bagi mengekspresikan Agensi Nuklear Malaysia (Nuklear Malaysia) dalam bidang sains dan teknologi nuklear. Platform Refleksi adalah kompilasi rekaan grafik poster yang mencerminkan imej Nuklear Malaysia sebagai sebuah agensi yang menerajui penyelidikan, pengkomersialan dan inovasi (R&D&C&I). Menerusi kompilasi pengumpulan poster yang dilaksanakan, Refleksi menjadi cerminan terhadap pemerkasaan sains dan teknologi nuklear dalam mempertingkatkan kecemerlangan Nuklear Malaysia ke arah yang lebih mampan.

Matlamat penghasilan naskhah Refleksi ini adalah untuk mencipta kecemerlangan baharu dalam memacu dan sekaligus memartabatkan penyelidikan sains dan teknologi nuklear dalam bentuk penerbitan kompilasi. Gabungan pelbagai rekaan grafik poster yang dimuatkan dalam penerbitan kompilasi ini berupaya untuk mencetus ekspresi terhadap transisi imej Nuklear Malaysia dengan lebih efisien.

Proses untuk menghasilkan penerbitan ini melibatkan pengumpulan koleksi poster daripada pelbagai pameran dalam skala yang besar khususnya dalam menyebarkan bidang penyelidikan sains dan teknologi nuklear. Entiti dalam pemilihan kompilasi poster adalah berdasarkan kepada penglibatan Nuklear Malaysia di dalam pameran yang jelas memberikan impak yang tinggi kepada agensi ini.

Oleh yang demikian, sejuta penghargaan diucapkan kepada semua yang terlibat dan sekaligus menjadi pendukung kepada penghasilan bagi penerbitan kompilasi Refleksi ini. Segala kebaikan yang diberikan daripada semua pihak dalam penerbitan Refleksi ini semoga akan dibalas kembali oleh-Nya.

Sekian, terima kasih.

Sidang Editorial

MINGGU SAINS NEGARA (MSN)

Minggu Sains
Negara (MSN)
1-7 april 2021

SAINS
UNTUK KESIHATAN
1-7 April 2021

NUKLEAR MALAYSIA

MINGGU SAINS NEGARA 2021

SEPANJANG HARI

- PAMERAN
- IMBASAN MSN 2020
- INOVASI

01 April 2021 | Khamis
SEMBANG SANTAI SAINTIS: Nuklear di Bidang Perubatan
12.00pm-1.00pm

02 April 2021 | Jumaat
SEMBANG SANTAI SAINTIS: Simulator Reaktor TRIGA PUSPATI (RTP)
11.30am-1.30pm

03 April 2021 | Sabtu
FORUM: Selamatkah Makan Makanan Disinar?
11.30am-1.30pm

04 April 2021 | Sabtu
FORUM: Selamatkah Makan Makanan Disinar?
11.30am-1.30pm

05 April 2021 | Isnin
BENGKEL SAINS NUKLEAR UNTUK GURU SAINS
10.00am-1.00pm

06 April 2021 | Selasa
BENGKEL KESELAMATAN SINARAN & KIMIA
10.00am-12.00pm

06 April 2021 | Selasa
NUCLEAR BEST FRIEND FOREVER (BFF)
10.00am-12.00pm

Untuk menyertai, Sila scan QR cod atau layari pautan yang diberi
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Refleksi

MINGGU SAINS NEGARA (MSN)

SAONS
UNTUK KESIHATAN
1-7 April 2021

02
April 2021
10.00am-11.30am

Sembang Santai Saintis:
**Simulator Reaktor
TRIGA PUSPATI
(RTP)**

En. Mohd Sabri
Pegawai Penyelidik

Pn. Nurfarhana Ayuni
Pegawai Penyelidik

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MINGGU SAINS NEGARA (MSN)

SAONS
UNTUK KESIHATAN
1-7 April 2021

03
April 2021
11.30am-1.30pm

Forum:
**Selamatkan
Makan Makanan
Disinar?**

En. Mohd Sidek Othman
Pegawai Penyelidik

Dr. Ahmad Zainuri Mohd Dzomir
Pegawai Penyelidik

En. Nasaal Masngut
Pegawai Penerbitan
Moderator

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MINGGU SAINS NEGARA (MSN)

SAINS
UNTUK KESIHATAN
1-7 April 2021

05 Bengkel Sains Nuklear Untuk Guru Sains
April 2021
9.00am-12.00pm

Speakers:

- Pn. Aisyah, Bkg. Pembangunan Kurikulum
- Olga Salimah, SMK Jalan 4, Bandar Baru Bangi, Selangor
- Olga Hanimah, SMK Bandar Puchong Jaya (A), Puchong, Selangor
- Olga Ahmad Rizaki, SMK Seksyen 18, Shah Alam, Selangor
- Olga Mohd Khairul Anwar, SMK Sultan Abu Bakar, Kuantan, Pahang
- Olga Nor Azzila, SMK Sultan Ismail, Johor Bahru, Johor
- Olga Nordehar, SMK ST Teresa, Kuching, Sarawak
- Olga Ahmad Shamsul, SMK Ayer Putih Gajah, Pandang, Kelah

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SAINS
UNTUK KESIHATAN
1-7 April 2021

06 Nuclear Best Friend Forever (BFF)
April 2021
10.00am-12.00pm

Speakers:

- En. Faizal Azrin, Pegawai Penyelidik
- En. Mohd Hasnor, Pegawai Penyelidik
- En. Muhammad Zaid, Jurutera Kanan, Guru DKK di Yayasan FAOEH
- Pn. Zaharatul Sophia, Setiausaha Yayasan FAOEH
- Pn. Normazlin, Pegawai Penyelidik

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The poster is for a workshop titled "Bengkel Keselamatan Sinaran & Kimia" (Radiation and Chemical Safety Workshop) held on April 1, 2021, from 9.00am to 12.00pm. It features two speakers: En. Yli Mei Wo and Pn. Nooradilah, both identified as Pegawai Penyelidik (Research Officers). The poster includes logos for SAINS (for health), NUKLEAR MALAYSIA, and the MSN 2021 event. A QR code is provided for more information, along with the website <https://minggusainsnegara2021.com.my>. Social media links for the Nuclear Malaysia website and Facebook/Instagram pages are also listed at the bottom.

SAINS
UNTUK KESIHATAN
1-7 April 2021

NUKLEAR MALAYSIA

MINGGU SAINS NEGARA 2021

06 Bengkel Keselamatan Sinaran & Kimia
April 2021
9.00am-12.00pm

En. Yli Mei Wo
Pegawai Penyelidik

Pn. Nooradilah
Pegawai Penyelidik

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Konvensyen
Teknikal
Nuklear Malaysia
26-28 OKTOBER 2021



NTC 2021

"Nuclear Technology Application in New Norm"

R & D IN MICROBIAL BIOPROCESS

Jong Bor Chyan, Pauline Liew Woan Ying, Hing Jan Nie, Elly Ellyna Rashid
Agrotechnology and Biosciences Division, Malaysian Nuclear Agency (Nuklear Malaysia),
Bangi, 43000 KAJANG, MALAYSIA

INTRODUCTION

Bioprocess :
A specific process that uses **complete living cells or their components** to obtain desired products.

Microbial Bioprocess :
A specific bioprocess that uses **microbial biomass as starter cultures** to obtain desired products.

Process : A + B = C
Bioprocess : A + B = C
A + B = A + B + C
A + B =

Microbial Bioprocess Parameters :

Physical

- Mechanical
- Temperature
- Flow rates
- Pressure
- Viscosity
- Turbidity
- Power consumption

Chemical

- pH
- Type of substrate(s)
- Substrate concentration
- Oxygen concentration

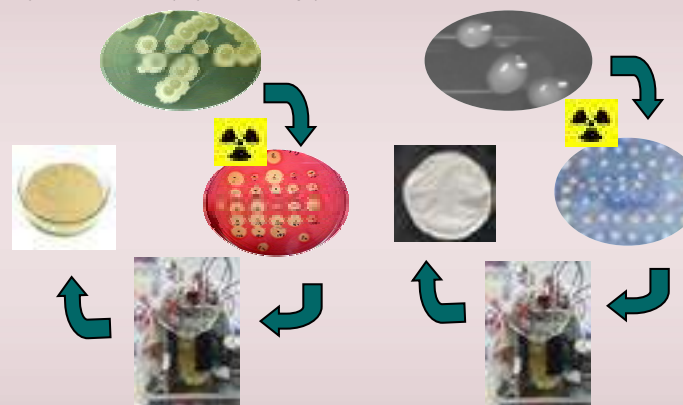
Biological

- Type of culture
- Starting culture (stage)
- Enzyme(s) activities
- Protein concentration

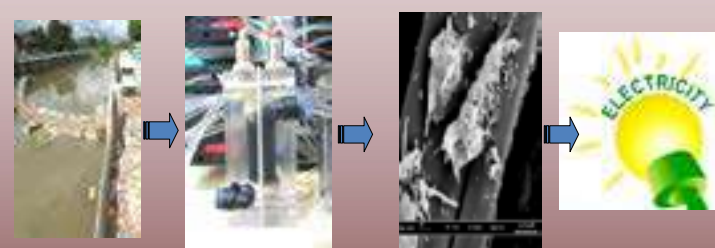
Bioprocessing Companies

MilliporeSigma (Merck KGaA)
Danaher Life Sciences (Danaher)
GE Healthcare (General Electric)
Fujifilm Healthcare (Fujifilm Holdings)

Lonza – Pharma & Biotech.
CPC (Colder Products Co.)
Thermo Fisher Scientific.
Yamasa Co.



Three major microbial activities that we are practicing to bioprocess the functional bacteria at Malaysian Nuclear Agency.



CONCLUSION

In conclusion, microbial bioprocess is different from other process. Bioprocess involving living biological cells which is therefore most crucial to generate optimum and reproducible results, particularly important for quality assurance purposes.

For further information, please contact:

Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang, Malaysia
Selangor Darul Ehsan, Malaysia
<http://www.nuklearmalaysia.gov.my>

Attn:
Dr. Jong Bor Chyan
Radiation Biotechnology Group
Agrotechnology and Biosciences Division
Tel: +603-89112000 ext. 1347
email: jongbc@nm.gov.my



NTC 2021

"Nuclear Technology Application in New Norm"

NUTRIENT BROTH OF DIFFERENT MANUFACTURERS AND TYPES OF SHAKE FLASK AFFECT BACTERIAL PHA GENERATION AND GROWTH

Pauline Liew Woan Ying, Jong Bor Chyan, Elly Ellyna Rashid, Hing Jan Nie
Agrotechnology and Bioscience Division, Malaysian Nuclear Agency (Nuklear Malaysia),
Bangi, 43000 KAJANG, MALAYSIA

MATERIALS AND METHODS

1

Two PHA-producing *Bacillus* isolates, NMBCC 50015 and 50018, and *Burkholderia*, NMBCC 50014, were grown separately in NB brands Oxoid and Merck, supplied with glucose for PHA generation. All bacterial isolates and their γ -derived mutants were cultivated at 30°C by shaking at 200 rpm in an incubator shaker (New Brunswick Scientific, USA) for 24 hrs. The growth of the bacteria was estimated by viable cell counting. PHA generation was estimated by crotonic acid method (Law and Slepecky, 1961).

2

The effects of the shake flask materials on the PHA generation by *Azotobacter vinelandii* were observed. The performance of bacterial culture in flasks made from glass and plastic (PP) materials were compared. *A. vinelandii* was grown for up to 54 hrs at 30°C by shaking at 200 rpm in a minimal salt medium containing POME for PHA generation.

RESULTS AND DISCUSSION

The results were displayed in Figure 1 and 2.

- both *Bacillus* generated higher PHA in the Oxoid brand NB.
- *Burkholderia* generated higher PHA in Merck brand NB.
- Merck brand NB generally induced higher cell mass, the effects more protruding for *Burkholderia* than *Bacillus*.
- When using culture flasks made from different materials, *A. vinelandii* showed higher PHA generation in the culture flask made of glass.

In research, optimisation of research materials/ elements is often necessary. From the results obtained, the different research materials/ elements have produced different results despite having the same name and same purpose. NB is a multipurpose medium used for general cultivation of bacteria. Although both Oxoid and Merck used the same commercial name for Nutrient Broth, their medium compositions were different. Even though the materials of culture flask were not often considered, this report showed suitable culture flask might improve the experimental results.

CONCLUSION

This paper has demonstrated different performances of bacterial growth and PHA generation when the specific bacterial strains were cultured in different commercial media brands or different culture flask materials. Stringent selection of research materials is therefore most crucial to generate optimum and reproducible results, particularly important for quality assurance purposes.

For further information, please contact:

Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang, Malaysia
Selangor Darul Ehsan, Malaysia
<http://www.nuklearmalaysia.gov.my>

Attn:
Dr. PAULINE LIEW WOAN YING
Radiation Biotechnology Group
Agrotechnology and Biosciences Division
Tel: +603-89112000 ext. 1369/1441
email: paulineliew@nm.gov.my

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2021

UNIVERSITI TEKNOLOGI MALAYSIA

GUIDELINES IN PREPARING
HIGH-QUALITY GRAIN SEEDLINGS FOR
PADDY STRAW MUSHROOM (*Volvariella volvacea*)

Am Syazween S.¹, Azhar M.¹, Lyena Watty Z. A.¹, Nur Dyana Q.², Seri Chempaka M. Y.¹, Mohd Hafiz A. N.¹,
Irwani Syah R.²

¹Faculty of Applied Sciences, Universiti Teknologi MARA, 40450, Shah Alam
²Malaysian Nuclear Agency, Bangi, 43000, Kajang, Malaysia
Corresponding author: azhar_m@nuclearmalaysia.gov.my

INTRODUCTION

Volvariella volvacea, also known as the paddy straw mushroom, is a fast-growing fungus and produces its fruiting body on top of substrate that act as its food source.

Corn grain seedling in *V. volvacea* cultivation was introduced by the Malaysian Nuclear Agency in 2016 to increase production volume and reduce seedling production costs.

MATERIALS

V. volvacea mother culture

Corn grain (Grade 5)

Limestone

13 x 6 cm Polypropylene (PPP) spawn bag

Plastic neck and cap

V. volvacea grain seedlings

METHODOLOGY

1 GRAIN PREPARATION PROCESS

Weighing corn grains

Washing off debris

Soak for 6 to 8 hours

Soak the grains for 12 hours

Mix with 1% limestone

Weigh the corn grains

Pack into 13 x 6 cm PPP bag

2 STERILIZATION PROCESS

Attach the autoclave indicator strip

Autoclave at 121°C, 15 psi for 20 minutes

3 INOCULATION PROCESS

Healthy *V. volvacea* mother culture

Heat sterilize the cork borer

Excising the mycelium

Transfer sample using hook

Place into the corn grain

Flame sterilizing the mouth of the grain bag

Seal with cap and incubate at a well ventilated area

DISCUSSIONS

- Pre-treatments of corn grains such as washing, soaking, and mixing with 1% limestone are very important in preventing contamination and ensuring high-quality mycelial growth.
- It is important to maintain a sterilized environment during the inoculation process. The laminar flow was cleansed and sanitised using a 70% ethanol thoroughly prior to inoculating.
- Autoclaving is the method of sterilization where the corn grain will be sterilized using heated steam to inactivate all fungi, bacteria, viruses, and endospores.

CONCLUSIONS

Outstanding practice in preparing high-quality grain seedlings for paddy straw mushroom was described precisely. The information discussed, might be useful in supporting the mushroom industry towards high-impact mushroom cultivation for growers.

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KONVENSYEN TEKNIKAL NUKLEAR MALAYSIA

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2021

ISOLATION OF DENITRIFYING BACTERIA FROM SUNGAI BUAH, DENGKIL

Hing Jan Nie¹, Jong Bor Chyan¹, Pauline Liew Wan Ying¹, Noor Haza Fazlin Binti Hashim²,
Ely Elyna Rashid¹, Shuhaimi Shamsudin¹

¹Agrotechnology and Biosciences Division, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor D.E., Malaysia.
²Water Quality Laboratory, National Hydraulic Research Institute of Malaysia (NAHRIM), Lot 5377, Jalan Putra Permai, 43300 Seri Kembangan, Selangor D.E., Malaysia.

Introduction

- Excess use of nitrogen fertiliser in agriculture and runoff from the fertilised soil is the main cause of nitrate pollution in surface and groundwater (Sevda et al. 2018; Górski et al. 2019; Bijay-Singh & Craswell 2021).
- Nitrate pollution affects human health and damages the water ecosystems.
- In Malaysia, 10 mg/L of nitrate is the drinking water maximum accepted value and raw water recommended value according to Malaysian National Standard for Drinking Water Quality (NSDWQ) by Ministry of Health.
- Biological removal of nitrate in water is possible with denitrification by bacteria (Wong et al. 2020). Denitrification is the process of reducing nitrate into gaseous forms (Lv et al. 2017).
- The objective of this project was to isolate denitrifying bacteria from a river with anthropogenic activities observed nearby.

Materials and Methods

Fig. 1. Isolation of bacteria with spread plate method.

Fig. 2. Surrounding environment of Sungai Buah.

Fig. 3. Sample collection with pail and string.

Fig. 4. Sample were transferred to 250 ml bottles and sent to lab.

Fig. 5. Standard method developed for isolation of bacteria from environmental water samples.

Fig. 6. Sample were filtered.

Fig. 7. pH and nitrate level measured.

Fig. 8. Nitrate level measured with spectrophotometer.

Fig. 9. Plates incubated anaerobically.

Fig. 10. Various colony morphologies observed.

Results and Discussion

The pH level of water samples was detected to be between 5.0 and 6.0. The average nitrate level of samples was 11.5 mg/L. A total of 8 aerobic and 3 anaerobic strains were isolated. Isolates have various colony morphologies (Fig. 10). Results suggested diverse bacteria were present in the river water.

Conclusion

A standard method was developed for isolation of bacteria from environmental water samples. Isolates were observed to have various morphologies as expected. Isolates will be characterised based on denitrifying ability in next experiment.

Acknowledgements

The authors wish to thank staff and researchers of Malaysian Nuclear Agency that assisted us with this project. The authors also acknowledge funding from Malaysian Nuclear Agency for this project (NM-R&D-20-12).

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For further information, please contact:

Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuclearmalaysia.gov.my
Attn:
Hing Jan Nie
Radiation Bioindustry Group
Agrotechnology and Biosciences Division
Tel: +603-89112000 ext. 1451
email: hing@nm.gov.my

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METHOD DEVELOPMENT OF STEVIOL GLYCOSIDES (REBAUDIOSIDE A) ANALYSIS USING ULTRA HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (UHPLC)

Nur Hafizati Abdul Halim¹, Norzila Bahari¹, Muzaffar Ali¹, Chong Saw Peng¹, Norzila Bahari²

¹Agrotechnology and Bioscience Division, Nuclear Technology Division, Malaysian Nuclear Agency (Nuclear Malaysia), Bangi, 43000 Kajang, Selangor Darul Ehsan, Malaysia

Abstract

Stevia rebaudiana leaf is the only species to have the natural sweetness in replacing artificial sweeteners without resulting in any negative effects on human health. The leaf consists of nine active components of steviol glycosides (SG) which are: stevioside (S1), rebaudioside A (Rb-A), rebaudioside B (Rb-B), rebaudioside C (Rb-C), rebaudioside D (Rb-D), rebaudioside E (Rb-E), rebaudioside F (Rb-F), rebaudioside G (Rb-G), rebaudioside H (Rb-H) and rebaudioside I (Rb-I). The ratio of these active components influences the quality, identity and purity of the stevia extracts. Rb-A is one of the primary components from the *Stevia rebaudiana* leaf. Therefore, the objective of this study is to develop a method to analyze Rb-A components quantitatively using Agilent 1290 Infinity LC System Ultra High Performance Liquid Chromatography (UHPLC). In this study, separation was conducted at room temperature through an Agilent ZORBAX Carbohydrate Analysis Column (4.6 x 250mm, i.d. 5 µm), mobile phase consisting of acetonitrile/water with several compositions, addition of 0.1% trifluoroacetic acid (TFA) as a modifier. Flow rate was set at between 0.3 – 1.0 mL/min and wavelength at between 290 – 210 nm using Photodiode Array Detection (PDA). As a conclusion, this Rb-A analysis method by using UHPLC developed can be used for quantitative analysis of Rb-A component in stevia derivative extracts.

Keywords: Rebaudioside A, Steviol Glycosides, Stevia Rebaudiana, UHPLC

Introduction

In 1897, a German naturalist Antonie Berton had discovered new natural sweetener which is known as Stevia (*Stevia rebaudiana* Bertoni), an herbaceous perennial plant of the Asteraceae family. *S. rebaudiana* Bertoni is the source of all other species of stevia (Noguchi et al., 1982; Kugler et al., 1984).

Rebaudioside A is the most abundant and most stable steviol glycoside, and it is the most used steviol glycoside as a sugar substitute in food and beverage due to its high content in stevia leaves, which it accounts for 2-4% in total steviol glycosides (Martinez, 2014).

Various methods of rebaudioside A analysis have been developed. Most of the quantitative methods of rebaudioside A, are based on the High-Performance Liquid Chromatography (HPLC) method. However, today, modern advanced liquid chromatography and which is ultra-high-performance liquid chromatography (UHPLC) has become a better and more efficient separation approach across some applications fields because of lower cost, high efficiency, high resolution, speed of analysis, robustness, reliability, and commercial availability of the whole range of UHPLC instruments. Therefore, in this study, UHPLC was used as a tool for development of a method to analyze Rb-A components quantitatively.

Methodology

1. Chemicals and Raw Materials

Rebaudioside A (99% by HPLC) standard (CAS: 8051-16-1) and water for chromatography (LC-MS) grade was purchased from Sigma-aldrich. Meanwhile, HPLC grade acetonitrile (ACN), trifluoroacetic acid (TFA) and other reagents were purchased from J.T Baker. All solvents and standards were liquid chromatography (LC) grade or higher.

2. Instrumentation

Agilent 1290 Infinity LC System Ultra High Performance Liquid Chromatography (UHPLC) with Agilent ZORBAX Carbohydrate Analysis Column (4.6 x 250mm, i.d. 5 µm), mobile phase consisting of acetonitrile/water with several compositions, addition of 0.1% trifluoroacetic acid (TFA) as a modifier. Flow rate was set at between 0.3 – 1.0 mL/min and wavelength at between 290 – 210 nm using Photodiode Array Detection (PDA).

3. Chromatographic procedure

Parameter	Setting
Mobile phase	Acetonitrile/water (5:95) (TFA) (Chromatographic grade)
Flow rate	0.3 mL/min
Column	Agilent ZORBAX Carbohydrate Analysis Column (4.6 x 250mm, i.d. 5 µm)
Temperature	30°C
Wavelength	290, 210 nm

4. Standard preparation

The standard stock solution was prepared by dissolving 1 mg of Rb-A in 1 mL of mobile phase. Then the mixture was sonicated for 15 minutes before filtered with 0.2 µm nylon membrane filter. The solution is further serially diluted and used to construct a linear calibration curve. An aliquot of 5 µL standard solution was used for the UHPLC analysis.

Result

Optimum parameters for separation using UHPLC to analyze Rebaudioside A

Parameter	Setting
Column	Agilent ZORBAX Carbohydrate Analysis Column (4.6 x 250mm, i.d. 5 µm)
Mobile phase	A: Acetonitrile, B: Water (5:95) (TFA)
Composition	A, B = 20:80
Mobile Phase	Acetonitrile
Flow rate	0.3 mL/min
Temperature	30°C
Wavelength	290 nm
Injection volume	5 µL

Chromatogram of Rebaudioside A

From the calibration curve and determination, the one confirms that the matching peak is belong to Rb-A. Under optimum conditions, all standard and sample should be separated at given conditions.

Conclusion

In conclusion, the method to analyze Steviol glycosides (SG) which is Rebaudioside A, by using Agilent 1290 Infinity LC System Ultra High Performance Liquid Chromatography (UHPLC) was successfully developed. The method is useful for the identification, quality assurance, and absolute measurement of *S. rebaudiana* and steviol glycosides derivatives (stevia products).

Acknowledgement

This research was supported by Dana Debitum Nuklear Malaysia (DND-20-20-16). We would like to thank our highest gratitude to Malaysian Nuclear Agency for funding our project and giving us the opportunity to deliver this project successfully. We would like to thank as well to Nuclear Technology Division, Malaysian Nuclear Agency for allowing access to UHPLC.

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For further information, please contact: Director General, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor Darul Ehsan, Malaysia. <http://www.nuklearmalaysia.gov.my>

Nur Hafizati binti Abdul Halim, Agrotechnology & Bioscience Division, Agrotechnology & Bioscience Division, Tel: +603-89112000 ext. 1332, email: hafizati@nm.gov.my

NTC 2021

PENCIRIAN VARIETI MUTAN STEVIA REBAUDIANA BERTONI

Chong Saw Peng¹, Nur Hafizati binti Abdul Halim¹, Norellia binti Bahari¹, Sharifah Nazura binti Syed Saabeer Ali² and Norzila binti Noordin¹

¹Malaysian Nuclear Agency (Nuclear Malaysia), Bangi, 43000 Kajang, SELANGOR, MALAYSIA

²School of Bioprocess Engineering, Universiti Malaysia Perlis, Sg. Chuchuh, Arau, Jalan Wang Ulu, 01000 Kangar, PERLIS, MALAYSIA

ABSTRAK

Stevia rebaudiana Bertoni ialah sejenis pemanis semula jadi dan tanpa kalori, ia banyak digunakan dalam industri makanan dan minuman. Spesies ini telah diperkenalkan sebagai tanaman komersial yang berpotensi disebabkan oleh keperluan yang tinggi terhadap pemanis yang boleh menggantikan gula. Dalam kajian ini, dua stevia mutan S10A dan S40C telah dicirikan morfologi dan kandungan kemanisannya berbanding dengan stevia kawalan. Stevia S10A mempunyai bentuk daun obovate dan keluasan permukaan yang lebih besar berbanding dengan stevia S40C dan kawalan. Di samping itu, stevia S40C mempunyai bentuk daun lanceolate dan saiz daun yang kecil berbanding dengan stevia S10A tetapi ia mempunyai biojisim yang tinggi berbanding dengan stevia S10A dan kawalan. Stevia S10A mempunyai kandungan kemanisan yang sama dengan kawalan (0.50% Brix), akan tetapi stevia S40C mempunyai kandungan kemanisan yang paling rendah (0.43% Brix). Bagi kajian jarak internod, stevia S10A dan S40C mempunyai jarak internod yang lebih panjang daripada kawalan, iaitu dengan 3.5 dan 3.9 cm panjang masing-masing. Stevia kawalan hanya mempunyai jarak internod 2.1 cm sahaja.

BAHAN DAN KAEDAH

Bahan kajian:

- Stevia kawalan - Varieti Paraguay dibeli daripada MARDI
- Stevia S10A dan S40C – Varieti mutan dihasilkan daripada penyniran gama

Pencirian dan penilaian morphochemical:

- Keluasan daun stevia diukur dengan kertas grid, 2 x 2 mm²
- Morfologi daun diciri berdasarkan shape, tip, base, dan margin
- Kemanisan daun stevia diukur dengan Refractometer
- Jarak internod pokok diukur dengan pembarris

PENGENALAN

Berdasarkan laporan World Health Organization, Pesakit diabetik akan meningkat sebanyak 80 ribu pada 2025. Justeru itu, pengganti pemanis amat penting dan diperlukan bagi menggantikan gula dalam pemakanan kita. Stevia merupakan pokok berasal daripada Paraguay. Stevia ialah sejenis pemanis semulajadi tanpa kalori. Stevioside dan rebaudioside A merupakan dua penanda sebatian utama yang wujud dalam stevia. Agensi Nuklear Malaysia telah berjaya menghasilkan dua varieti mutan stevia S10A dan S40C melalui kaedah pembiakan mutasi menggunakan penyniran gama. Kedua-dua mutan ini menunjukkan toleransi yang tinggi kepada iklim Malaysia. Dalam Kajian ini, pencirian dari segi morfologi dan kandungan bahan kimia mutan stevia telah dijalankan.

HASIL DAN PERBINCANGAN

Rajah 1. Morfologi pokok dan daun bagi stevia kawalan, S10A dan S40C telah ditunjukkan. Keluasan permukaan, panjang dan lebar daun telah diukur menggunakan kertas grid.

Jadual 1. Pencirian morfologi daun stevia mutan berbanding dengan kawalan.

	Stevia Control	Stevia S10A	Stevia S40C
Leaf shape	Lanceolate	Obovate	Lanceolate
Leaf tip	Obtuse	Obtuse	Acute
Leaf base	Attenuate	Cuneate	Attenuate
Leaf margin	Dentate	Dentate	Serrated
Leaf length	41.2 mm	48.2 mm	54.8 mm
Leaf width	14.2 mm	22.2 mm	17.8 mm
Leaf surface area	386.4 mm ²	689.2 mm ²	650.4 mm ²

Rajah 2. Perbandingan jarak internod stevia mutan S10A dan S40C dengan kawalan. *p*-value ialah 0.002596. keputusan menunjukkan significant pada *p* < 0.05.

KESIMPULAN

Stevia S10A mempunyai pokok dan daun yang lebih besar berbanding dengan kawalan. Manakala, stevia S40C mempunyai daun yang lebih kecil tetapi lebih lebar berbanding dengan kawalan. Bagi kandungan kemanisan, stevia S40C mempunyai kandungan kemanisan yang terendah berbanding dengan stevia S10A dan kawalan, kandungan kemanisan stevia S10A adalah sama dengan kawalan. Bagi kajian jarak internod pula, stevia S10A dan S40C mempunyai internod yang lebih panjang berbanding dengan kawalan.

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PENGHARGAAN

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Maklumat selanjut sila hubungi:

Ketua Pengarah
Agensi Nuklear Malaysia
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuklearmalaysia.gov.my>

Attn:
Chong Saw Peng
Kumpulan Pembalokan Tanaman
Bahagian Agroteknologi dan Biosains
Tel: +603-89112000 ext. 1470
email: sawpeng@nm.gov.my



A STUDY OF PROBIOTIC BIOFERTILISER M100 ON STRAWBERRIES IN CAMERON HIGHLANDS FARM

KAJIAN PROBIOTIK BIOBAJA M100 KE ATAS STRAWBERI DI LADANG CAMERON HIGHLANDS



"Nuclear Technology Application in New Norm"

Phua Choo Kwai Hoe dan Mariani Deraman
Malaysian Nuclear Agency (Nuclear Malaysia)
Bangi, 43000 KAJANG, MALAYSIA

ABSTRACT

Strawberries are popular among consumers due to their attractive appearance, pleasant taste and high nutritional benefits. Strawberries in Malaysia are commercially planted in the highland region of Cameron Highlands. The two major problems of planting strawberries are the lack of resistance to various diseases and low yields. *Acinetobacter calcaceticus* (M100) is a multifunctional biofertiliser bacterium with capabilities of atmospheric nitrogen (N_2) fixation and phosphate and potassium solubilisation; it can be a good probiotic biofertiliser. Biofertiliser M100 may create healthy root systems for plant growth and increase the yields. Oligochitosan is an enhancer of plant growth and may also enhance the growth of strawberries. The objective of this study was to determine the effects of biofertiliser M100 (T1), oligochitosan (T2), combination of biofertiliser with oligochitosan (T3) and farmer practice (T4) on Festival cultivar strawberry at Brinchang, Cameron Highlands strawberry plot. All treatments were applied during transfer, a month after transfer and during flowering. Strawberries were harvested weekly for two and a half months. Fresh weights and number of strawberries were measured. Yields and number of fruits obtained from plants subjected to T1 and T3 were significantly higher than those from plants subjected to T2 and T4. Thus, biofertiliser M100 or the combination treatment leads to satisfactory results and is a good treatment for the strawberry farm.

Keywords: *Acinetobacter calcaceticus* (M100), oligochitosan, strawberries, probiotic and biofertiliser

MATERIALS AND METHODS

Biofertiliser M100 was prepared by culturing M100 bacteria isolates on nutrient broth for 24 h. It was prepared at a concentration of 10^8 cfu/ml. Oligochitosan was prepared at a concentration of 100 ppm. All treatments were applied during transfer, a month after transfer and during flowering. Strawberries (*Festivel* cultivar) were harvested weekly for two and a half months. Fresh weights (g) and number of strawberries were measured. There were 32 plants per treatment. The experimental design was a completely randomised block design (CRBD). Data were analysed by ANOVA with the means separated by Duncan's test ($P \leq 0.10$).

Treatments:
T1- Biofertiliser M100
T2- Oligochitosan
T3- Combination of biofertiliser with oligochitosan
T4- Farmer's practice

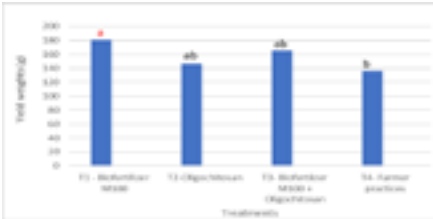


Figure 1: Effects of biofertiliser with oligochitosan on the fresh weight of strawberries in the field experiment (g). All values are expressed as the means of 10 harvests. Means followed by the same letter are insignificantly different from each other ($P \leq 0.10$) as determined by Duncan's Multiple Range test.

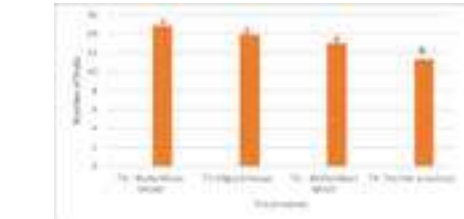


Figure 2: Effects of biofertiliser with oligochitosan on the number of strawberry fruits in the field experiment. All values are expressed as the means of 10 harvests. Means followed by the same letter are insignificantly different from each other ($P \leq 0.10$), as determined by Duncan's Multiple Range test.

plant were determined. Yields and number of fruits obtained from plants T3) were significantly higher than those obtained from plants subjected to iser M100 treatment or the combination treatment showed good results in the n the plants. Some previous reports showed the synergistic effects between and Agbodjato et al., 2016). However, in this study, no significant synergistic Further investigation on synergistic effects may be carried out with others

IONS

san on strawberry yield and number of fruits. However, plants subjected to umber of fruits. The biofertiliser and combination treatments showed better gested as an alternative to farmer's practice to obtain high yields. Further



For further Information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>
Attn:
Dr. Phua Choo Kwai Hoe
Group : Agroecosystem
Division: Agrotechnology and
Biosciences
Tel: +603-89112000 ext. 1383
email: phua@nm.gov.my



STABLE ISOTOPE TECHNIQUE FOR HONEY AUTHENTICITY

¹Mohd Noor Hidayat Adenan, ²Salmah Moosa, ³Azharuddin Abd Aziz, ⁴Siti Aminah Omar, ⁵Nur Hafizati Abdul Halim, ⁶Mustapha Akil, ⁷Hazlina Abdullah, ⁸Maizatul Akmal Mohd. Nasir and ⁹Rafiah Mohamed Roshidi
¹Malaysian Nuclear Agency, Bangi, 43000 Kajang, Malaysia
²Department of Chemistry Malaysia, Jalan Sultan, 46661 Petaling Jaya, Malaysia



"Nuclear Technology Application in New Norm"

Abstract

Almost 80% of honey in Malaysian market is inauthentic. Stable isotope analysis using carbon isotope ratio is an official method for identification of adulterated honey involving sugar addition in the product. The difference in the isotope ratio between protein and sugar more than >1‰ is considered adulterated. Initially, protein is required to be extracted from the honey samples by using chemical precipitation protocols. Then, the protein and raw honey from the sample will be analyzed for carbon, nitrogen, sulphur, oxygen and hydrogen stable isotopes using Elemental Analyzer Isotope Ratio Mass Spectrometer (EA-IRMS). Certain standard materials are required to produce accurate results. Calculation of apparent sugar addition is applied to identify the percentage of adulteration. The geographical origin of authentic honey based on location is identified by using multivariate statistical analysis.

Introduction



- ❖ Honey in Malaysia is produced by several honey bee species:
 - i. Wild bee (*Apis dorsata*),
 - ii. Western honey bee (*Apis mellifera*),
 - iii. Asian honey bee (*Apis cerana*)
 - iv. Stingless bee honey (*Trigona* spp.)
- ❖ There are a lot of health benefits possessed by honey:
 - i. Antimicrobial property
 - ii. Wound-healing activity
 - iii. Antioxidant property



- ❖ Global honey market size in 2020 was USD 9.21 billion.
- ❖ The price of honey in Malaysia can reach RM 260 per kilogram.



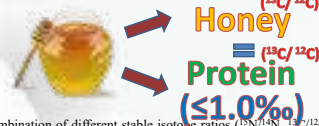
- ❖ Due to high economic value, 80% of honey in market is adulterated with cane sugar and other substances which harmful to consumer's health.
- ❖ It is difficult to differentiate the authentic and the fake honey because physically, the colour and viscosity of both are quite similar. This highlights the importance of differentiating the authentic honey from adulterated honeys using a robust analytical method.



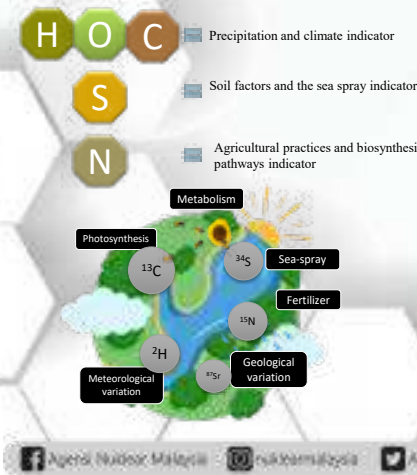
- ❖ Stable isotope technique is the best candidate for honey authenticity:
 - i. Ability to identify sugar added honey.
 - ii. Differentiate honey based on agricultural practices, climatic and geographical conditions.

Principle

- ❖ Bees collect nectars from the flowers of C-3 plants. The carbon isotopic value for C-3 plants is from -24‰ to -33‰.
- ❖ Sugar syrup from sugar cane and corn flour are categorized as C-4 plant. The carbon isotopic value is ranging from -10‰ to -16‰.
- ❖ There are two main components of honey namely sugar (whole honey) and protein. It is assumed the carbon isotope ratio ($^{13}C/^{12}C$) of the honey and protein is identical (less than or equal to 1.0‰).



- ❖ Combination of different stable isotope ratios ($^{15}N/^{14}N$, $^{13}C/^{12}C$, $^{34}S/^{32}S$, $^{18}O/^{16}O$ and $^2H/^1H$) are important to develop the honey authenticity model based on the geographical origin.



Methodology

1. Sample size calculation (95% confidence level)
2. Collection of authentic honey samples of known origin from registered farmers
3. Protein extraction by 10% sodium tungstate and 0.33 M H_2SO_4
4. Stable isotopes analysis for sugar and protein from honey (IRMS Analysis) (C, N & S = Combustion) and (O & H = Pyrolysis)
5. Adulteration(%)
$$100 \times \frac{[\delta^{13}C(P)] - [\delta^{13}C(H)]}{[\delta^{13}C(P)] - (-9.7)}$$

Authenticity based on sugar added honey
Authenticity based on Geographical Origin

Conclusion

- ❖ The stable isotope analysis is a robust and powerful technique to verify honey authenticity.
- ❖ Each step in the protocol need to be applied thoroughly for reliable and quality results.
- ❖ The unique stable isotope signature can accurately determine the true origin of honey.
- ❖ This technique is hoped to be implemented in national food regulations for ensuring food safety and quality.

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For further Information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>
Attn:
Mohd Noor Hidayat Adenan
Agroecosystem Management Group
Agrotechnology and Biosciences
Division
Tel: +603-89112000 ext. 1483
email: hidayat@nm.gov.my

KONVENSYEN TEKNIKAL NUKLEAR MALAYSIA

NTC 2021

KAJIAN PELAKSANAAN AUDIT DALAMAN SECARA ATAS TALIAN DI NUKLEAR MALAYSIA



Aisyah Raihan Abdul Kadir, Mohd Azmi Sidid Omar, Dr Hazmini Kassim, Azlinda Aziz, Abdul Quddos Abu Bakar, Muhammed Zulfakir Zulkaffly dan Ruzalina Baharin
Bahagian Perancangan & Hubungan Antarabangsa (BPA) & Bahagian Sokongan Teknikal (BST)
Agensi Nuklear Malaysia
Bangi, 43000 KAJANG, MALAYSIA

Abstrak

Peningkatan kes harian COVID-19 dan isu pandemik global telah menyebabkan kerajaan melaksanakan penutupan penuh sektor sosial dan ekonomi diseluruh negara dalam tempoh Perintah Kawalan Pergerakan (PKP) 3.0. Pengoperasian pejabat juga melaksanakan kaedah Berkerja Dari Rumah (BDR) sepenuhnya, tidak termasuk perkhidmatan barisan hadapan. Lanjutan daripada ini, pelaksanaan mesyuarat/bengkel/program/seminar dan kursus termasuk audit juga perlu diadakan secara atas talian. Audit dalam secara atas talian dilaksanakan bagi memastikan pensijilan dan akreditasi ISO di semua fasiliti terbitan dapat dikekalkan. Bahagian Perancangan & Hubungan Antarabangsa (BPA) telah menubuhkan Prosedur Audit Dalam (Revision 13) dengan penambahan garis panduan dalam menguruskan aktiviti Audit Dalam Secara Atas Talian. Hasil dari kaji selidik awal menunjukkan 38.1% Juruaudit Dalam dan 66.7% kakitangan fasiliti bersetuju untuk melaksanakan audit secara atas talian. Sehingga kini, terdapat enam fasiliti di Nuklear Malaysia telah mengadakan audit dalam secara atas talian. Hasil dari kaji selidik keberkesanan pelaksanaan audit dalam secara atas talian ini menunjukkan 86.0% Juruaudit Dalam dan 87.0% Kakitangan fasiliti menyatakan audit dalam secara atas talian ini telah dilaksanakan dengan berkesan. Pengurusan Audit Dalam secara atas talian ini merupakan alternatif kepada pelaksanaan audit dalam secara fizikal yang dapat membantu fasiliti dalam mengekalkan pensijilan dan akreditasi ISO di Nuklear Malaysia.

PENGENALAN

Semenjak tahun 2020, negara telah berhadapan dengan pandemik COVID-19. Perintah Kawalan Pergerakan (PKP) telah dilaksanakan akibat daripada peningkatan penularan kes COVID-19. Pelaksanaan PKP ini telah mengambil tempoh masa yang lama dan menyebabkan kesukaran untuk pelaksanaan Audit Dalam Secara Fizikal di Nuklear Malaysia. Sehubungan dengan itu, bagi mengekalkan pensijilan dan akreditasi ISO di Nuklear Malaysia, BPA telah mengambil inisiatif untuk menjalankan kaji selidik bagi mendapatkan pandangan awal daripada kakitangan fasiliti dan Juruaudit Dalam untuk mengadakan pelaksanaan Audit Dalam Secara Atas Talian. BPA telah mengemaskini Prosedur Audit Dalam (Revision 13) dengan penambahan garis panduan dalam menguruskan aktiviti Audit Dalam Secara Atas Talian. Penambahan terhadap Prosedur Audit Dalam ini telah dapat membantu dan menjadi garis panduan kepada semua Fasiliti dan Juruaudit Dalam dalam melaksanakan Audit Dalam secara atas talian. Sehingga kini, terdapat enam fasiliti di Nuklear Malaysia iaitu PKP-BCMS, NIR, ALURTRON, KMS, Pusat IT dan CoNet telah mengadakan audit dalam secara atas talian.

OBJEKTIF

- Objektif kajian ini dilaksanakan adalah untuk:
 - Mendapatkan pandangan Juruaudit Dalam dan kakitangan fasiliti dalam pelaksanaan Audit Dalam secara atas talian.
 - Mengetahui keberkesanan Audit Dalam secara atas talian.
 - Meningkatkan mutu pelaksanaan Audit Dalam secara atas talian di Nuklear Malaysia.

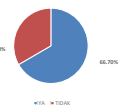
KEPUTUSAN & PERBINCANGAN

Pandangan Awal Juruaudit Dalam dan kakitangan fasiliti dalam pelaksanaan Audit Dalam secara atas talian

Rajah 2 menunjukkan sebanyak 38.1% Juruaudit Dalam bersetuju untuk mengadakan Audit Dalam secara atas talian berbanding 61.9% yang tidak bersetuju. Manakala Rajah 3 menunjukkan sebanyak 66.7% kakitangan fasiliti bersetuju untuk mengadakan Audit Dalam secara atas talian berbanding 33.3% yang tidak bersetuju. Daripada kajian ini, didapati bahawa pandangan awal juruaudit dalam adalah tidak bersetuju bahawa audit dalam dijalankan secara atas talian. Manakala kakitangan fasiliti bersetuju agar audit dalam ini diadakan secara atas talian. Ini menunjukkan bahawa kakitangan fasiliti telah bersedia untuk mengadakan audit secara atas talian bagi terus mengekalkan pensijilan dan akreditasi ISO dalam situasi menghadapi pandemik. BPA sentiasa menyokong dan menggalakkan kumpulan juruaudit dalam untuk bersedia menjalankan audit dalam secara atas talian.



Rajah 2: Peratusan Juruaudit Dalam yang bersetuju Audit Dalam Diadakan Secara Atas Talian (Online)



Rajah 3: Peratusan Kakitangan fasiliti yang bersetuju Audit Dalam Diadakan Secara Atas Talian (Online)

Keberkesanan Audit Dalam secara atas talian.

Rajah 4 menunjukkan sebanyak 86.0% Juruaudit Dalam menyatakan Audit Dalam secara atas talian telah dilaksanakan dengan berkesan dan 14.0% menyatakan tidak berkesan. Manakala Rajah 5 menunjukkan 87.0% kakitangan fasiliti menyatakan audit dalam secara atas talian ini telah dilaksanakan dengan berkesan dan 13.0% menyatakan tidak berkesan. Antara justifikasi Juruaudit Dalam dan kakitangan fasiliti mengatakan audit secara atas talian tidak berkesan ialah kesukaran untuk mendapatkan bukti (evidence) kerana kebanyakan dokumen lengkap adalah dokumen hardcopy yang ada di pejabat. Kajian ini menunjukkan bahawa Juruaudit Dalam dan kakitangan fasiliti telah berupaya menjalankan audit dalam secara atas talian. Ini adalah penting bagi Nuklear Malaysia untuk terus meningkatkan kualiti perkhidmatan dan mengekalkan pensijilan dan akreditasi ISO di Nuklear Malaysia.



Rajah 4: Peratusan Juruaudit Dalam bersetuju audit dalam secara atas talian ini telah dilaksanakan dengan berkesan



Rajah 5: Peratusan kakitangan fasiliti bersetuju audit dalam secara atas talian ini telah dilaksanakan dengan berkesan

Meningkatkan mutu pelaksanaan Audit Dalam secara atas talian di Nuklear Malaysia.

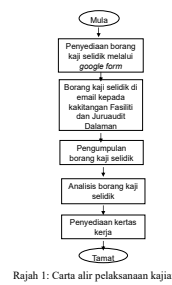
Kajian ini mendapati bahawa beberapa inisiatif perlu dibangunkan bagi menambahkan dan meningkatkan mutu pelaksanaan audit dalam pada masa hadapan terutama semasa menghadapi pandemik atau sebarang kecemasan. Antara cadangan-cadangan Juruaudit Dalam dan Kakitangan fasiliti dalam meningkatkan mutu pelaksanaan audit dalam secara atas talian pada masa akan datang adalah seperti berikut:

- Pihak kakitangan fasiliti (auditee) perlu memastikan semua dokumen ada dibuat salinan soft copy
- Penambahan kaedah mengakses dokumen-dokumen
- Menyediakan satu platform untuk memudahkan kakitangan fasiliti (auditee) memuatnaik data/dokumen yang berkenaan dan hanya boleh diakses oleh pegawai yang terlibat bagi setiap bahagian.
- Audit dalam perlu membuat persediaan awal sebelum melaksanakan audit secara atas talian.

METODOLOGI

Kajian ini menggunakan kaedah kaji selidik yang melibatkan penyediaan 3 borang kaji selidik. Kumpulan saar bagi kajian ini adalah Juruaudit Dalam dan Kakitangan fasiliti yang terlibat. Borang kaji selidik ini telah dihantar secara email kepada responden melalui link google form seperti dibawah:

- Borang Kaji Selidik Pandangan Kakitangan fasiliti terhadap Pelaksanaan Audit Dalam Secara Atas Talian (Online) di Nuklear Malaysia, (Link Google Form: <https://forms.gle/Mxksdm68247ztsuk9>)
- Borang Kaji Selidik Pandangan Juruaudit Dalam Terhadap Pelaksanaan Audit Dalam Secara Atas Talian (Online) di Nuklear Malaysia, (Link Google Form: <https://forms.gle/Rs4GIw59Hn8N85UP9>)
- Borang Kaji Selidik Keberkesanan Pelaksanaan Audit Dalam Secara Atas Talian, (Link Google Form: <https://forms.gle/E1qQuDx6zgaA9Tf6g>)



Rajah 1: Carta alir pelaksanaan kajian

KESIMPULAN

Pengurusan Audit Dalam secara atas talian ini merupakan alternatif kepada pelaksanaan audit dalam secara fizikal yang dapat membantu fasiliti dalam mengekalkan pensijilan dan akreditasi ISO di Nuklear Malaysia. Hasil dari kaji selidik awal menunjukkan Juruaudit Dalam tidak bersetuju dan kakitangan fasiliti bersetuju untuk melaksanakan audit secara atas talian. Hasil dari kaji selidik selepas pelaksanaan audit atas talian telah menunjukkan Juruaudit Dalam dan Kakitangan fasiliti bersetuju bahawa audit dalam secara atas talian ini telah dilaksanakan dengan berkesan. Ini menunjukkan bahawa pelaksanaan audit dalam secara atas talian ini telah berjaya dilaksanakan. BPA akan sentiasa menambahkan mutu pelaksanaan audit dalam secara atas talian ini pada masa akan datang berdasarkan cadangan-cadangan yang telah dikemukakan oleh Juruaudit Dalam dan kakitangan fasiliti dalam kaji selidik ini. Ini adalah penting bagi Nuklear Malaysia untuk terus meningkatkan kualiti perkhidmatan dan mengekalkan pensijilan dan akreditasi ISO di Nuklear Malaysia.

RUJUKAN

- [1]Arahan Pentadbiran Bilangan 2 Tahun 2021Garis Panduan Kehadiran Ke Pejabat/Lokasi Bertugas Bagi Pegawai Kementerian Sains Teknologi Dan Inovasi Dalam Tempoh Perintah Kawalan Pergerakan (PKP) 3.0
- [2] Prosedur Audit Dalam Nuklear Malaysia (Revision 13)

PENGHARGAAN

Penghargaan terima kasih ditujukan kepada kakitangan fasiliti-fasiliti yang terlibat dengan pensijilan dan akreditasi ISO dan rakan-rakan yang telah membantu saya dalam menyediakan kertas kerja ini.

For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>

Attn:
Aisyah Raihan Binti Abdul Kadir
Unit Perancangan Teknologi dan Perancangan Operasi
Bahagian Perancangan & Hubungan Antarabangsa
Tel: +603-89112000 ext. 1721
email: aisyah@nm.gov.my

Agensi Nuklear Malaysia | www.nuclearmalaysia.gov.my

KONVENSYEN TEKNIKAL NUKLEAR MALAYSIA

NTC 2021

DPPH RADICAL SCAVENGING AND FOLIN-CIOCALTEU ASSAYS: SIMPLE AND RELIABLE METHODS TO QUANTIFY ANTIOXIDANT ACTIVITY AND TOTAL PHENOLIC CONTENT



Zainah Adam, Rosniza Razali, Daryl Jesus Arapoc, Azfar Hanif Abd Aziz & Nor Azizah Marsiddi
Medical Technology Division, Malaysian Nuclear Agency, 43000 Kajang, Selangor Darul Ehsan

INTRODUCTION

Phenolic compounds

- Phenolic compounds are phytochemical substances derived from secondary metabolism pathway of plants.
- Phenolic structure consists of one or more hydroxyl (OH) groups bonded directly to an aromatic hydrocarbon group.
- Phenolic is divided into different group such as phenolic acids, flavonoids, stilbenes, tannin and lignans.
- Examples of phenolic compounds are gallic acid, quercetin, catechin, resveratrol, tannic acid, matairesinol, hydroquinone and etc.



phenol



Quercetin
Cosme et al., 2020

Antioxidant

- Antioxidants are molecules that have ability to donate electrons to free radicals and neutralize them (scavenging activity).
- Interactions of antioxidants with free radicals terminate chain reactions and prevent molecules damage (protein, lipid, nucleic acid).
- Source of antioxidants are mainly from plants, vegetables and fruits.
- Benefits of antioxidants : Preventing the occurrence of free radicals related disease and reduce adverse effects of nuclear medicine procedures.



Lobo et al., 2010

DPPH Radical Scavenging Assay

- Widely used to measure antioxidant activity because it is easy to perform and short analysis period.
- Spectrophotometric technique.
- DPPH is stable free radicals that will give violet color when dissolved in ethanol and has maximum absorption at 520 nm. When an antioxidant scavenges the free radicals by hydrogen donation, the violet colors will become lighter or pale yellow, thus decrease the absorbance value.
- Presented by IC₅₀ value. Lower IC₅₀ value indicated potent scavenging activity.



Rahman et al., 2015

Folin-Ciocalteu Assay

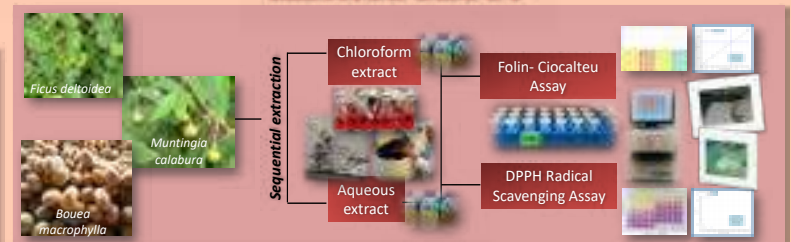
- One of popular method to measure phenolic content.
- Spectrophotometric technique.
- In the assay, antioxidants will reduce Folin-Ciocalteu reagent to produce molybdenum-tungsten (blue) which has maximum absorbance at 760 nm.
- The intensity increases linearly with the concentration of antioxidants.
- Phenolic content in the samples were measured using gallic acid standard curve and expressed as gallic acid equivalence (GAE).



Blainski et al., 2013

OBJECTIVE

To apply Folin-Ciocalteu and DPPH radical scavenging assays in determining phenolic content and antioxidant activity of *Ficus deltoidea*, *Muntingia calabura* and *Bouea macrophylla*



RESULTS AND DISCUSSIONS

Table 1: Total phenolic content (TPC)

Plant name	Plant extract	Total Phenolic Content (mg GAE/mg extract)
<i>B. macrophylla</i>	Aqueous	689.17 ± 37.50
	Chloroform	686.04 ± 40.21
<i>F. deltoidea</i>	Aqueous	126.67 ± 3.98
	Chloroform	35.83 ± 4.27
<i>M. calabura</i>	Aqueous	334.38 ± 3.24
	Chloroform	78.13 ± 0.88
Quercetin (reference)		1267.14 ± 24.97

Results expressed as mean ± SD (n=4) from 3 independent experiments

B. macrophylla extracts have the highest phenolic content. Aqueous extract of *F. deltoidea* and *M. calabura* have a moderate phenolics content. Chloroform extract of both extracts have lowest phenolics content. Phenolics content in all extracts less than standard reference, quercetin.

Table 2: DPPH radical scavenging activity

Plant name	Plant extract	DPPH scavenging (IC ₅₀ value, µg/ml)
<i>B. macrophylla</i>	Aqueous	4.73 ± 0.51
	Chloroform	4.34 ± 0.74
<i>F. deltoidea</i>	Aqueous	58.848 ± 0.65
	Chloroform	233.43 ± 14.48
<i>M. calabura</i>	Aqueous	22.28 ± 2.20
	Chloroform	193.22 ± 17.80
Ascorbic acid (reference)		5.19 ± 0.44

Results expressed as mean ± SD (n=4) from 3 independent experiments

B. macrophylla extracts showed the strongest DPPH scavenging activity. Aqueous extract of *M. Calabura* and *F. deltoidea* exhibited moderate activity. Chloroform extract of both extracts exhibited weak activity. DPPH scavenging activity of *B. macrophylla* were comparable to ascorbic acid.

Table 3: Correlation analysis of TPC and DPPH

Plant name	Plant extract	Pearson correlation coefficient (r ²)
<i>B. macrophylla</i>	Aqueous	0.999
	Chloroform	0.999
<i>F. deltoidea</i>	Aqueous	0.471
	Chloroform	-0.973
<i>M. calabura</i>	Aqueous	0.600
	Chloroform	-0.901

Correlation analysis between Total phenolic content and DPPH radical scavenging activity was done using Microsoft Excel

DPPH radical scavenging activity correlated with total phenolic content. *B. Macrophylla* extracts exhibited strong positive correlations ($r = 0.999$). Aqueous extracts of *M. Calabura* and *F. deltoidea* showed moderate ($r = 0.600$) and weak ($r = 0.471$) correlation. Chloroform extracts of both plants have no clear correlation ($r =$ negative value).

CONCLUSION

In this study, by using DPPH radical scavenging and Folin-Ciocalteu assays, total phenolic content and antioxidant activity of *F. deltoidea*, *M. calabura* and *B. macrophylla* were successfully evaluated and discovered. The results revealed that these plants contain phenolic compounds and possess antioxidant activity. The antioxidant activity was found to be correlated to phenolic content. *B. macrophylla* exhibited the strongest antioxidant activity and has the highest phenolic content. It is suggested that *B. macrophylla* can be developed as new antioxidant agent which may benefits peoples suffering with free radicals-related disease and patients that undergoes nuclear medicine procedures.

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"Nuclear Technology Application in New Norm"

SISTEM PENGURUSAN KERJASAMA DAN PEMINDAHAN TEKNOLOGI AGENSI NUKLEAR MALAYSIA

Noor Hayati Abdul Rahman, Norasiah Ab Kasim, Dr. Ishak Mansor, Tengku Zamzura Tengku Zahid dan Khatijah Jaamat | Agensi Nuklear Malaysia, Bangi, 43000 Kajang, Selangor.

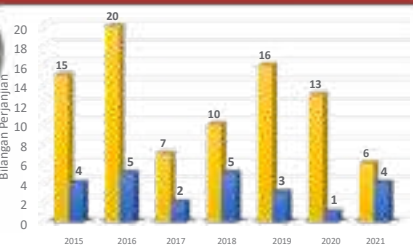
Kerjasama dan pemindahan teknologi penyelidikan, pembangunan dan inovasi (R,D&I) adalah jalinan perkongsian jangka panjang yang memberi peluang komersial dan melibatkan pelbagai pihak seperti inventor atau penyelidik yang membangunkan produk dan teknologi, syarikat yang berhasrat untuk menyalin kerjasama pengkomersialan, pengurusan harta intelek, pengurusan kewangan, pengurusan dan jawatankuasa yang bertanggungjawab memberi keputusan serta dasar dan perundangan di Kementerian.

Di Agensi Nuklear Malaysia (Nuklear Malaysia), kerjasama dan pemindahan teknologi ini dikendalikan oleh Bahagian Pengkomersialan Teknologi (BKT). Suatu sistem proses pengurusan telah dibangunkan pada 2015 agar pelaksanaan aktiviti pengkomersialan dan pemindahan teknologi Nuklear Malaysia dapat dijalankan secara lebih teratur dan sistematik dan mematuhi semua peraturan semasa.

Objektif sistem pengurusan ini adalah untuk memastikan penyampaian perkhidmatan pengurusan dalam konteks pengkomersialan dan pemindahan teknologi ini lebih cekap, di mana pengurusannya mengambil tempoh masa yang fleksibel bagi menghasilkan dokumen perjanjian yang dipersetujui, teratur secara dasar, kewangan dan perundangan. Sistem ini telah mendapat kelulusan dan diperakui pelaksanaannya dari Jawatankuasa Penilaian Kerjasama Pengkomersialan Agensi Nuklear Malaysia.

Kata kunci: Sistem pengurusan pengkomersialan dan pemindahan teknologi, carta alir proses kerja, garis panduan pengkomersialan

KEPUTUSAN DAN PERBINCANGAN



Tahun	NDA	MOA
2015	15	4
2016	20	5
2017	7	2
2018	10	5
2019	16	3
2020	13	1
2021	6	4

Pelaksanaan sistem pengurusan ini didapati telah meningkatkan kualiti pengurusan pengkomersialan di Nuklear Malaysia dengan pengurusan yang lebih telus, teratur dan tidak melanggar mana-mana peraturan Kerajaan sedia ada.

Peluang Penambahbaikan
BKT telah mengenalpasti bahawa sistem ini perlu ditambahbaik dengan membangunkan satu **Garis Panduan Pengkomersialan** yang lebih terperinci sebagai panduan dan rujukan semua pegawai penyelidik, pengurusan Nuklear Malaysia dan staf Nuklear Malaysia yang terlibat secara langsung atau tidak dalam projek kerjasama pengkomersialan dan pemindahan teknologi.

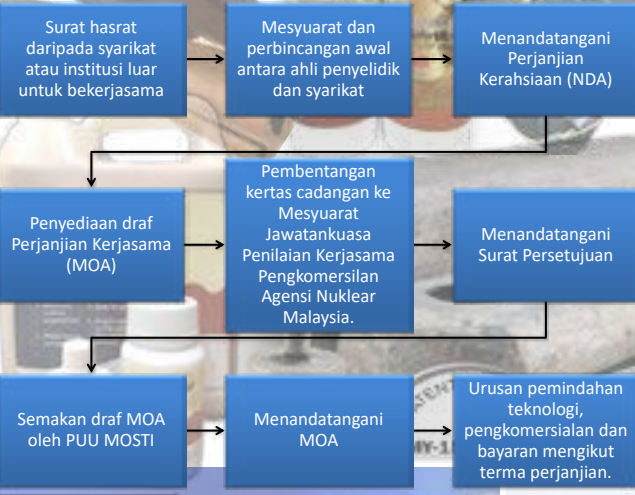
For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>

Attn:
Noor Hayati Abdul Rahman
Unit Pengkomersialan
Bahagian Pengkomersialan Teknologi
Tel: +603-89112000 ext. 1532
email: noorhayati@nm.gov.my

LATAR BELAKANG



CARTA ALIR PENGKOMERSIALAN



KESIMPULAN

Sistem pengurusan pengkomersialan ini merupakan penambahbaikan yang telah dilaksanakan dalam konteks pengurusan pelaksanaan perundingan projek kerjasama dan pemindahan teknologi di Nuklear Malaysia. Hasil pelaksanaan sistem ini didapati penyampaian perkhidmatan pengurusan dalam konteks pengkomersialan dan pemindahan teknologi ini lebih teratur secara dasar, kewangan dan perundangan. Namun, tempoh masa menguruskan perjanjian kerjasama masih bergantung kepada pelbagai faktor dan ia memerlukan kerjasama semua pihak yang terlibat. BKT akan sentiasa menambahbaik sistem pengurusan pengkomersialan ini pada masa akan datang.

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"Nuclear Technology Application in New Norm"

Organizational Ergonomics Approach in the Segregation of Legacy Mixed Organic Radioactive Waste

Pendekatan Ergonomi Organisasi dalam Pengasingan Sisa Radioaktif Organik Tercampur Warisan

Ahmad Khairulkrum Zahari, Norasialwa Zakaria, Rafizi Salihuddin, Nazran Harun, Mohd Zahiruddin Jaafar

PROBLEM STATEMENT - FAILED ACTION PLAN

Initial action plan: a design to perform segregation work with minimum supervision and time commitment by WasteC staff

Project leader demonstrates work method

One worker from shift A leads shift B

One worker from shift B leads shift C

and so on

3 person / shift

2 hours / shift

INEFFICIENT PROCESS - LOW OUTPUT

METHODOLOGY FOR IMPROVEMENTS

Ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system and the profession that applies theory principles, data, and methods to design in order to optimize human well-being and overall system performance - International Ergonomics Association (IEA)

FORMULATING NEW ACTION PLAN - 5W2H

What	Why	Where	How Much
When	Who	How	

- Elements of **What**, **Why** and **Where** remains.
- WHEN** - shift duration changed from 2 hours to 1 hour, flexibility in choosing from 6 daily available shift.
- WHO** - worker roles are revised: leader is tasked with logistical duties (workforce management, equipment and consumables needed).
- HOW** - **Process Mapping** was formulated to assist effective communication.
- HOW MUCH** - Incentive: **RADIATION LEAVE**

FINDING ROOT CAUSE - THE 5 WHYS

PROBLEM STATEMENT
Segregation process progresses too slowly

Why so?

Workers fail to give full commitment.

Why so?

Lack of monitoring by project leader.

Why so?

Project leader subjected to similar limitations.

Why so?

Other work responsibilities, long hours, dire working condition.

Why so?

Ineffective action plan.

DISCUSSION

COMMUNICATION

CREW RESOURCE MANAGEMENT

DESIGN OF WORKING TIME

COOPERATIVE WORK

LEADERSHIP

17 WASTEC STAFF VOLUNTEERED

WORKING METHOD - Process Mapping

For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>

Attn:
Ahmad Khairulkrum Zahari
Waste Tech. Dev. Centre (WasteC)
Waste Tech. and Env. Division (BAE)
Tel: +603-89112000 ext. 1867
email: khairulkrum@nm.gov.my



NTC 2021

"Nuclear Technology Application in New Norm"

Perkongsian Pengalaman Membangunkan Program Latihan dan Perkembangan Kakitangan BTP dalam Projek Pengeluaran Kapsul Iodine-131: Laporan Latihan Tahunan bagi 2016-2020

MANISAH SAEDON, Wan Hamirul Bahrin Wan Kamal, Anee Suryani Sued, Cheok Ken Yew, Khong Khei Chong, Muhamad Hafiz Ahmad dan Ts. Dr. Mohd Rodzi Ali
Bahagian Teknologi Perubatan

ABSTRAK

Bahagian Teknologi Perubatan telah bekerjasama dengan syarikat swasta dalam projek kerjasama pengeluaran bahan radiofarmaseutikal bagi pasaran tempatan, khusus bagi kegunaan di pusat perubatan nuklear. Projek kerjasama ini sedang berjalan dan dalam proses mendaftarkan produk iaitu kapsul Iodin-131 (I-131) dengan pihak Kementerian Kesihatan Malaysia (KKM) bagi memenuhi keperluan Amalan Perkilangan Baik atau *Good Manufacturing Practice* (GMP). Buat masa ini, pusat perubatan nuklear menggunakan bahan I-131 dalam bentuk cecair dan diimport dari luar negara. Secara klinikal, kapsul I-131 digunakan bagi merawat pesakit yang mengalami penyakit kanser tiroid. Kakitangan BTP disyaratkan menjalani latihan berkenaan GMP setiap tahun dalam pelbagai sub bidang. Latihan ini merupakan syarat wajib bagi memenuhi keperluan GMP merangkumi unit pengeluaran, kawalan mutu dan jaminan mutu. Program latihan yang diadakan mestilah mematuhi panduan GMP dan dalam masa yang sama ianya akan diaudit oleh juru audit dalaman dan juga oleh pihak KKM. Perkongsian program latihan ini adalah bagi memberikan gambaran tentang bentuk latihan dan tahap ianya dipraktikkan di BTP bagi tempoh masa yang dinyatakan.

OBJEKTIF

1. Latihan GMP untuk pembangunan kakitangan BTP
2. Kompetensi kakitangan untuk jalankan tugas dalam penghasilan Iodin-131

SKOP LATIHAN: Tertakluk kepada semua kakitangan yang terlibat dalam penghasilan Kapsul Iodin-131 di BTP

KAEDAH

PICS GMP GUIDE – Chapter 2 – Personnel - Training
Doc No: I-131/SOP/QA/GN/08-02
Personnel Competency and Training

JADUAL LATIHAN

BORANG KEHADIRAN

BORANG EVALUATION

KEPUTUSAN

• Fokus kepada pembangunan dokumentasi dalam 3 tahun pertama kemudian *trial run* prosedur dengan proses sebenar.

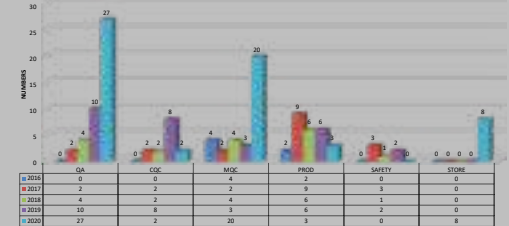
• Terdapat peningkatan untuk memastikan kompetensi kakitangan dengan hadir kursus SOP (teori & OTJT)

KESIMPULAN

KOMITMEN DARI SEMUA PIHAK QA, PROD, QC, STORE & SAFETY ADALAH PENTING UNTUK MEMASTIKAN LATIHAN GMP BERJALAN DENGAN LANCAR.

For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuclearmalaysia.gov.my
Attn:
Manisah Saedon
Kumpulan Teknologi Radiofarmaseutikal
Bahagian Teknologi Perubatan
Tel: +603-89112000 ext. 1589
email: manisah@nm.gov.my

YEARELY TREND TRAINING ACTIVITIES BY EACH UNITS FROM YEAR 2016-2020



Year	QA	PROD	QC	STORE	SAFETY
2016	2	2	2	2	2
2017	4	4	4	4	4
2018	10	10	10	10	10
2019	27	27	27	27	27
2020	27	27	27	27	27





NTC 2021

"Nuclear Technology Application in New Norm"

PERSONAL SOLVENT EVAPORATOR: AN INNOVATIVE SOLVENT REMOVAL

¹R. Razali, ²Z. Adam, ³D. Jesus Arapoc, ⁴A.H. Abd Aziz, ⁵N. A. Marsidi, and ⁶H. Ahmad Hassali

¹Medical Technology Division, Malaysian Nuclear Agency, 43000 Kajang, Selangor, Malaysia

ABSTRACT

Solvent removal in many areas of scientific research, whether concentration of samples or complete drying has been considered as a major challenge during the solvent extraction processes. Personal solvent evaporator (PSE) is one of the advanced technologies system that have been developed for the solvent removal in various sample chemistries. This system consists of centrifugal vacuum concentrators and freeze driers capable of removing water and organic solvents. The techniques used in this system combines great performance, ease of use and compatibility with all commonly used solvents. This paper gives a brief overview of personal solvent evaporator for different solvent group and its application in scientific research such as natural product, analytical chemistry, medicinal chemistry and post purification sample handling.

INTRODUCTION

Evaporation - process by which a solvent evaporates from a liquid state into a gas. Some solvents evaporate quickly on their own, while others require the addition of heat to speed up the process



Uses :

- > clinical and diagnostic testing
- > DNA and oligonucleotides
- > environmental analysis
- > food and beverage
- > metabolic and toxicology studies
- > natural products research
- > proteins and peptides
- > parallel chemistry
- > sample handling after purification

Personal Solvent Evaporator (EZ-2 Elite)

- > modern systems that combine great performance, ease of operation, and compatibility with all common solvent including water
- > autostop function and pre-programmed method
- > dri-pure anti-bumping system that prevents cross-contamination and sample loss due to bumping
- > solvent-resistant, oil-free vacuum pump, and a high-efficiency
- > unique self-draining collection vessel attached to the Speed Trap that utilizes the powerful scroll pump
- > capable of evaporating even solvents with highest boiling points up to 220°C
- > Lyospeed Fast lyophilization (HPLC fractions)

RESULT

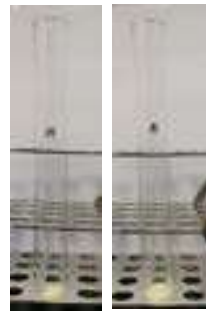
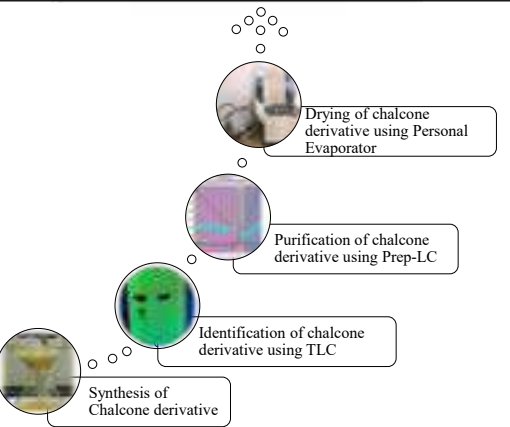


Figure 1 showed the condition of the sample that have been studied. Using a personal solvent evaporator, a 5 ml sample from the purification process was dried using personal solvent evaporator (sample A) and air-dried (sample B). Consequently, sample A was entirely dried after 2 hours, whereas sample B still had a solvent within the test tube (Figure 3). The samples would take up to 2 hours to dry using the personal solvent evaporator. The operator was free to undertake other duties during this period. Overall, installing the personal solvent evaporator was estimated to save the laboratory five days in the evaporation process. The apparatus allowed for the processing of more extensive sample series in a single day

CONCLUSION

Besides saving time, this system also can ensures that the solvent boils down from the sample surface, minimizing boil-over and solvent shock. This prevents sample loss and also means that different samples can be evaporated in parallel without cross contamination. Solvent mixtures can be evaporated in a controlled manner by controlling pressure and heat

METHODOLOGY



ACKNOWLEDGEMENT

The authors wish to thank Malaysian Nuclear Agency for providing facilities and funding for this research

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- 4) *Report*: Peter Bennett and Ian Whitehall. 1995. Automation without Robotics: Elimination of sample transfer steps to optimize yield and data quality in laboratory. 1995-01-01

For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuclearmalaysia.gov.my
Attn:
Rosniza Razali
Phytofarmaceutical Technology Group
Medical technology Division
Tel: +603-89112000 ext. 2
http://www.nuclearmalaysia.gov.my
email: rosniza@nm.gov.my

For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuclearmalaysia.gov.my
Attn:
Manisah Saedon
Kumpulan Teknologi Radiofarmaseutikal
Bahagian Teknologi Perubatan
Tel: +603-89112000 ext. 1589
email: manisah@nm.gov.my

KONVENSYEN TEKNIKAL NUKLEAR MALAYSIA



SISTEM PENGURUSAN KESINAMBUNGAN PERKHIDMATAN (BCMS) AGENSI NUKLEAR MALAYSIA: CABARAN MENGHADAPI AUDIT SEMASA PANDEMIK COVID-19

Norasiah Ab. Kasim, Norfaizal Mohamed, John Konsoh Sangau, Ishak Mansor, Dr. Noor Hayati Abdul Rahman, Robiatul Adawiyah dan Norliza Minhat | Agensi Nuklear Malaysia, Bangi, 43000 Kajang, Selangor.

LATAR BELAKANG

Agensi Nuklear Malaysia (Nuklear Malaysia) telah mendapat perakuan persijilan ISO 22301:2012, Sistem Pengurusan Kesinambungan Perkhidmatan (BCMS) pada 7 Januari 2019. Skop pelaksanaan BCMS ini merangkumi lima pusat khidmat utama iaitu loji MINTec-Sinagama, RAYMINTEX, Pusat Teknologi Rawatan Sisa (WasTec), Kumpulan Metrologi Sinaran (KMS) dan Makmal Radiokimia dan Alam Sekitar (RAS). Pusat khidmat ini terlibat dalam menjalankan aktiviti penyelidikan dan juga memberikan perkhidmatan teknikal dan konsultasi kepada agensi awam dan swasta di Malaysia. Sepanjang bulan Mei hingga Julai 2021, pihak Koordinator dan Pengawal Dokumen (CDC) BCMS telah bertungkus lumus untuk menjayakan dua audit penting bagi persijilan ini iaitu Audit Dalam dan Audit Pemantauan yang masing-masing dijalankan oleh Juruaudit Dalam Nuklear Malaysia dan Juruaudit Badan Persijilan Cyber Security Malaysia. Pelaksanaan kedua-dua audit ini semasa negara sedang menghadapi situasi sukar disebabkan oleh pandemik Covid 19 merupakan pengalaman mencabar bagi semua yang terlibat untuk menjayakannya. Kertas kerja ini dihasilkan bertujuan untuk berkongsi pengalaman pihak CDC semasa menyelaras dan mengendalikan pelaksanaan kedua-dua audit, latihan simulasi 'table-top', semakan dokumen dan mesyuarat semakan pengurusan (MRM) secara atas talian. Selain itu, kertas kerja ini juga akan membentangkan keputusan audit pemantauan dari Cyber Security Malaysia dan cadangan penambahbaikan yang perlu dilakukan bagi mengukuhkan lagi pelaksanaan BCMS di Nuklear Malaysia.

Keywords: CDC, Sistem Pengurusan Kesinambungan Perkhidmatan, BCMS, pandemik Covid-19, Audit Dalam, Audit Pemantauan, Persijilan, MRM

PASUKAN CDC
DIKETUI OLEH
PENGARAH BKT



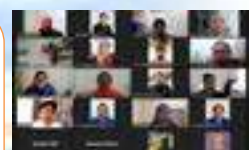
- 'Refresher Course' - ISO 22301:2012 pada 10 Jun 2021, disampaikan oleh Pn. Ruzalina Bahrin
- Audit Dalam BCMS pada 10 – 16 Jun 2021, diketuai oleh Pn. Ruzalina Bahrin
- Kursus 'Introduction To Table Top Exercise' pada 18 Jun 2021, disampaikan oleh Tn. Syed Asraf Syed Asraf Fahlawi Wafa S.M. Ghazi.
- 'Table Top Exercise Simulation Drill' pada 24 Jun 2021, dibimbing oleh Tn. Syed Asraf Syed Asraf Fahlawi Wafa S.M. Ghazi
- Mesyuarat Semakan Pengurusan (MRM) pada 25 Jun 2021, dipengerusi oleh YBrs. Ts. Dr. Siti A'iasah Hashim
- Audit Pemantauan 2 pada 30 Jun – 1 Julai 2021, diketuai oleh Pn. Hasnida Zainudin dari Cyber Security Malaysia
- Bengkel Semakan 'Risk Assessment' dan 'Business Impact Analysis' pada 14 – 15 Oktober 2021 di Blok 57 secara fizikal

Keputusan, Rumusan dan Cadangan

Melalui audit dalam Nuklear Malaysia telah menerima 4 major NC, 18 minor NC dan 24 OFI manakala semasa audit pemantauan 2, Nuklear Malaysia menerima 3 NC. Pihak juruaudit mencadangkan agar membuat semakan semula pada senarai penilaian risiko dan BIA bagi semua pusat khidmat yang terlibat, mempertimbangkan kesan ancaman dari kewangan, perundangan dan politik sebagai risiko kepada agensi. Pihak juruaudit juga mencadangkan agar objektif BCMS Nuklear Malaysia disemak semula. Walaubagaimanapun, secara keseluruhannya BCMS Nuklear Malaysia berjaya mencapai objektif yang ditetapkan iaitu mencapai sekurang-kurangnya 60% objektif pemulihan dan mencapai 70% kehadiran kursus.

Bagi memastikan sistem pengurusan yang holistik dan berterusan di Nuklear Malaysia, MRM telah mencadangkan agar penambahbaikan dilakukan terhadap pelaksanaan BCMS di Nuklear Malaysia antaranya seperti latihan simulasi diadakan sekurang-kurangnya bagi dua pusat khidmat setahun, aktif menyalurkan maklumat serta menilai keberkesanan kesedaran BCMS supaya melepasi paras 70%, mensasarkan matlamat kosong (0) major NCR semasa audit luaran dan mengadakan semakan semula RA dan BIA sekurang-kurangnya sekali dalam setahun.

Kaedah, Aktiviti dan Pencapaian



For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuclearmalaysia.gov.my
Attn:
Norasiah Binti Ab. Kasim
Pengurus Pusat Kerjasama &
Pengkomersialan
Bahagian Pengkomersialan Teknologi
Tel: +603-89112000 ext. 1201
email: norasiah@nm.gov.my

KONVENSYEN TEKNIKAL NUKLEAR MALAYSIA



ORAL GAVAGING IN ADULT ZEBRA FISH

ABSTRACT

Zebrafish (*Danio rerio*) offer an ideal experimental system as in vivo model in biomedical research. Zebrafish have been widely used as model organisms for developmental and disease studies. In order to achieve accurate and precise results, an effective method should be established to deliver test samples, compounds, or drugs into Zebrafish. The existing method for oral administrations are inaccurate due to variability in voluntary consumption by the fish. Hence, the gavage technique was introduced to increase accuracy and precision. Gavage is a standard method used in other laboratory animal species to administer precise quantities of a product with a known concentration for study in biomedical and pharmaceutical research. Adult Zebrafish over 6 months of age were used in this study. Zebrafish were anesthetized using market-ready anaesthetic solutions and held 45° between sponges. A self-blunted 25G needle and microsyringe were used in this method. The needle was lowered into the oral cavity of the zebrafish until the tip of the needle extended past the gills (approximately 1 cm). The solution was then injected slowly into the intestinal tract. Administration time for this procedure were significantly lengthen compare to voluntary consumption. However, this procedure showed almost 95% of desired solutions consume by the fish.

Keywords: Zebrafish,

INTRODUCTION

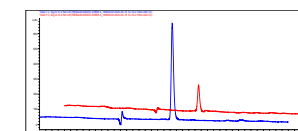
Zebrafish are an excellent method for analyzing development, genetics, immunology, behavior, physiology, and nutrition (Teame et al., 2019). Zebrafish has recently been used in other fields of research such as pharmacology, clinical research, and drug discovery (Dayal et al., 2016). To use zebrafish in scientific study, effective ways for delivering compounds or agents into the organism must be discovered and practiced (Dayal et al., 2016). Due to the general variability in voluntary intake by the fish, current techniques for delivering compounds and drugs orally to adult zebrafish are inadequate. To administer exact amounts of infectious agents to zebrafish for biomedical research, a gavage method was established (Collamore et al., 2013). Oral gavage provides a regulated delivery approach without the stress of invasive injections, perhaps permitting daily treatments for a longer duration. Advances in gavage device catheter tubing have considerably decreased stress, trauma, and injury during single-dose administration (Dang et al., 2016).

OBJECTIVES

To administer a precise amount of dosage into zebrafish.

To evaluate the effectiveness of oral gavage technique using self-blunted 25G needle with microsyringe.

RESULTS & DISCUSSION



The graph, the traces of gallic acid is higher in the water sample from gavage zebrafish than gavage zebrafish. Due to variability in voluntary fish, feeding techniques to administer dosage to adult zebrafish are not (Collamore et al., 2013). Moreover, the time taken to administer oral gavage is longer compared to the feeding technique. However, the time to administer will be shorter as the techniques being practised (Collamore et al., 2013).

METHODOLOGY



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CONCLUSION

Oral gavage ensures precise amount of dosage being administered to zebrafish. However, this gavage techniques for compound or drug administration required a longer period compared to the random feeding technique.

ACKNOWLEDGMENT

The authors would like to acknowledge and wish thanks to Malaysian Nuclear Agency for providing facilities and funding for this research.

For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuclearmalaysia.gov.my

Attn:
Daryl Jesus Arapoc
Pharmaceutical Technology Group
Medical Technology Division
Tel: +603-89112000 ext. xxxxxx
email: daryl@nm.gov.my



PEMBANGUNAN ALIRAN SINTESIS BENZENA DI MAKMAL TENTU UMUR RADIOKARBON, AGENSI NUKLEAR MALAYSIA

DEVELOPMENT OF BENZENE SYNTHESIS LINE AT RADIOCARBON DATING LABORATORY, MALAYSIAN NUCLEAR AGENCY



"Nuclear Technology Application in New Norm"

Nooradilah Abdullah, Norfaizal Mohamed@Muhammad, Mohd Zuhair Mohd Sanusi, Salahuddin Muhamad, Mohamad Noh Sawon, Mohd Tarmizi Ishak & Muhammad Izzat Muammar Ramli
Malaysian Nuclear Agency,
Bangi, 43000 KAJANG, MALAYSIA

ABSTRAK

Makmal Tentu Umur Radiokarbon telah wujud di Agensi Nuklear Malaysia sejak tahun 1983. Kemudahan Aliran Sintesis Benzena yang diperolehi melalui projek kerjasama Hidrologi Isotop di antara IAEA, AAEC dan PUSPATI pada ketika itu telah berjaya digunakan untuk menentu umur air bawah tanah selain sampel-sampel artifak seperti kayu dan cengkerang. Walaubagaimanapun, setelah projek tersebut tamat, kemudahan ini tidak lagi digunakan. Menyedari kepentingan kemudahan ini, beberapa usaha telah dijalankan agar kemudahan ini dapat berfungsi kembali. Antara usaha yang telah dijalankan adalah dengan mengadakan misi pakar pada tahun 2014 dan 2015. Terkini, melalui peruntukan Rancangan Malaysia ke-11 RP 4 (2020), satu aliran sintesis benzena yang baru telah diperolehi. Kertas kerja ini akan membincangkan penambahbaikan yang telah diadakan dalam usaha untuk membangunkan kemudahan ini semula.

TENTU UMUR RADIOKARBON



Apabila tumbuh-tumbuhan atau haiwan ini tidak lagi hidup, kemasukan C-14 juga akan terhenti yang menyebabkan tiada input baru dalam hidupan berkenaan. Dengan itu, masa kematian boleh diketahui dengan menentukan baki kandungan C-14 yang masih ada dalam bahagian-bahagian tertentu hidupan berkenaan yang tidak mereput seperti tulang, gigi, sisik, cengkerang, batang kayu dan lain-lain. Tentu umur radiokarbon mempunyai aplikasi yang sangat meluas dalam pelbagai bidang, seperti arkeologi, hidrologi, kuaternari dan perubahan iklim.

PEMBANGUNAN KEMUDAHAN ALIRAN SINTESIS BENZENA



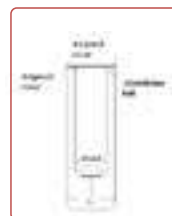
Penambahan kelang bulat 5-L (1) dan tindak balas sampel tak organik dengan asid (2)



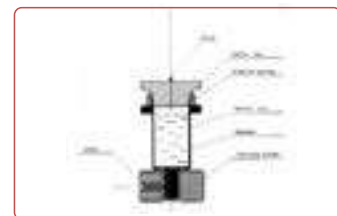
Pengubahsuaian saiz reaktor karbida



Penyimpanan logam Li dalam medium lengai



Sistem vakum pirolisis



Vial untuk Pembilangan Menggunakan LSC

Sistem BSL yang terdapat di Kiev, Ukraine



KESIMPULAN

Makmal Tentu Umur Radiokarbon merupakan satu aset strategik kepada Agensi Nuklear Malaysia dan berpotensi tinggi untuk digunakan dalam penyelidikan dan untuk dikomersialkan. Setelah pelbagai usaha dijalankan, akhirnya makmal ini berjaya mendapatkan satu BSL yang boleh digunakan. Diharapkan dengan pembangunan Makmal Tentu Umur Radiokarbon, aktiviti penyelidikan berkaitan dengan tentu umur di Nuklear Malaysia dapat berjalan dengan lancar.

Agensi Nuklear Malaysia | @nuklearmalaysia | Agensi Nuklear Malaysia (NM) | www.nuklearmalaysia.gov.my

For further information, please contact:
Director General
Malaysian Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuklearmalaysia.gov.my
Attn:
ChM. Nooradilah Abdullah
Radiochemistry & Environment
Group
Division of Waste and Environmental
Technology
Tel: +603-89112000 ext. 1559
email: nooradilah@nm.gov.my



Kajian Taburan Bahan Radioaktif Semulajadi (NORM) Di Kawasan Tadahan Air Sembrong, Johor.

Study Of Naturally Occurring Radioactive Materials (NORM) Distribution In Water Catchment Areas In Sembrong, Johor.

Mohd Izwan Abdul Adziz¹, Jalal Sharib@Sarip¹, Dainee Nor Fardzila Ahmad Tugi¹ dan Mohd Tarmizi Ishak¹

¹Radiochemistry and Environmental Laboratory, Waste Technology and Environmental Division, Malaysian Nuclear Agency, Bangi, 43000, Kajang Selangor, MALAYSIA.

e-mail: izwan@nuclearmalaysia.gov.my

ABSTRAK: Sumber bahan radioaktif semulajadi merupakan penyumbang utama kepada dedahan radiasi terhadap manusia dan alam sekitar. Peningkatan bahan radioaktif semulajadi terutamanya di dalam tanah perlu diberi perhatian, memandangkan ia merupakan salah satu laluan dedahan kepada manusia dan komuniti. Kajian dan pemantauan yang dilakukan terhadap taburan dan penentuan aktiviti keradioaktifan radionuklid semulajadi ini boleh dijadikan panduan serta rujukan serta amat berguna terutamanya ketika berlakunya dedahan yang tidak terancang. Sampel tanah permukaan dari beberapa lokasi yang telah dikenalpasti di sekitar kawasan tadahan air Empangan Sembrong telah diambil untuk dijalankan kajian. Pengukuran kepekatan radioaktif dalam sampel tanah dilakukan dengan menggunakan sistem pembilangan spektrometer gamma yang dilengkapi dengan pengesanan HPGe. Keputusan yang diperolehi menunjukkan kepekatan radioaktiviti ²³⁸U adalah berkisar di antara 17.83 – 31.80 Bq/kg, ²³⁴Th adalah berkisar di antara 23.18 – 40.64 Bq/kg, ²²⁶Ra adalah berkisar di antara 20.09 – 32.80 Bq/kg, ²²⁸Ra adalah berkisar di antara 21.20 – 38.88 Bq/kg dan ⁴⁰K adalah berkisar di antara 9.11 – 51.39 Bq/kg dengan nilai purata masing-masing adalah 21.45 Bq/kg, 28.17 Bq/kg, 24.00 Bq/kg, 27.43 Bq/kg dan 24.01 Bq/kg. Nilai-nilai kepekatan radioaktiviti radionuklid tersebut didapati rendah atau setara dengan nilai-nilai yang pernah dilaporkan dalam kajian terdahulu.

Kata kunci: Spektrometer gama, Tanah, Bahan Radioaktif Semulajadi, pengesanan HPGe, Kawasan tadahan air.

KEPUTUSAN DAN PERBINCANGAN

Jadual 1: Aktiviti spesifik radionuklid dalam sampel tanah/sedimen di lokasi yang berbeza di sekitar kawasan tadahan air Sembrong, Johor.

Stesen Persampelan	GPS Koordinat (DMS)	Aktiviti khusus radionuklid (Bq/kg)			
		²³⁸ U	²³⁴ Th	²²⁶ Ra	²²⁸ Ra
S01	N01°58.55' E103°13.96'	19.97 ± 1.69	26.84 ± 1.66	21.51 ± 1.12	28.66 ± 1.70
S02	N02°00.00' E103°14.69'	18.83 ± 2.09	27.11 ± 1.79	22.81 ± 3.07	30.89 ± 1.80
S03	N02°00.59' E103°15.23'	19.81 ± 1.45	25.04 ± 0.92	22.22 ± 2.81	24.17 ± 1.0
S04	N02°01.05' E103°14.89'	20.82 ± 2.78	31.17 ± 1.69	22.75 ± 1.10	30.01 ± 1.60
S05	N02°01.50' E103°14.09'	24.42 ± 4.53	35.55 ± 2.10	26.19 ± 2.29	35.55 ± 2.15
S06	N02°01.77' E103°14.09'	21.87 ± 2.13	27.71 ± 1.84	27.92 ± 2.82	25.86 ± 1.50
S07	N02°01.53' E103°13.22'	21.84 ± 4.51	26.61 ± 2.40	23.80 ± 3.10	24.60 ± 2.45
S08	N02°00.73' E103°12.59'	31.80 ± 2.01	40.64 ± 2.69	32.80 ± 3.15	38.88 ± 2.50
S09	N01°59.92' E103°12.20'	19.84 ± 2.28	26.15 ± 3.52	21.68 ± 2.20	24.15 ± 2.40
S10	N01°58.89' E103°11.69'	20.41 ± 2.52	24.27 ± 1.85	21.70 ± 2.08	22.70 ± 1.80
S11	N01°58.70' E103°11.45'	19.83 ± 0.70	25.78 ± 0.92	24.62 ± 2.80	22.48 ± 1.00
S12	N01°58.80' E103°11.77'	17.88 ± 1.89	23.18 ± 1.58	20.09 ± 2.10	21.20 ± 1.42
Range		17.88 – 31.80	23.18 – 40.64	20.09 – 32.80	21.20 – 38.88
Mean		21.44 ± 2.38	28.17 ± 1.91	24.00 ± 2.63	27.43 ± 1.78

Jadual 2: Perbandingan aktiviti khusus radionuklid dalam sampel tanah/sedimen di sekitar kawasan tadahan air Sembrong dengan lokasi lain di Semenanjung Malaysia dan negara-negara lain.

Lokasi	Aktiviti khusus radionuklid (Bq/kg)				Rujukan
	²³⁸ U	²³⁴ Th	²²⁶ Ra	²²⁸ Ra	
Sembrong, Johor	21	24	27	28	Kajian ini
Repository Facility, Bukit Kiedang, Perak	(17.83 – 31.80)	(20.09 – 32.80)	(21.20 – 38.88)	(23.18 – 40.64)	(9.11 – 51.39)
Kinta District, Pulau Pinang	-	21	-	33	Adziz, M. I. & Khoo, K. S. 2018
Dengkil, Selangor	31.64 – 449.15	-	-	27 – 103	Lee et al. 2007
Malaysia	66	67	-	82	Almayahi et al., 2012
Thailand	114	48	-	40	Yasir, S. M. et al., 2007
Japan	29	33	-	26	UNSCEAR Report, 2000
China	33	32	-	41	
Worldwide mean	35	33	-	36	

PERNYATAAN MASALAH

Data NORM penting dalam pemantauan radioaktiviti persekitaran

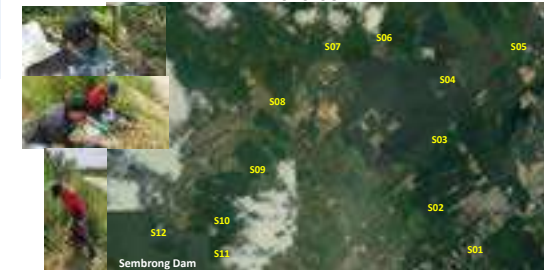
Malaysia masih kurang maklumat berkenaan :

- taburan kepekatan radionuklid terrestrial/daratan
- pengkalan data mengenai analisis risiko radiologi dan kesihatan

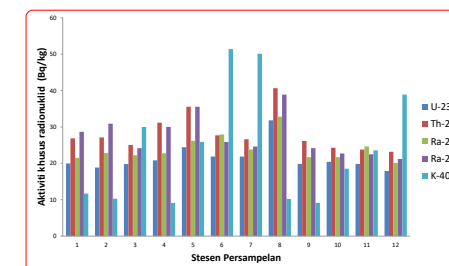
Keperluan untuk wujudkan pengkalan data/kemaskini kepekatan radionuklid terrestrial.

Asas untuk mengesan sebarang aktiviti pencemaran radioaktif pada masa hadapan di kawasan kajian.

METODOLOGI



Rajah 1: Lokasi stesen persampelan



Rajah 2: Kepekatan aktiviti khusus radionuklid (Bq/kg) untuk sampel tanah/sedimen

KESIMPULAN

Kepekatan aktiviti min ²³⁸U, ²²⁶Ra dan ²³²Th adalah setanding dengan data min seluruh dunia, namun, untuk ⁴⁰K, nilainya lebih rendah (24 Bq/kg) berbanding dengan nilai min seluruh dunia (474 Bq/kg). Dari kajian ini juga, didapati nilai purata bagi radionuklid ²²⁶Ra dan ²³²Th adalah setanding dengan kajian terdahulu dan lebih rendah daripada nilai purata yang dicatatkan dari kajian sebelum ini untuk kawasan tertentu di Semenanjung Malaysia.

PENGHARGAAN

Terima kasih kepada semua ahli projek IAEA RAS 5084 dan NM-R&D-20-41 dan juga semua kakitangan makmal RAS/BAS.

For further information, please contact:
Director General
Malaysian Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>

Attn:
Mohd Izwan Bin Abdul Adziz
Radiochemistry & Environment Lab.
Waste Technology and Environmental
Division (BAS)
Tel: +603-89112000 ext. 1141
email: izwan@nm.gov.my



KESAN UMUR INOKULUM TERHADAP PENGHASILAN BIOJISIM CENDAWAN TIRAM MERAH JAMBU (*Pleurotus flabellatus*) DALAM FERMENTASI KULTUR TENGCELAM

Everina Nuri, Shaiful Azuar Mohamad



BAHAN DAN KAEDAH

Bahan Kajian

- Miselium cendawan tiram merah jambu (*Pleurotus flabellatus*)
- Bioreaktor angkut udara

Kaedah

Pleurotus flabellatus akan dikultur di dalam kelalang kon dan seterusnya di pindahkan ke dalam bioreaktor angkut udara. Berat miselium yang dihasilkan akan dikeringkan dan ditimbang.



ABSTRAK

Biojisim dihasilkan menggunakan bioreaktor angkut udara dalam fermentasi kultur tenggelam. Bagi aplikasi kosmoseutikal, biojisim akan diekstrak untuk menghasilkan polisakarida. Penghasilan miselium ini perlu dibuat kawalan kualiti supaya produk polisakarida dapat dihasilkan dengan konsisten dan mengikut spesifikasi. Oleh itu, tujuan kajian ini dilakukan adalah untuk mengkaji kadar pertumbuhan dan penghasilan miselium di dalam bioreaktor angkut udara (5 L). Inokulum dalam kelalang goncangan dengan umur kultur yang berbeza iaitu 0, 2, 4, 6 dan 8 minggu digunakan untuk penghasilan biojisim dalam bioreaktor angkut udara. Hasil berat kering biojisim akan ditimbang selepas pengeringan dalam ketuhar. Analisis statistik menunjukkan bahawa umur inokulum tidak mempengaruhi penghasilan biojisim miselium dengan signifikan. Ini menunjukkan umur kultur dari 2 hingga 8 minggu boleh digunakan untuk penghasilan biojisim secara konsisten dan tidak mempengaruhi hasil dengan signifikan. Oleh itu, proses kawalan kualiti hasil boleh dilaksanakan dengan efektif.

PENGENALAN

Cendawan tiram adalah diantara spesies cendawan yang digunakan dalam pelbagai bidang nutrasetikal, farmasetikal dan kosmeseutikal. Dalam penyelidikan ini teknik nuklear diaplikasikan dalam penyenggaraan jasad buah, pencirian bahan dan ujian fotoprotektif. Kaedah fermentasi tenggelam dipilih kerana penghasilan biojisim dan polisakarida dapat dihasilkan dalam masa yang lebih singkat berbanding fermentasi substrat pepejal. Walaubagaimanapun dalam kajian ini kaedah fermentasi substrat pepejal digunakan bagi penyenggaraan kultur. Setakat ni kajian menunjukkan polisakarida yang dihasilkan paling berpotensi untuk dikembangkan dalam bidang kosmeseutikal. Penghasilan biojisim dan polisakarida dari bioreaktor menunjukkan hasil yang memberangsangkan. Oleh itu, bagi merancang projek ke peringkat seterusnya pada skala yang lebih besar, proses kawalan kualiti adalah penting. Pelbagai aspek kawalan kualiti perlu dibuat kajian lanjut. Kajian ini memfokuskan kepada faktor umur inokulum terhadap penghasilan biojisim. Proses permindahan teknologi juga sedang dalam proses perancangan dan pelaksanaan.

HASIL DAN PERBINCANGAN

Jadual 1. Produktiviti penghasilan biojisim berdasarkan usia kultur inokulum

Usia Kultur (Minggu)	Berat Purata (gram)	Sisihan Piawai (g/L.d)	Produktiviti (g/L.d)
0	0.00	0.00	0.00
2	18.71	2.74	1.87
4	14.41	3.10	1.44
6	13.85	0.82	1.39
8	14.41	3.10	1.44

Jadual 2. Analisis statistik ANOVA bagi penghasilan biolisom *P. flabellatus*

	Total
N	15
Purata/Min	12.277
Sisihan Piawai	6.896
Nilai P	0.946
Nilai Nisbah F	0.055

Perbincangan : Seperti yang ditunjukkan di dalam jadual 2, nilai P adalah 0.946. Maka keputusan ini adalah tidak signifikan kerana p adalah lebih besar daripada 0.05

KESIMPULAN

Keputusan menunjukkan bahawa perbezaan usia kultur tidak mempengaruhi produktiviti biojisim miselium *P. flabellatus* di dalam bioreaktor angkut udara dan kawalan kualiti terhadap penghasilan biojisim produk akan menjadi lebih efisien.

RUJUKAN

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PENGHARGAAN

Terima kasih kepada seluruh pihak yang terlibat serta warga Blok S6.

Maklumat lanjut sila hubungi:

Ketua Pengarah
Agensi Nuklear Malaysia,
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>

Attn:

Dr. Shaiful Azuar Mohamad
Kumpulan Bioindustri Sinaran
Bahagian Agroteknologi dan Biosains
Tel: +603-89112000 ext. 1404
email: azuar@nm.gov.my



INTRODUCTION TO ULTRAVIOLET-VISIBLE (UV-Vis) SPECTROSCOPY



Abstract

UV-Vis spectroscopy are usually use for optic measurement due to low cost, sensitive and non-destructive technique. UV-Vis spectroscopy is a quantitative technique used to measure the amount of photons (intensity of light) in term of absorption after it pass through the sample. By absorption of light energy, electron are excited from ground state to an excited state. Absorption spectra are determine ranging from 200-800 nm. From absorption spectra, energy band gap are calculated.

Keyword: Absorption, energy band gap

Introduction

- UV-Vis spectroscopy is an important analytical technique that refers to absorption or reflectance spectroscopy in the ultraviolet-visible spectral region (Figure 1).

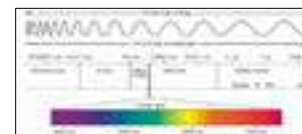


Figure 1: The visible spectrum (390 – 780 nm) represents only a small portion of the whole electromagnetic spectrum

- Range of wavelength in UV-Vis spectroscopy (Table 1)

Table 1: Range of wavelength in UV-Vis spectroscopy

Type of Radiation	Wavelength Range (nm)
Far ultra-violet (UV)	10-200
Near ultra-violet (UV)	200-390
Visible (Vis)	390-780

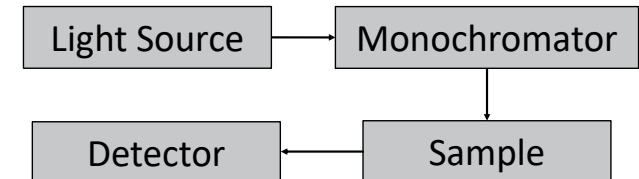
- UV-Vis spectrum represents a **distribution of radiant energy**.
- From UV-Vis spectroscopy - Determine the mode of **absorption, transmittance or reflected**
- Energy band gap calculated using equation (1):

$$E = hc/\lambda \quad (1)$$

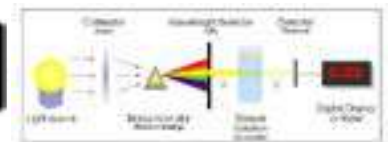
- Optical energy band gap are calculated using Tauc equation (Equation 2)

$$(ah\nu)^n = A(h\nu - E_g) \quad (2)$$

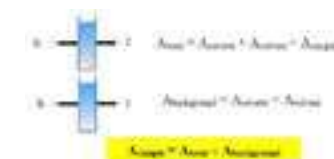
Setup



Working Principle



Background correction



References

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For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>

Attn:
Dr. xxxxx
Group
Division
Tel: +603-89112000
email: xxxxxx@nm.gov.my



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A STUDY OF RADIONUCLIDES MEASURED IN SURFACE AIR IN TANAH RATA, CAMERON HIGHLANDS, PAHANG IN 2020

KAJIAN PENGUKURAN RADIONUKLID DI PERMUKAAN UDARA DI TANAH RATA, CAMERON HIGHLANDS, PAHANG SEPANJANG TAHUN 2020

Faisal Izwan Abdul Rashid, Muhammed Zulfakar Zolkaffly & Nor Pa'iza Mohamad Hasan
Malaysian Nuclear Agency (Nuklear Malaysia) Bangi, 43000 Kajang, Selangor

ABSTRACT

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is a multilateral agreement that prohibits any nuclear explosion, whether for military or civilian purposes. The treaty is supported by a network of International Monitoring Systems (IMS), including radionuclide monitoring stations. Malaysia is the Member State of CTBT and hosts the Radionuclide Monitoring Station (Station Code: RN42) in Tanah Rata, Cameron Highlands, Pahang. Continuous daily measurements at RN42 have been an invaluable resource for understanding the variation of natural radioactivity in that area. This study analyses radionuclide measured at the surface air in Tanah Rata, Cameron Highlands, Pahang via RN42 station in 2020. The results show that most of the radionuclide measurements in RN42 are categorised as a natural background. However, throughout 2020, the station has several times measured radionuclides with anomalous concentrations. The significant findings may form the basis for further studies on local radiological impact assessment as well as the development of baseline radiological data.

INTRODUCTION

- The Comprehensive Nuclear-Test-Ban-Treaty (CTBT) is a multilateral treaty that bans all nuclear explosions
- Under the CTBT, 321 monitoring stations and 16 laboratories are being set up worldwide encompassing 4 monitoring technologies namely seismic, hydroacoustic, infrasound and radionuclide
- The main function of these stations is to detect global nuclear explosion
- Malaysia is a Member State to CTBT and hosts one radionuclide monitoring station (site code: RN42) in Tanah Rata, Pahang since 2010
- RN42 perform continuous daily measurements of atmospheric radionuclide particulates indicative of a nuclear explosion
- Apart from monitoring nuclear tests, the monitoring data could also be used for civil and scientific purposes
- This study is performed by the Malaysian CTBT National Data Centre (MY-NDC) to analyses the trend of radionuclides measured at the surface air at RN42 station in Tanah Rata, Cameron Highlands, Pahang in 2020

RESULTS & DISCUSSION

Radionuclide categorisation

- Most of the measurements were categorised as Level 1 (typical background) (Figure 4)
- No measurements of Level 2, Level 5 and uncategorised data (NC) were recorded
- A small portion of unavailable data (NA) was recorded in January, September and November 2020 (Figure 5)
- Level 4 samples were detected from May until December 2020 except in July and November 2020

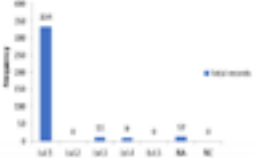



Figure 4. The overall categorisation at RN42 in 2020

Figure 5. Distribution of categorisation levels at RN42 in 2020 by months

Historical comparison for samples with measurement category of Level 4 and 5

- 3 radionuclides with anomalous concentrations were identified as the contributor to Level 4 in 2020, namely Sodium-24 (Na-24), Cesium-137 (Cs-137) and Iodine-131 (I-131)
- Comparison with historical measurements (1 Jan 2010-31 Dec 2019) in Figure 6 showed that:
 - historical concentrations of Na-24 were between 12 to 16 $\mu\text{Bq}/\text{m}^3$ and Level 4 measurements of Na-24 in 2020 fall within the range of historical detections
 - historical concentrations of Cs-137 were between 0.6 to 2 $\mu\text{Bq}/\text{m}^3$ and detection of Cs-137 is very rare with the last detection was recorded only in April 2011
 - historical concentrations of I-131 were between 2 to 3 $\mu\text{Bq}/\text{m}^3$ and detection of I-131 is very rare with the last detection was recorded only in April 2011

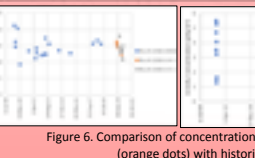


Figure 6. Comparison of concentration of Na-24, Cs-137 and I-131 detected in 2020 (orange dots) with historical measurements (blue dots)

METHOD

Site Description

Station Code: RN42

Location: Tanah Rata, Pahang

Elevation: 1545 m above sea level



Figure 1. Location of RN42

Sample collection, analysis and categorisation

- RN42 is equipped with a high-volume air sampler
- Air was forced through an air filter for 24 hours
- Then, the filter was compressed to 5cm diameter disc and was placed in sample holder to allow for decay for 24 hours
- Next, the filter was analysed using HPGe for 24 hours
- The gamma spectra was sent to International Data centre (IDC) in Vienna for sample analysis and categorisation (Figure 2)

Data acquisition and analysis

- Analysis and categorization result were published in the IDC's Reviewed Radionuclide Report (RRR)
- MY-NDC extract the result from RRR and analyse the trend
- Level 4 and 5 were given high attention in this study as these categories indicate high measurement anomalies
- Figure 3 shows the whole process from sample collection to trend analysis

Sample collection at RN42

↓

MY-NDC extract result from RRR and analyse

Gamma spectra at RN42 were sent to IDC

↓

IDC analyses the spectra and publish in RRR

Figure 3. The overall process from sample collection to trend analysis

CONCLUSION

- Throughout 2020, RN42 had operated almost every day with a data availability rate of 97%
- Most of the radionuclide measurements at RN42 were categorised as Level 1 (typical background)
- Out of the total of 354 samples, 11 samples were categorised as Level 4 due to anomalous concentrations of Na-24, Cs-137 and I-131
- The rare detections of fission products namely Cs-137 and I-131 in the sample spectra have demanded a separate study to investigate the possible source of these radionuclides

CONTACT DETAILS

Faisal Izwan Abdul Rashid
 MY-NDC, Malaysian Nuclear Agency
 Bangi, 43000 Kajang,
 Selangor Darul Ehsan, Malaysia
 Email: faisal_izwan@nm.gov.my

Muhammed Zulfakar Zolkaffly
 MY-NDC, Malaysian Nuclear Agency
 Bangi, 43000 Kajang,
 Selangor Darul Ehsan, Malaysia
 Email: zulfakar@nm.gov.my



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TENTUKURAN ALAT PEMBACA TLD MODEL 5500 MENGGUNAKAN DOSIMETER CIP TLD 100 (CALIBRATION OF TLD READER MODEL 5500 USING TLD 100 CHIP DOSIMETER)

N. F. S. A. Hamid¹, A. B. A. Kadir¹, M. K. Matori², H. Sham², S. K. A. Hadin¹, N. A. M. Makhtar¹, R. C. Rosmi², S. Ariffin², R. A. Latif²
 Makmal Standard Dosimetri Sekunder (SSDL), Agensi Nuklear Malaysia (Nuklear Malaysia), Bangi, 43000 Kajang, Selangor.

ABSTRAK

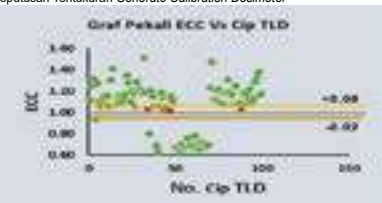
SSDL, Agensi Nuklear Malaysia pada bulan Februari 2021 telah menerima satu unit alat pembaca TLD Model 5500 yang telah diperbaiki oleh pembekal iaitu Thermofisher Scientific, bagi memastikan alat pembaca TLD ini berfungsi dengan baik dan boleh digunakan untuk analisa chip TLD. SSDL telah melaksanakan proses tentukan pada alat pembaca menggunakan chip TLD 100 (LiF:Mg,Ti) sebanyak 50 unit. Cip TLD 100 ini telah disinaran kepada punca gama Cs-137 pada jarak 2.0 meter yang telah ditetapkan nilai Kadar Kerma Udara (mGy/mint) menggunakan kebuk pengionan rujukan SSDL. Cip TLD 100 yang telah disinaran akan dianalisa oleh alat pembaca TLD Model 5500 mengikut 3 fungsi berikut iaitu Generate Calibration Dosimeter, Calibration Reader dan Calibration Dosimeter. Poster ini memperincikan carta alir tentukan alat pembaca TLD model 5500 ini.

PENGANTARAN

Sebelum Pembaca TLD Model 5500 dibaiki, kaedah tentukan yang digunakan oleh pembaca ini adalah kaedah Tentukan Individu. Oleh itu, bagi meningkatkan kualiti kerja harian di Makmal Standard Dosimetri Sekunder (SSDL), kaedah tentukan diubah dari kaedah Tentukan Individu ke kaedah Tentukan Berkelompok. Perbezaan di antara Tentukan Individu dan Tentukan Berkelompok adalah dari segi pemilihan Faktor Tentukan, *Calibration Factor (CF)* dan Faktor Tentukan Pembaca, *Reader Calibration Factor (RCF)*. Bagi Tentukan Individu, setiap cip TLD100 perlu dicari nilai *CF* kerana setiap cip TLD100 mempunyai nilai *CF* yang tersendiri. Manakala, Tentukan Berkelompok hanya memilih sebilangan cip yang mempunyai peratusan ralat terbaik sebagai nilai faktor tentukan kumpulan atau dinamakan Faktor Tentukan Pembaca, *Reader Calibration Factor (RCF)*. Nilai RCF ini akan digunakan sebagai pekali untuk mendapatkan nilai dos yang diukur oleh setiap TLD yang telah ditentukan secara berkelompok. Hasilnya, nilai bacaan setiap TLD dalam bentuk dos, Sirvet (Sv).

KEPUTUSAN

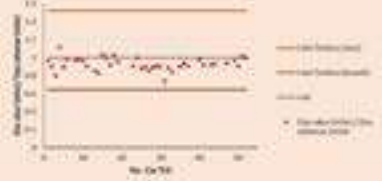
1. Keputusan Tentukan *Generate Calibration Dosimeter*



2. Keputusan Tentukan *Calibration Reader*

CIP TLD	Elemen (nC)	RCF (nC/mSv)
0007	37.282	0.0075
0012	38.359	0.0077
0027	34.848	0.0070
0034	38.864	0.0077
0038	36.441	0.0073
0042	34.699	0.0069
0045	34.598	0.0069
0046	33.42	0.0067
0048	33.42	0.0067
0048	34.697	0.0069
0089	37.518	0.0075
Purata RCF		0.0072

3. Keputusan Tentukan *Calibration Dosimeter*



OBJEKTIF

- Menentukan nilai Pekali Pembetulan Elemen, *Element Correction Coefficients (ECC)* untuk setiap cip TLD
- Menentukan peratusan ECC terbaik yang akan dipilih sebagai *Reader Calibration Factor (RCF)*.
- Menentukan semua cip yang dikategorikan sebagai *Calibration Dosimeter* termasuk dalam julat $\pm 30\%$ untuk ditandakan sebagai kategori *Field Card*.

BAHAN DAN METODOLOGI





Rajah. 1. Peralatan yang digunakan dalam projek ini dan susun atur peralatan penyinaran



Rajah. 2. Metodologi Tentukan Berkelompok

KESIMPULAN

- Kesemua cip TLD yang berjumlah 50 telah berjaya ditentukan secara berkelompok di mana hanya 10 cip dipilih sebagai RCF.
- Ujian Tentukan Dosimeter terhadap 40 cip TLD menunjukkan kesemuanya berada di dalam julat yang ditetapkan oleh SSDL iaitu $\pm 30\%$ dan dikategorikan sebagai Field Card oleh sistem WinREMS mesin pembaca TLD Model 5500.

RUJUKAN

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PENGHARGAAN

Terima kasih kepada Pengurus SSDL dan semua kakitangan SSDL yang membantu dalam menyajikan penyelidikan ini.

For further information, please contact:

Director General
 Malaysia Nuclear Agency
 Bangi, 43000 Kajang,
 Selangor Darul Ehsan, Malaysia
<http://www.nuklearmalaysia.gov.my>

Attn:
 NOOR FATIN SHUHADA BINTI AB HAMID
 KUMPULAN METROLOGI SINARAN
 BAHAGIAN KESELAMATAN DAN KESIHATAN
 SINARAN
 Tel: +603-89112000 ext. 1815
 email: fatin@nm.gov.my



NTC 2021

GAMMA IRRADIATED CHITOSAN AS DIETARY SUPPLEMENT FOR TILAPIA AND CRUSTACEAN

Sarada Idris, Maznah Mahmud, Khomsaton Abu Bakar, Norhashidah Talip, Marina Talip, Zahid Abdullah, Nurul Aizam Idayu Mat Sani, Norafifah Ahmad Fabillah and Mohamad Nalrazmi Mohamad Shukri

INTRODUCTION

Chitosan obtained from deacetylation of chitin is irradiated under gamma irradiation to produce low molecular weight oligo chitosan as a dietary supplement for tilapia and crustacean

OBJECTIVE

- To produce tilapia and crustacean dietary supplement from low molecular weight chitosan
- To enhance growth and immunity system of tilapia and crustacean

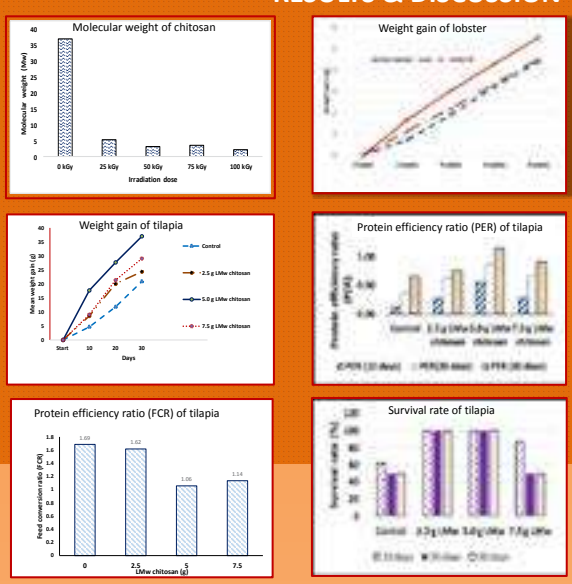
METHODE



EXPERIMENTAL



RESULTS & DISCUSSION



WAY FORWARD



CONCLUSION

Chitosan irradiated at 25 kGy is applicable for use as diet supplement for tilapia and crustacean with encouraging growth rate and immunity

- Development of fish/crustacean dietary supplement from irradiated chitosan
- Enhanced growth performance
- Optimized protein efficiency ratio (PER)
- Improved feed conversion ratio (FCR)
- Reduced mortality

For further information, please contact:
 Director General
 Malaysia Nuclear Agency
 Bangi, 43000 Kajang,
 Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>
 Attn:
 Dr. Sarada Idris
 Group: Biopolimer
 Division: BTS
 Tel: +603-89112000 ext. 1402
 email: sarada@nm.gov.my



NTC 2021

STUDY ON ULTRAVIOLET (UV) RADIATION SAFETY

ABSTRACT

According to International Commission on Non-ionizing Radiation Protection (ICNIRP), Ultraviolet (UV) radiation is the band of non-ionizing radiation in the electromagnetic spectrum that located next to ionizing radiation. UV radiation is in the range of 400nm – 100nm and is the dividing line between ionizing and non-ionizing radiation. The lower energies band in the UV is non-ionizing radiation while the higher energies is ionizing radiation. However, there is no clear evidence on classification of UV radiation as ionizing radiation. The source of UV radiation is from the sun and artificial man-made. There are three classification of UV radiation, which are; UVA (400 – 315nm), UVB (315 – 280nm) and UVC (280 – 100nm). This classification is depending on the wavelength of UV radiation. UV radiation from the sun do give benefit to human by providing Vitamin D, but as the ozone layer becomes thin, more harmful UV can reach the earth. The application of UV radiation is in the commercial, industry and medical. UV radiation widely used for illumination, lighted signs, backlighting, UV curing, tanning, phototherapy and germicidal. Compare to the ionizing radiation, UV radiation has a low power of penetration, therefore the health effect limited to the skin and eyes. For protection on UV radiation, ICNIRP recommends standard protective clothing and application of sunscreen for outdoor occupational and for indoor occupational that dealing with artificial UV radiation, safety precautions include; structural measures, administrative controls and personal protective equipment must be applied. It is impossible for people to avoid UV radiation completely, but the awareness on the safety of UV radiation must be made to avoid any excessive exposure of UV radiation.

INTRODUCTION

- Ultraviolet radiation (UVR) is define as an invisible ray that are part of the energy that comes from the sun and man-made sources
- The International Commission on Non-ionizing Radiating Protection (ICNIRP) published a Guidelines on Limits of Exposure to Ultraviolet Radiation of Wavelengths between 180 nm and 400 nm (Incoherent Optical Radiation).
- ICNIRP suggest a value of exposure limit in term of irradiance and the permissible exposure duration as a guideline for UVR safety.

OBJECTIVE

- To create awareness on Ultraviolet Radiation (UVR) Safety
- To disseminate information on the exposure limit of UVR as given by the International Commission on Non-ionizing Radiating Protection (ICNIRP)

EXPOSURE LIMITS FOR WORKERS AND PUBLIC

According to ICNIRP, the exposure limit for UVR per day which is for 8 hours is as follow:

30 J/m² = 0.1 μW/cm² = 0.0001 mW/cm²

Any personnel or public should not be exposed more than 30 J/m² of UVR for 8 hours. Different exposure duration was limited based on different exposure limits which given by the table below:

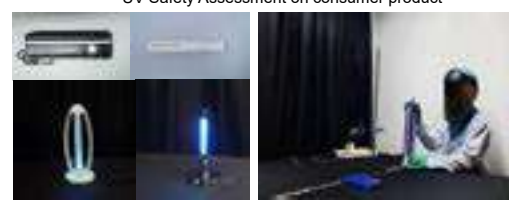
Duration	Effective Irradiance (μW/cm ²)	Effective Irradiance (mW/cm ²)
8 hours	0.1	0.0001
4 hours	0.2	0.0002
2 hours	0.4	0.0004
1 hour	0.8	0.0008
30 minutes	1.7	0.0017
15 minutes	3.3	0.0033
10 minutes	5.0	0.0050
5 minutes	10.0	0.0100
1 minute	50.0	0.0500
30 seconds	100.0	0.1000
10 seconds	300.0	0.3000
1 second	3000.0	3.0000
0.5 seconds	6000.0	6.0000
0.1 seconds	30000.0	30.0000

UVR CLASSIFICATION

Type of UVR	Wavelength (nm)	Health Effect
UVA	315 - 400	Cataracts of lens, skin cancer, retinal burns
UVB	280 - 315	Corneal injuries, cataracts of lens, photo keratitis, erythema, skin cancer
UVC	100 - 280	Corneal injuries, erythema, skin cancer, photokeratitis

SERVICES BY NIR, NUKLEAR MALAYSIA

UV Safety Assessment on consumer product



UVR PERSONEL PROTECTIVE EQUIPMENT (PPE)

Personnel Protective Equipment (PPE) must be use by the personnel handling any UVR source to avoid any unnecessary exposure. The PPE as follow:

- Gloves
- Lab Coat
- UV Face Shield



CONCLUSION

Safety on UVR must be taken seriously. All necessary precaution must be taken prior to the usage of UVR. Awareness on safety of UVR should be made as a constant realization of every personnel dealing with UVR. The safety assessment on UVR is one of tool for UVR Safety.

For further information, please contact:
 Director General
 Malaysia Nuclear Agency
 Bangi, 43000 Kajang,
 Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>
 Attn:
 Wan Syazlin binti Wan Yunoh
 Non-ionising Group (NIR)
 Radiation Safety and Health Division
 Tel: +603-89112000 ext. 1504
 email: wan_syazlin@nm.gov.my

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The Effect of Different Sol-gel Concentration on Preparation of Silica and Titania Nanofibrous Mats via Electrospinning Process

Umar Abdullah¹, Hafizal Yazid¹, Sahrim Ahmad¹, Nurulizzati Makhtar^{1,2}, Siti Zaubidah^{1,3}, Ruey Shan Chen¹, Nur Syafiqaz¹

¹Department of Applied Physics, Faculty of Science and Technology, UKM, 43600 Bangi, Selangor, Malaysia
²Material Technology Group, Industrial Technology Division, Malaysia Nuclear Agency, 43000, Kajang Selangor, Malaysia
³School of Applied Physics and Material Sciences, Faculty of Applied Physics, Universiti Teknologi MARA

ABSTRACT

Nano scale fibrous mats of SiO₂ and TiO₂ with various compositions of viscosity and different voltages have been prepared by electrospinning a sol-gel precursor of tetraethyl orthosilicate (TEOS) and titanium (IV) isopropoxide (TIP). Different concentrations of polymer precursor were studied. Distance tip to collector of 15cm, applied voltages of 17.5v, and flow rate of 0.003 ml/h were fixed for entire electrospinning process. The morphology of nanofibrous mats were evaluated versus different solution concentrations. The as-spun nanofibrous mats were characterized by SEM. Results showed that the average fiber diameter decreases with decreasing of Polyvinylpyrrolidone (PVP) solution concentration. At 5%wt, both electrospinning of Silica and Titania failed to produce nanofibrous mats without beading formed on fibers. Clear nanofibrous mats were achieved for both Silica and Titania at 10%wt with fixed 15cm of tip to collector distance, 17.5v of applied voltages, and 0.003ml/h of flow rate.

INTRODUCTION

The main interest in this study which is mechanical morphology of nanofibrous mats plays an important role in the applicability of nanofibrous mats in many promising fields. For electrospun nanofibrous mats, the chosen solution and process parameters, such as the distance between tip and the collector, applied voltage, and flow rate are accompanied by a certain level of morphological properties. Effective control of these parameters would enable one to achieve optimal nanofibrous mats.

OBJECTIVE

Study the effects of solution concentration on the morphology of the electrospun nanofibrous mats. A potential application of the nanofiber mats would be in food packaging where polymer films currently dominate.

METHODS AND MATERIALS

Materials
Tetraethyl orthosilicate (TEOS) and titanium (IV) isopropoxide (TIP) with a reagent grade of 99% from Sigma Aldrich were used as the source of Silica and Titania precursor. For polymer precursor, high molecular weight Polyvinylpyrrolidone (Mw 1300000) was purchased from Sigma Aldrich alongside nitric acid (HNO₃) and ethyl acetate which also obtained from Sigma Aldrich.

Sol-gel preparation
To simplify the condition for analysis, a typical procedure was selected, different concentration of polymer solutions (5%wt, 10%wt, 15%wt) was prepared by adding Polyvinylpyrrolidone (PVP) into ethanol with stirring for 2h at 50°C. As preparation of Silica and Titania precursor, initially a numbers of gram of precursor of tetraethyl orthosilicate (TEOS) and titanium (IV) isopropoxide (TIP) were added into 10ml of deionized water under stirring process. Then, a few drop of ethyl acetate were added and the stirring process was continued for 16hours. Both solution then were transferred into glass beaker for mixing process of 2h at 50°C.

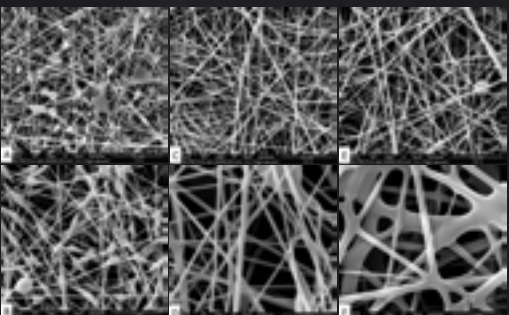
Electrospinning
Each solutions were transferred into plastic syringe equipped with a 23-gauge needle. The needles were connected to a voltage supply which is capable of generating DC voltage as high as 25kV. In a typical procedure the distance between the needle and collection screen was fixed at 15cm. The relative humidity was controlled between 50 and 60% at room temperature. Throughout the entire electrospinning process, the voltage and flowrate was kept constant at 17.5kV and 0.003ml/h of different polymer concentrations.

Characterization
The morphology of fibers was examined by scanning electron microscopy (SEM)

DISCUSSION AND CONCLUSION

Beaded fibers was formed at low concentration of sol-gel (5%wt) for both Silica (a) and Titania (b) electrospun mats. This is due to the insufficient amount of viscoelastic force to overcome the repulsive forces of charge. Fluids with low relaxation time or low extensional viscosity tend to result in beads formation due to Rayleigh instability driven by surface tension. To overcome beading effect, polymer concentration were increased to 10%wt. As result of increasing concentration to 10%wt, the effect of bead formation on the fibers were reduced for both Silica (c) and Titania (d). At higher concentration of polymer (15%), stack fibers formed on both Silica (e) and Titania (f). Due to its large diameter size, its not suitable for fabrication of nanofibrous mats. Based on the morphological result, 10% polymer concentration were selected as the most suitable sol-gel concentration for both Silica and Titania.

In conclusion, it has been shown that solution concentration has a serious effect on the final size of fibers and distribution of particles. In this study of producing Silica and Titania nanofibrous mats from aqueous solutions of 1300000 molecular weight PVP, concentrations in the range of 5–15%wt produced fibers. Beaded fiber structure was obtained at lower polymer concentration (5%wt) but an increase in the polymer concentration to 10%wt yielded bead-free fibers, which indicates that a high viscosity is required to obtain uniform Silica and Titania nanofibrous mats.



ACKNOWLEDGEMENT

The authors would like to thank the Nuclear Malaysia and Ministry of Higher Education (MOHE) for the research financial support under the research scheme of Fundamental Research Grant (FRGS) with the grant number FRGS/1/2018/STG07/MOSTI/02/01.

For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuclearmalaysia.gov.my>

Attn:
Dr. Hafizal Yazid
Group: Material Technology
Division: Industrial Technology
Tel: +603-89112000
email: hafizal@nuclearmalaysia.gov.my

Agensi Nuklear Malaysia | www.nuclearmalaysia.gov.my | Agensi Nuklear Malaysia (NM) | www.nuclearmalaysia.gov.my

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Refleksi

KONVENSYEN TEKNIKAL NUKLEAR MALAYSIA

NTC
2021



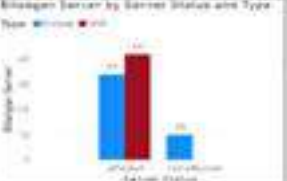
"Nuclear
Technology
Application
in New Norm"

PEMULIHAN BENCANA SERANGAN RANSOMWARE – SATU PENGAJARAN

Pasukan Pemulihan Bencana ICT Agensi Nuklear Malaysia
Pusat Teknologi Maklumat, Bahagian Sokongan Teknikal

Abstrak

Pada pertengahan Mei 2020, Pusat data Agensi Nuklear Malaysia telah diserang oleh ransomware dari varian Dharma. Serangan ini menjejaskan hampir 90 peratus server utama agensi termasuk storan sandaran. Berikut itu, hampir 94 peratus aplikasi utama agensi telah terganggu. Ini merupakan serangan malware pertama dan pasukan pemulihan bencana ICT telah mengambil masa hampir 4 minggu untuk memulihkan aplikasi-aplikasi utama agensi seperti e-SSDL, e-Client, laman web dan lain-lain secara berperingkat mengikuti pelan pemulihan bencana ICT agensi. Anggaran implikasi kewangan akibat dari serangan ini mencecah hampir RM700,000.00 yang melibatkan kos kehilangan data dan kos pemulihan server-server yang terjejas. Kertas kerja ini akan membincangkan pengajaran yang diperolehi dari serangan ransomware ini terutama dari aspek kawalan keselamatan siber dan pelan pemulihan bencana ICT yang telah dijalankan.



FASA 1 (Hyperacute): 48 jam awal – meminimalkan kesan serangan dan membuat penyiasatan, diagnosis awal dan establish incident command.

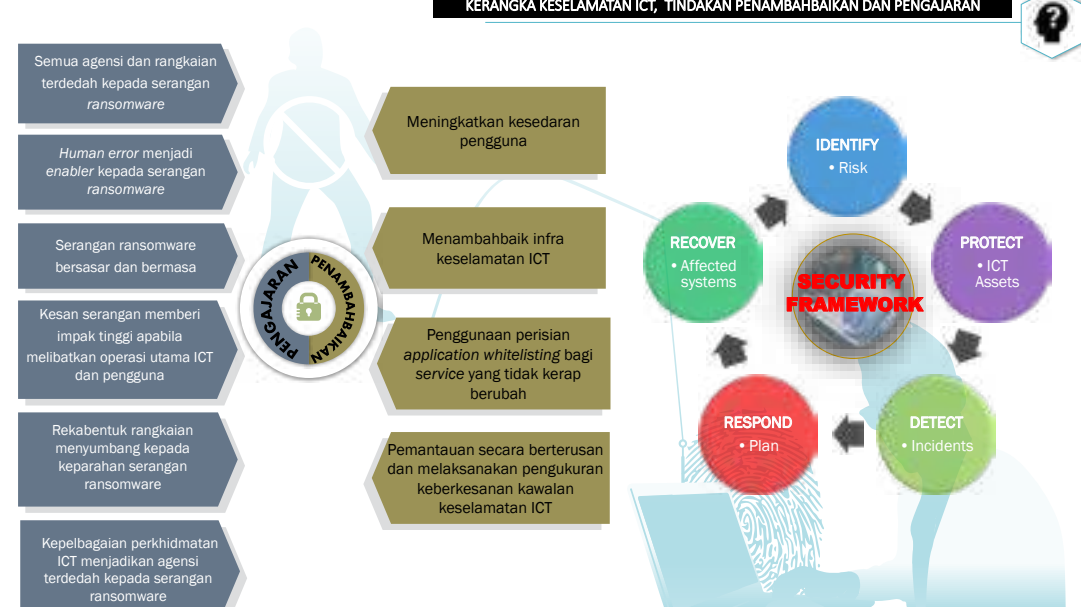
FASA 2 (Acute): Pengaktifan Pelan Pemulihan Bencana ICT. Peralihan kepada alternative prosedur (cth transition to manual procedures). Limitkan capaian kepada sistem digital.

FASA 3 (Infra Recovery): Pemulihan infra, data dan rebuild asset digital.

FASA 4 (Reconciliation): Pembentukan semula perkhidmatan ICT termasuk Integrasi data analog dengan aset digital, menguji keupayan sistem yang telah dipulihkan serta membuat pelaporan.

Rangkaian pulih sepenuhnya dalam tempoh 1 minggu secara berperingkat. Aplikasi kritikal kembali berfungsi dalam tempoh 4 minggu secara berperingkat

KERANGKA KESELAMATAN ICT, TINDAKAN PENAMBAHBAIKAN DAN PENGAJARAN



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Refleksi



USE OF NANODOT OPTIC STIMULUS LIGHTING DOSIMETER (OSL) IN TESTING TO VERIFY THE FUNCTIONALITY OF RADIATION APPARATUS IN AELB CASE FOR CASE OF VIOLATION OF PROVISIONS OF ACT 304

M. K. Matori, A. B. A. Kadir, N. H. Alias, H. Salleh, A. Ripin, H. Sham, M.F. A. Rahman, S. A. Azizan, M.K.M Zin
Agensi Nuklear Malaysia (NUKLEAR MALAYSIA)



Abstract:

The Malaysian Nuclear Agency's role is to assist Atomic Energy Licensing Board (AELB) in providing technical services for testing the functionality of irradiation apparatus for cases to be prosecuted for violation of Act 304. Among the common offenses committed by consumers is selling, possessing, and operating irradiation apparatus without a valid license. The Malaysian Nuclear Agency's role is to assist Atomic Energy Licensing Board (AELB) in providing technical services for testing the functionality of irradiation apparatus for cases to be prosecuted for violation of Act 304. Among the common offenses committed by consumers is selling, possessing, and operating irradiation apparatus without a valid license. A qualified specialist performed the technical test to determine whether the case item could emit ionizing radiation and function properly as a radiation device. Active and passive dosimeters such as survey meters, TLD dosimeters, OSL dosimeters, and diagnostic radiology films are among the options used for validation testing. However, the OSL nanoDot dosimeter is the most practical and effective because it is easy to use and compatible with all irradiation apparatus tested. The advantages of using OSL nanoDot in the confirmation test of the presence of ionizing radiation are presented further in this paper.

Keywords: Act 304, Dosimeter, Optically Stimulated Luminescence (OSL) nanoDot, Ionizing Radiation

INTRODUCTION

Malaysian Nuclear Agency serves as the national technical support organization in assisting the Atomic Energy Licensing Board (AELB) in enforcing act 304 on radiation protection in our country. Every year there are many violations of the atomic energy licensing act 1984 (Act 304) and will be investigated by the AELB. The AELB will obtain technical assistance from the Malaysian Nuclear Agency to conduct tests to verify the functionality of the irradiation apparatus used by the companies concerned. Appropriate dosimetry is essential to obtain correct and accurate results to verify the functionality of these irradiation apparatuses. It is crucial because the AELB prosecuting officer will use the results of this test for the prosecution process in court. From observation, not all dosimeters testing could potentially use in ionizing radiation verification in industrial conditions.

MATERIALS AND METHOD

- The testers consist of senior research officers and have specific skills such as having a radiation protection certificate for officers and testers recommended by Nuclear Malaysia RPO
- Used appropriate active and passive types dosimeter
- Survey meter, TLD dosimeter, OSL dosimeter, diagnostic radiology film, film badge are standard dosimeters used in radiation monitoring
- The suitability of using these dosimeters depends on the types of radiation and the suitability of the irradiation equipment tested.



Figure 2: Type of dosimeter used in the testing



Figure 3: Method of installing various dosimeter into a space of radiation apparatus



Figure 4: OSL dosimeter size

Figure 5: Advantages of an OSL nanoDot dosimeter mounted on an apparatus with limited irradiation space

CONCLUSION

Using OSL nanoDot dosimeter is the best and most practical way in industry testing verification. The miniature physical size of the dosimeter is an advantage as it can be used for testing on all types of irradiation apparatus and can detect small amounts of dose.

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- Proceeding: A.B.A. Kadir et al. (2016) Reproducibility Test for Optically Stimulated Luminescence Dosimeter (OSL) NanoDot Type Using Cobalt-60 Gamma Source, Proceeding of the R&D Seminar 2016.
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OBJECTIVE

- To identify the most suitable dosimeter used for testing the verification of the functionality of the irradiation apparatus for cases of violation of the provisions of act 304
- Comparing the use of passive and active dosimeters in this verification of the functionality test
- The advantages of using OSL nanoDot for radiation measurement especially for small irradiation apparatus



Figure 1: Examples of irradiation apparatus in various industrial sectors in Malaysia

RESULT AND DISCUSSION

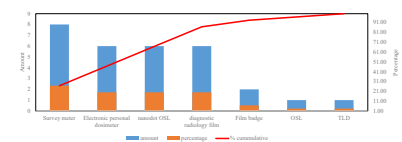


Figure 6: Frequency of use of various dosimeters used during testing

For active type dosimeters, survey meters and electronic personal dosimeters are the most frequently used. While diagnostic radiology film and OSL nanoDot are passive type dosimeters. However, it is not always the case that the most carried dosimeter can give satisfactory results. The suitability of using these dosimeters depends on the irradiation apparatus.

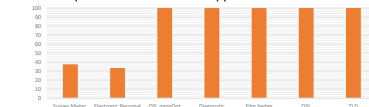


Figure 7: Percentage of test success according to the dosimeter used

The experience of conducting tests verifying the functionality of irradiation apparatus found that using OSL nanoDot dosimeters is the most effective and practical method in detecting the presence of ionizing radiation. This dosimeter is suitable for personnel monitoring, environmental monitoring, medical and industrial applications. The size factor is the main factor that makes OSL nanoDot dosimeters the most practical method used to detect the presence of ionizing radiation. Most of the irradiation apparatus tested are used to analyze the character of the sample, measure the thickness of the material, or the quality of the product, where the irradiation space is small and narrow.

For further information, please contact:

Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuklearmalaysia.gov.my

Attn:
Mr Mohd Khalid Matori
Metrology Radiation Group
Radiation Safety & Health
Tel: +603-89112000 ext. 1513
email: khalid_matori@nm.gov.my



Raman Spectroscopy for Graphene Analysis

By: Roshasnorlyza bin Hazan*, Nur Ubaidah Bt. Saidin and Wilfred @ Sylvester Paulus



Abstract

Raman spectroscopy application has been developed to determine **graphene quality**. The spectra of graphene and graphite samples has been characterized by 532 nm laser wavelength. The Integral intensities and full width half maximum (FWHM) of the bands assigned to the vibrations of graphitic band (G band) and defect band (D band) were used to calculate the graphene layers and its quality. This technique is quick and no extra preparation needed.

A Brief History

- In 1928, C. V. Raman and K. F. Krishnan **discovered Raman** [1].
- For this finding, C. V. Raman was awarded the **Nobel Prize in physics**.
- In 1930s, Raman was recognized as **nondestructive chemical analysis**.
- In 2004, the novel advanced material, **graphene, first reported in Science** [2].
- Graphene consists of **single molecular layers of highly crystalline graphite**.
- It is the basic structural element of some carbon allotropes, including graphite, carbon nanotubes and fullerenes.

Raman Spectral Information

- Molecular fingerprint** – each molecule and chemical species has its own unique Raman spectrum.
- Allow us to develop databases of known standard that can later be used for **identification or verification of unknowns**.
- Structural information** – every single bands related to a specific vibrational, rotational or low-frequency mode.

Results and Discussion

- Graphene has **excellent properties** to be applied in various areas such as printed electronics, conductive coatings and polymer-based composite fillers [2].
- Graphene** is a **2-dimensional** (2-D) carbon materials, where as **graphite** consist **multi-layer** of carbon materials (Fig. 1).

Fig. 1 Diagram of graphite and graphene materials.



- Looking at this potential, MTEG has developed a method to differentiate the graphite and graphene using Raman spectroscopy.
- There are three bands commonly recorded [3] shown in Fig. 2:
 - D peak (1351 cm⁻¹)**, defect peak;
 - G peak (1586 cm⁻¹)**, graphitic signature of carbon; and
 - 2D peak (2697 cm⁻¹)**, 2nd order disorder mode(2D) for carbon nano material.

- The **ratio I2D/IG** of these bands for **high quality (defect free)** single layer graphene will be seen to be **equal to 2**.

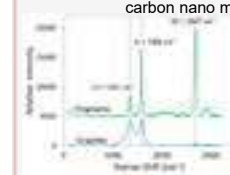


Fig. 2 Raman spectrum of graphite and graphene using 532 nm laser.

Raman Benefits

- Nondestructive technique.
- No sample preparation.
- Performed directly through transparent containers.
- Used for qualitative and quantitative analysis.
- Able to differentiate molecules in chemical species that are very similar.
- Fast analysis times.

Methodology (Renishaw InVia Confocal Raman Spectrometer)



Conclusions

Raman spectroscopy is the best instrument for the **graphene quality** analysis and in specific, this technique **can differentiate** either it is **single, bi-layer or multi-layer carbon materials**.

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How important Raman analysis to characterize carbon materials?



For further information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuklearmalaysia.gov.my
Attn:
Dr. Roshasnorlyza binti Hazan
Materials Technology Group (MTEG)
Industrial Technology Division (ITD)
Tel: +603-89112000 ext. 178
email: roshasnorlyza@nm.gov.my



KESAN PERBEZAAN PENGGUNAAN JENIS ALAS TROLI YANG BERBEZA TERHADAP SINARAN ALUR ELEKTRON KETIKA PENYINARAN SILIKON WAFER

Shahrina Akma Mansur, Siti Zulaiha Hairaldin, Ruzalina Baharin, Mohd Suhaimi Jusoh.

Electron Beam Irradiation Centre (ALURTRON)
Malaysian Nuclear Agency (NUKLEAR MALAYSIA)

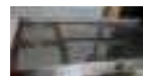
ABSTRAK

ALURTRON merupakan salah sebuah pusat khidmat di Agensi Nuklear Malaysia yang menawarkan khidmat penyinaran alur elektron. Terdapat pelbagai produk yang dihantar ke ALURTRON untuk disinarkan termasuk produk silikon wafer (Si wafer). Produk ini menggunakan hampir 60% masa operasi ALURTRON setiap tahun. Dalam kajian ini, parameter mesin EPS-3000 yang digunakan adalah 3 MeV, 2 mA dengan kelajuan trol 0.94 m/min. Tiga alas trol yang digunakan ialah papan lapis, *wire mesh* dan *stainless steel*. Dos yang digunakan adalah di antara 90 kGy sehingga 110 kGy. Dos bacaan terserap oleh sampel diukur menggunakan dosimeter CTA. Kedudukan dosimeter diletakkan pada kedudukan berbeza A1 & A2. Didapati, bacaan CTA adalah seragam apabila menggunakan *wire mesh* berbanding papan lapis dan *stainless steel*.

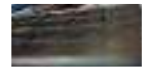
JENIS ALAS TROLI



Alas trol papan lapis



Alas trol wire mesh



Alas trol stainless steel

PENGENALAN

Silikon wafer (Si wafer) adalah antara produk komersial yang disinarkan di ALURTRON, sebuah kemudahan utama yang menyediakan khidmat penyinaran alur elektron. Ia terhasil daripada kristal silikon yang bertindak sebagai substrat dan ditanam di dalam bahan semikonduktor. Tujuan penyinaran dikenakan kepada silikon wafer adalah untuk meningkatkan dan menambah baik konduktiviti elektrik supaya lebih responsif terhadap arus di dalam litar bersepadu. Dari segi aplikasi, silikon wafer digunakan dalam pengeluaran cip dan mikrochip dalam alat elektronik. Objektif kajian ini dilakukan adalah untuk melihat perbezaan tindak balas Cellulose Triacetate (CTA) terhadap sinaran alur elektron apabila menggunakan tiga jenis alas trol berbeza semasa penyinaran sampel. CTA ini merupakan dosimeter yang digunakan di ALURTRON untuk mendapatkan dos bacaan terserap oleh sampel.

PERALATAN



Thermometer infrared



Dosimeter



Pelekat suhu



Pelekat suhu

OBJEKTIF

- Mengkaji kesan dos terserap CTA menggunakan tiga jenis alas trol yang berbeza
- Mengkaji kesan dos terserap CTA pada kedudukan A1 dan A2

METODOLOGI

BAHAN/ PERALATAN	MAKLUMAT
Penentuan suhu	Penunjuk suhu jenis pelekat, Infrared thermometer (IR).
Dosimeter	Film Cellulose Triacetate (CTA)
Pembaca Dosimeter	Mesin UV-VIS Spectronic Genesys 5
Penyinaran	Mesin Electron Processing System (EPS - 3000) (Sinaran Alur Elektron)
Keperluan pelanggan	Dos minimum: 90 kGy Dos maksimum: 110 kGy Suhu: <75 °C
Penentuan parameter	Voltan: 3 MeV, Arus: 2 mA Kelajuan trol : 0.94 m/min Laluan: 20 kGy per laluan

KEPUTUSAN



Kedudukan	A1	A2
Purata	106.2	99.2
Minimum	101.0	97.5
maksimum	111.0	101.0



Kedudukan	A1	A2
Purata	108.2	99.3
Minimum	103.0	94.4
maksimum	114.0	106.0



Kedudukan	A1	A2
Purata	106.6	100.9
Minimum	103.0	98.5
maksimum	111.0	105.0

KESIMPULAN

Ujian telah berjaya dilakukan keatas silikon wafer dengan parameter mesin ialah 3 MeV, 20 MA, dos serapan 100kGy dengan kelajuan 0.94m/min. Ujian ini menggunakan 5 laluan dengan setiap laluan menghasilkan 20 kGy. Hasil daripada kajian ini, didapati bacaan CTA adalah seragam apabila menggunakan *wire mesh* berbanding papan lapis dan *stainless steel*. Keadaan ini membolehkan ALURTRON menukar penggunaan papan lapis kepada *wire mesh* dan *stainless steel*. Hasil daripada kajian ini juga didapati kedudukan CTA pada A2 bacaan yang diterima adalah lebih stabil dan konsisten berbanding kedudukan A1.

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For further Information, please contact:

Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuclearmalaysia.gov.my

Attn: Puan Ruzalina Bt Baharin.
Group: ALURTRON
Division: Bahagian Sokongan Teknikal (BST).
Tel: +603-89112000 ext: 1450
email: ruzalina@nm.gov.my

Agensi Nuklear Malaysia | nuklearmalaysia | Agensi Nuklear Malaysia (NM) | www.nuclearmalaysia.gov.my



TAJUK : PENYENGGARAAN BERKALA ALAT BIO BEAM GAMMA CELL

Mazliah Mohamed Ramlan, Mohd Hazri, Saipo Bahari, Mohd Hafiz Abd Nasir, Shuhaimi Shamsudin, Ghazali Bachok, Mohd Na'quddin Ismail.

PENDAHULUAN

APA ITU ALAT BIO BEAM GAMMA CELL

Kebuk penyinaran Gamma BioBeam GM8000 mula beroperasi sepenuhnya pada 13 Disember 2012. Spesifikasi alat ini telah disesuaikan untuk penyinaran akut sampel biologi termasuk sampel tumbuhan, mikroorganisma, serangga, sel haiwan serta manusia. Bagi kajian biak baka mutasi, penyinaran boleh dibuat ke atas pelbagai sampel tanaman seperti keratan batang, biji benih, bebawang, rizom dan kultur tisru.

Kerja-kerja penyanggaraan berkala perlu dilakukan bagi memastikan alat tersebut dapat berfungsi dengan baik.

OBJEKTIF

- Penyanggaraan Komprehensif telah dilaksanakan di Agensi Nuklear Malaysia dengan tujuan :-
 - Menangani masalah-masalah yang dikenal pasti wujud
 - Memastikan peralatan saintifik/nuklear boleh digunakan sepanjang masa

Bahan dan kaedah:-

- Menjalankan audit untuk mengenalpasti masalah sedia ada
- Menjalankan proses baikpulih untuk membaiki apa-apa kerosakan
- Menjalankan penyanggaraan berkala bagi memastikan alat Bio Beam Gamma Cell dan aksesori berada dalam keadaan sempurna
- Memberi respon yang pantas terhadap setiap aduan kerosakan dan menjalankan proses baikpulih

OPERASI DAN PENJAJAAN

- Memastikan bekalan kuasa pada alat sentiasa berada dalam keadaan baik. (UPS juga sentiasa berkeadaan baik).
- Belt dan gear motor yang digunakan untuk membuka shutter pada alat perlu dalam keadaan baik bagi mengelakkan shutter tersangkut.
- Memastikan semua sensor pada alat menyala dengan baik (warna hijau) sekiranya sensor tidak menyala maka sensor tersebut rosak.
- Memastikan paparan pada skrin berfungsi dengan baik kerana data-data penggunaan alat akan terpapar pada skrin tersebut.

IMPLIKASI / KESAN JIKA TIADA PM

Punca Utama Kerosakan Yang Dikenalpasti	Penyelesaian Yang Digunakan
Kerosakan pada sistem UPS	Menukar set bateri yang baru
Kerosakan pada bahagian belting yang mengeras	Menukar belting
Kerosakan pada bahagian shutter	Menukar bahagian motor
Kerosakan pada bahagian sensor yang tidak menyala.	Menukar sensor yang rosak.

KESIMPULAN

Aktiviti penyanggaraan berkala seperti ini haruslah diteruskan secara konsisten dan untuk tahun seterusnya untuk mendapatkan khidmat yang berkualiti. Ia menjadikan alat yang digunakan akan lebih tahan lama daripada mengalami kerosakan yang kronik.



Aktiviti pembersihan habuk



For further Information, please contact:
Director General
Malaysia Nuclear Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuclearmalaysia.gov.my

Attn: Mazliah Mohamed Ramlan
Group: BST
Division: PIA
Tel: +603-89112000 ext. 1013
email: Mazliah@nm.gov.my

Agensi Nuklear Malaysia | nuklearmalaysia | Agensi Nuklear Malaysia (NM) | www.nuclearmalaysia.gov.my

Pelancaran Padi IS21 20 November 2021

PELANCARAN PADI IS21

NMR 152
VARIETI PADI BAHARU
KERJASAMA ANTARA
Syarikat Haji Md Nor
Bin Haji Abd Rahman (M) Sdn Bhd
dan Agensi Nuklear Malaysia

TEKNOLOGI SINARAN GAMA
NMR 152 adalah varieti padi hasil kajian bersama Agensi Nuklear Malaysia dan Syarikat Haji Md Nor Bin Haji Abd Rahman (M) Sdn Bhd yang menggunakan teknologi sinaran gama untuk menghasilkan padi yang tahan penyakit dan mempunyai daya tahan kepada perubahan iklim. NMR 152 dibangunkan melalui kaedah seleksi mutasi antras ke atas benih padi MR 219 menggunakan teknologi sinaran gama.

CIRI-CIRI PADI NMR 152

POKOK	BER PADI
Ukuran batang 100 x 1.5 inci	Panjang 21.3 inci Lebar 1.75 inci Berat 1900 g

KERINTANGAN
Kerintangan terhadap penyakit dan perosak.

KERINTANGAN PENYAKIT DAN PEROSAK
Kerintangan NMR 152 terhadap penyakit dan perosak.

PRESTASI HASIL
NMR 152 telah diuji di beberapa kawasan di Johor.

Kawasan	Musim	Pendapatan	Hasil	Peratus	Peratus
Johor Bahru (JJB)	2020	100	100	100	100
	2021	100	100	100	100

PELANCARAN PADI IS21

NUCLEAR MALAYSIA AGRONOMY PACKAGE FOR HIGH YIELD RICE PRODUCTION

Registration: 1) PVBT 026/15
2) PVBT 027/15

Authors: Abdul RH, Bobin H, Shamsan S, Masrah M, Phua CCL, Sybil AM, Ahmad Nadya Fauz A, Zahid A, Latifah N, Rozali R, Nori and ARI, Rusli I, Kananudin H, Kananudin AR & Zakiah G

INTRODUCTION

In Malaysia, rice industry has always been a priority based on strategic importance of rice as a staple food commodity. Presently, Self-Sufficiency Level (SSL) rice production in Malaysia is 70%. Average rice production in Malaysia is about 3.4 t/ha. Under National Key Economic Area (NKEA), Ministry of Agriculture has targeted SSL for Malaysia is 100% by the year 2020. Many agencies under different ministry have carried out research to address the national food security issue. Under service rice program all products finding from Nuclear Technology Research which are suitable to be used in rice cultivation has been tested and evaluated. These products generated from field and technical assistance obtained from MORTI and MELA has been identified and consolidated as NUKLEAR MALAYSIA AGRONOMY PACKAGE to increase rice productivity.

ISSUES AND CURRENT SCENARIO

- Current average rice yield of 4.20 t/ha (average 2015)
- Self-Sufficiency Level (SSL) = 70%
- Productivity is still low and unstable
- Ecological and abiotic stress (drought, flood, disease and pests)
- Global climate change has limited the productivity
- Source and water management
- Post-harvest losses of ~ 10 to 30%
- Widely rice and waste
- Quality needs (nutrition and certified)
- Total population by the year 2020 - 35 million

NOVELTY OF INNOVATIVENESS

- High yielding and well performed under aerobic condition
- This Nuclear Malaysia Agronomy Package has increased rice yield up to 30-50%
- The rice plant more vigorous and resistant to blast disease
- Nutrient uptake efficiency is higher
- Increase tiller fertility by the introduction beneficial microbe
- Reduce yield loss during harvesting
- Wider adaptability to diverse condition without negatively effect on yield performance

BENEFITS FROM INNOVATION

- Contribution to Self-Sufficient Level rice production of Malaysia through higher rice productivity
- Increase farmers income without significant increment in production cost as compare to normal practice
- Rehabilitation farmers field through the introduction of beneficial microbe from biofertilizer
- Reduction of chemical residues especially pesticides due to no pest treatment except by biological

COMPARISON BEFORE AND AFTER INNOVATION

BEFORE INNOVATION	AFTER INNOVATION
Yield per hectare = 4.2 t/ha Price for 1 tonne: RM 1,200 x 4.2 t/ha = RM 1,680.00 INCREASE FARMER'S INCOME = RM 2,100.00	Yield per hectare = 5.5 t/ha Price for 1 tonne: RM 1,200 x 5.5 t/ha = RM 1,650.00 INCREASE FARMER'S INCOME = RM 2,100.00
Field Trial at Pematang Raudhah Yield per hectare = 5.2 t/ha RM 1,200 x 5.2 t/ha = RM 1,584.00 RM 1,584.00 x 2.5 t/ha = RM 27,420.00	Field Trial at Pematang Raudhah Yield per hectare = 6.2 t/ha RM 1,200 x 6.2 t/ha = RM 1,656.00 RM 1,656.00 x 2.5 t/ha = RM 27,420.00 INCREASE FARMER'S INCOME = RM 8,448.00 (7 t/ha x RM 1,200.00 x 2.5 t/ha = RM 21,000.00)
Field Trial at Kempong Ulu Ai, Perlis Yield per hectare = 3.5 t/ha RM 1,200 x 3.5 t/ha = RM 4,200.00	Field Trial at Kempong Ulu Ai, Perlis Yield per hectare = 7.2 t/ha RM 1,200 x 7.2 t/ha = RM 8,640.00 INCREASE FARMER'S INCOME = RM 4,440.00 (7 t/ha x RM 1,200.00 x 2.5 t/ha = RM 21,000.00)

Malaysia gets international award

INDUSTRIAL PARTNERS

For further information, please contact:

Dr. Bobin H. Shamsan
Project Leader
Nuclear Malaysia Agronomy Package
Tel: +603-8951 2020 Fax: +603-8951 2020

PELANCARAN PADI IS21

PROSES PEMBAIKBAKAAN VARIETI PADI IS21

PEDIGIRI

Biji benih tersinar ditanam untuk penghasilan benih generasi M₁. Benih generasi M₂ dituai daripada populasi M₁.

20,000 populasi M₂ ditanam di rumah hijau 500 panikel peratus bernas tinggi dipilih setelah dirawat dengan tekanan air minima

- Saringan di sawah (simulasi kekurangan air: kemarau)
- 12 titisan berpotensi dipilih pada generasi M₄
- Saringan ulangan dan Ujian Verifikasi ketahanan kepada kemarau. Dua titisan berpotensi dipilih
- Ujian awal hasil dijalankan
- Pencirian molekul, ujian penyakit dan analisa kualiti beras
- Ujian multilokasi (MLT)
- Ujian penentusahan setempat (LVT)

LOJI PENGELUARAN BENIH ASAS DAN PENYELIDIKAN PADI

Untuk keterangan lanjut hubungi:

Ketua Pengarah
Kementerian Pertanian
Bangsa, 40000 Kajang
Selangor

Untuk Penjualan
Dr. Bobin H. Shamsan
Bahagian Agroteknologi dan Bioproses
tshamsan@nuklearmalaysia.gov.my

JANGAN TERIMA JIKA KAMPIT ROSAK



BENIH PADI SAH



IS21

20 KG
Berat Bersih



Agensi Nuklear Malaysia
Bangi, 43000 Kajang,
Selangor

Tel: +603 8911 2000 | Fax: +603 8911 2175
<http://www.nuclearmalaysia.gov.my>

JANGAN TERIMA JIKA KAMPIT ROSAK



BENIH PADI DAFTAR



IS21

20 KG
Berat Bersih



Agensi Nuklear Malaysia
Bangi, 43000 Kajang,
Selangor

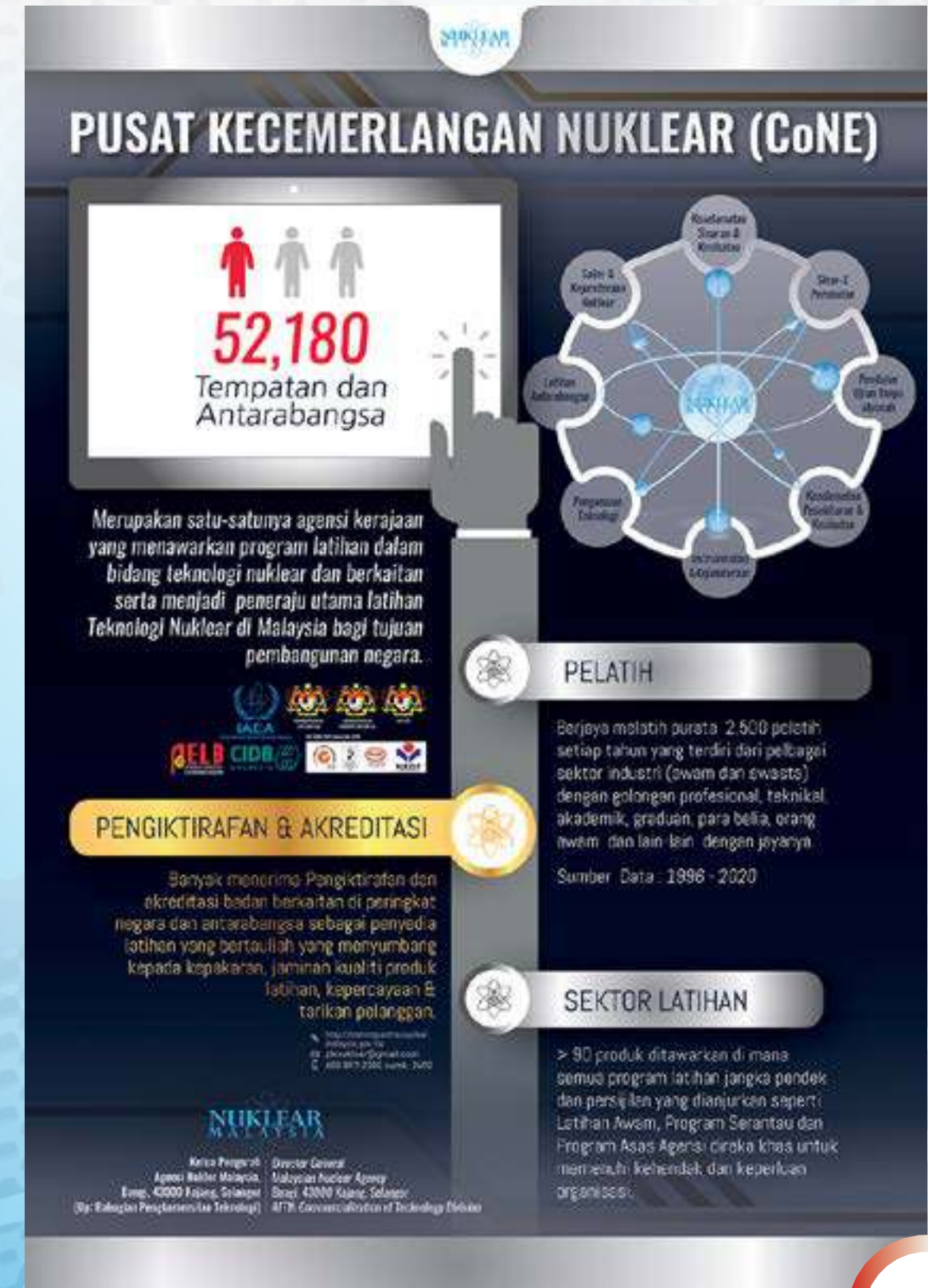
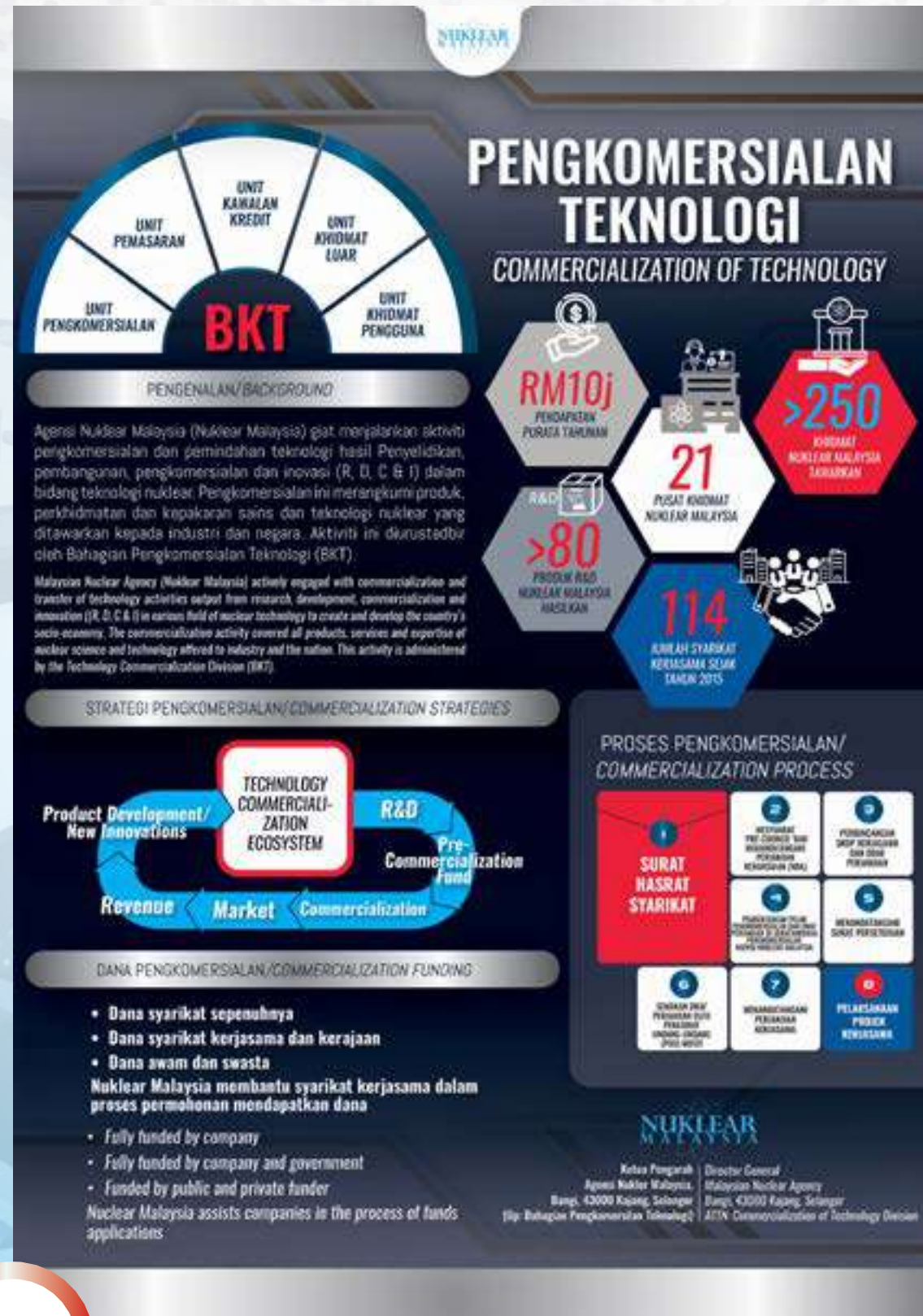
Tel: +603 8911 2000 | Fax: +603 8911 2175
<http://www.nuclearmalaysia.gov.my>

PELANCARAN PADI IS21



Selangor
*International
Expo (SIE)*

18-21 November 2021



EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

Lembay(UV)ng

Ultraviolet Germicidal Irradiation Box

A series of UVGI box prototype was developed by Malaysian Nuclear Agency for rapid disinfection of PPE (personal protective equipment) at hospitals. It was initially meant to overcome the issue of PPE shortage at hospitals in Malaysia during the early Covid-19 outbreak in April 2019. The shortage triggered the need to make critical PPE's such as N95 face mask reusable.

The prototype which is dubbed as Lembay(UV)ng, is designed with a mask holder and equipped with top and bottom UV-C lightings for quick 5-minute disinfection. The holder can be fitted with wire mesh for disinfection of other tools and small items. At the moment, there are two available sizes (35L and 73.5 Liter capacity) for portability.

Realiable bacterial & fungal inactivation

Commercial product

Easy to Use

- User can simply place the PPE or other small item into the box
- Turn the switch On
- Wait for 5 minutes
- The PPE is then safe & ready to use.

Benefits

- Easy to operate
- Lightweight and portable
- Quick 5-minute disinfection
- Reliable bacterial & fungal disinfection with two UV-C lamps top & bottom
- Affordable design.
- Low ozone release
- Can be used for personal usage or offices

For more information, kindly contact:

Director General, Malaysian Nuclear Agency (Bangi, 43000 Kajang)

ADP, Radiation Processing Technology Division

EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

CYCLOTRON

FOR NUCLEAR MEDICINE APPLICATIONS

Pet Radiol isotopes

Therapeutic Radiol isotopes

SPECT Radiol isotopes

Cyclotron is a particle accelerator used to produce radioactive materials for use in medicine, agriculture and industry. In medical applications a cyclotron can produce radioactive materials called **RADIOPHARMACEUTICALS**.

RADIOPHARMACEUTICALS are radioactive compounds or drugs used in nuclear medicine for the diagnosis and treatment of diseases.

A medium energy cyclotron is capable of producing radiopharmaceuticals that suits the needs of the population. Current local capacity is limited in the energy of the machine and the type of radiol isotopes produced.

Do you...

know that one in four Malaysians is likely to develop cancer by the time they reach the age of 75?

1 in 5

3.5 million

4 in 10

3 in 10

Most Common Cancers Among Malaysian Women

Breast Cancer 21.1%

Colon Cancer 6.9%

Endometrial Cancer 11.1%

Cervical Cancer 7.4%

Lung, Trachea & Bronchus Cancer 8%

Most Common Cancers Among Malaysian Men

Prostate Cancer 14.4%

Liver Cancer 3.8%

Stomach Cancer 3.4%

Bladder Cancer 3.4%

Testis Cancer 3.4%

Growing market for nuclear medicine products in Malaysia

For more information, kindly contact:

Director General, Malaysian Nuclear Agency (Bangi, 43000 Kajang)

ADP, Medical Technology Division

54

Refleksi

55

Refleksi

**EXHIBITION
OF NUKLEAR
MALAYSIA
PRODUCTS &
SERVICES**

Medical Technology Division PRODUCTS




Sodium Iodide I-131 capsules



- Sodium I-131 (I-131) is taken orally either in the form of pills or as liquid sodium iodide (NaI I-131)
- Iodine iodide is a radiopharmaceutical containing the beta and gamma emitting radionuclide I-131 with a half-life of 8 hours
- Dose – 50C (April 2006)
- Capsule – 30C (April 2010)

Usage of I-131 capsules

- Radioactive sodium Iodine caps. (I-131) for the treatment of disorders related to the thyroid gland.
- Thyroid disorders include hyperthyroidism, goitre, hypothyroidism and thyroid cancer.
- Hypertension from radioactive iodine will restore hyperactive thyroid gland cells and restore its function.
- Locate I-131 uptake by the thyroid gland hence doctors identify thyroid issues.

Benefits of I-131 capsules

- Easy to handle.
- Involves minimum risk of radioactive leakage during treatment.
- Easy to swallow.
- Reduce radiation exposure to medical personnel.

Radioisotope Samarium-153





- The radioisotope Samarium-153 is related with the carrier EDTMP to form the ethylenediaminetetramethylene phosphonate (EDTMP)-¹⁵³ethylenediaminetetramethylene phosphonate acid, Samarium-153 (EDTMP-Sm-153).
- Sm-153 acts as a palliative agent for bone pain where it enters body, take particles and gamma rays.
- The beta particles with an average energy of 0.23 MeV prevent injury against bone metastasis from reaching the brain thus preventing the brain from releasing pain signals.
- The gamma energy of 103 KeV is suitable enough to be detected using a gamma camera.
- (Beta – Pain relief)
(Gamma – Bone imaging)

Usage of Radioisotope Sm-153

- Sm-153 is indicated for relief of pain in patients with metastatic bone lesions.
- Pain alleviation by Sm-153 delivers effective radiation dose to the bone metastases with minimal effect to the surrounding healthy tissue.

Benefits of Radioisotope Sm-153

- Rapid delivery of radiation dose.
- Rapid clearance from the body.
- Improve patient's quality of life.

Ethylenediaminetetramethylene Phosphonic Acid (EDTMP) Kit






- Ethylenediaminetetramethylene phosphonic acid (EDTMP) in the form of freeze-dried kit (plate and syringe free) is a radiopharmaceutical which can be used to relieve pain.
- This kit is suitable for the convenient one-day preparation of ¹⁵³Gd-EDTMP.

Usage of EDTMP Kit

- EDTMP is selectively uptake at musculoskeletal tissue and primarily helps at osteogenic foci lesions.
- When the radioisotope Sm-153 is complexed with EDTMP and administered, the ¹⁵³Gd-EDTMP will localize in the lesion.
- The beta emitting radionuclide is able to provide pain relief and the gamma emission allows for bone imaging.
- (Beta – Pain relief)
(Gamma – Bone Imaging)
- The pain can be extremely excruciating which significantly affects the patients' quality of life.

Benefits of EDTMP Kit

- Easy and convenient handling.
- Simple and pyrogen-free.
- High stability with good shelf life.

Peranan: Director General
Majlis Nuklear Agency
(Bangi, 43000 Kajang)

MAMPU
Tn. Dr. Muzal Razip bin Ali
Medical Technology Division
mailto:mamtu_razip@nuklearmalaysia.gov.my

Medical Technology Division

EXHIBITION
OF NUKLEAR
MALAYSIA
PRODUCTS &
SERVICES

**QUALITY CONTROL TESTING OF
RADIOISOTOPE AND
RADIOPHARMACEUTICAL PRODUCTS**



SUKSES

TYPE OF TESTING

Radioisotopes and radiopharmaceuticals are used in nuclear medicine for the diagnosis and therapy of human diseases especially in cancer and cardiovascular diseases. Quality control and quality assurance are crucial prerequisites.

Radiopharmaceutical products that has not undergone quality control testing is unsafe and may give erroneous information about the patient's condition leading to inappropriate determination of therapy. Furthermore, it could lead to excess radiation exposure to non-targeted tissues and reduced efficacy. This highlights the importance of quality control testing in ensuring that all radiopharmaceuticals are safe and effective.

Physical & Chemical Tests



Radiochemical Tests



Microbiology Tests



For more information,
contact us at:

Director General
Ministry of Health
Bangi, 43000 Kajang

Attn:
To: Dr. Mohd. Kader bin Ali
Medical Technology Division
mtdm_rtdm@nuklearmalaysia.gov.my

EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

RADIATION IN STERILIZATION OF MEDICAL PRODUCT

Radiation kills germs that can cause disease and neutralizes other harmful organisms. Sterilization with ionizing radiation inactivates microorganisms very efficiently and, when used for product wrapping, ensures that healthcare products are safe and can be relied upon.

Ionizing Irradiation

Radioactive Isotope

- Gamma rays
- Most Popular
- Simple, Easy to Control
- Widely Applicable

Electron Beam Accelerator

Electron beam machine (E-Beam)

- Short Treatment Time
- High Dose Rate
- No Waste Products

X-rays machine (X-Ray)

- High Depth Penetration
- Good Dose Uniformity Rate

Advantages of Ionizing Irradiation

- High penetrating power:** products can be processed in their fully sealed, final packaging thus limiting the risk of contamination following sterilization.
- Rapidity of action:** saves time and efforts.
- Temperature is not raised:** compatible with temperature-sensitive materials, such as pharmaceuticals and biological samples.
- Flexibility:** can sterilize products of any phase (gaseous, liquid, or solid materials), density, size, or thickness.

Non-Ionizing Irradiation

Infra-Red

Ultraviolet Light

Non-ionizing radiations are quite lethal but do not penetrate glass, dirt, films, water, hence their use is restricted for disinfection of clean surfaces in operation theaters, laminar flow hoods as well as water treatment. The recommended dose is 250-300 nm wavelength, given for 30 minutes.

For Further Information, please contact:

Director General
Malaysian Nuclear Agency
Bangi, 43000 Kajang

AGP
Manager
MINTec-SINAGAMA
Technical Support Division

EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

Technical Support Division
IRRADIATION SERVICE CENTER MINTec-SINAGAMA

MINTec-SINAGAMA

Nuclear Malaysia started projects on radiation processing of various products using gamma irradiation in January 1985. MINTec-Sinagama irradiation plant operates on J30000 DR-250 which is able to irradiate various products requiring different doses simultaneously. MINTec-Sinagama is certified with MS ISO 9001:2008 and ISO 14001:2005.

Initially designed as a multi-purpose pilot facility for research and development purposes, the plant activities later diversified to offer services to the public and private enterprises, as in the following:

- 1. Sterilization of medical products and packaging materials
- 2. Decontamination of food, pharmaceuticals, herbs and animal feeds
- 3. Disinfection of insects in agricultural commodities, including for quarantine purposes
- 4. Samples for R&D purposes

FACILITY LAYOUT

LOADING AREA, UNLOADING AREA, CONTROL CONSOLE, SOURCE STORAGE POOL, SOURCE HOIST, SOURCE AND CONVERTER, RADIATION ROOM, MONITOR BUILDING

PRODUCT IRRADIATION SERVICES:

- Sterilization of Medical Devices, Packaging Materials & Laboratory Supplies
- Sterilization of Pharmaceutical Products
- Veterinary Products
- Food, Herbs & Spices
- Cosmetics Products

How does product irradiation work?

Unirradiated product

The ionizing energy passes completely through the product to kill spore and disease causing microorganisms with minimal temperature rise

Irradiated products remain intact with no radioactive or chemical residue

For Further Information, please contact:

Director General
Malaysian Nuclear Agency
(Nuclear Malaysia)
Bangi, 43000 Kajang,
SELANGOR, MALAYSIA

AGP
Mr. Abuamrullah bin Abdul Wahab
Irradiation Service Center
MINTec-SINAGAMA
Technical Support Division

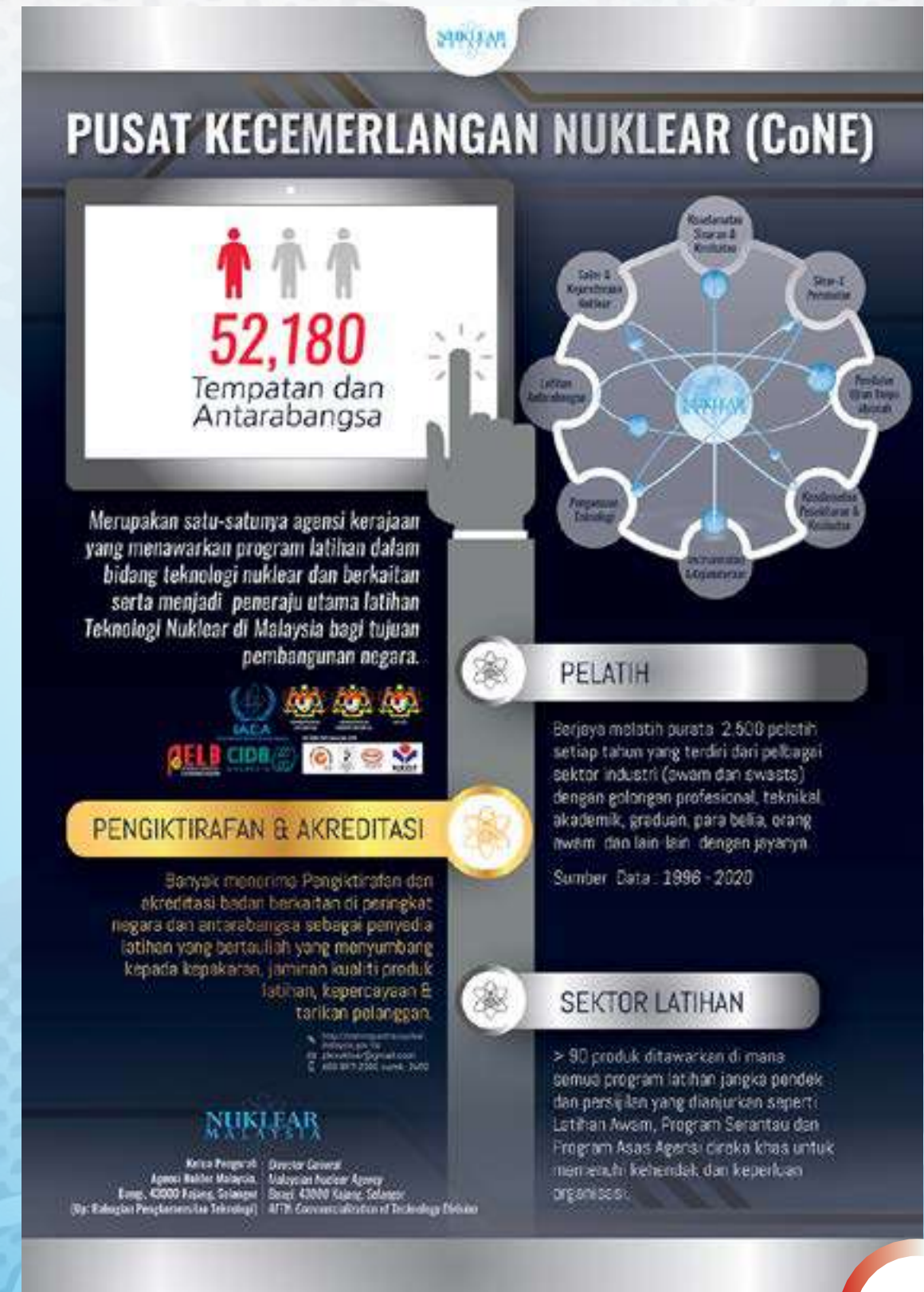
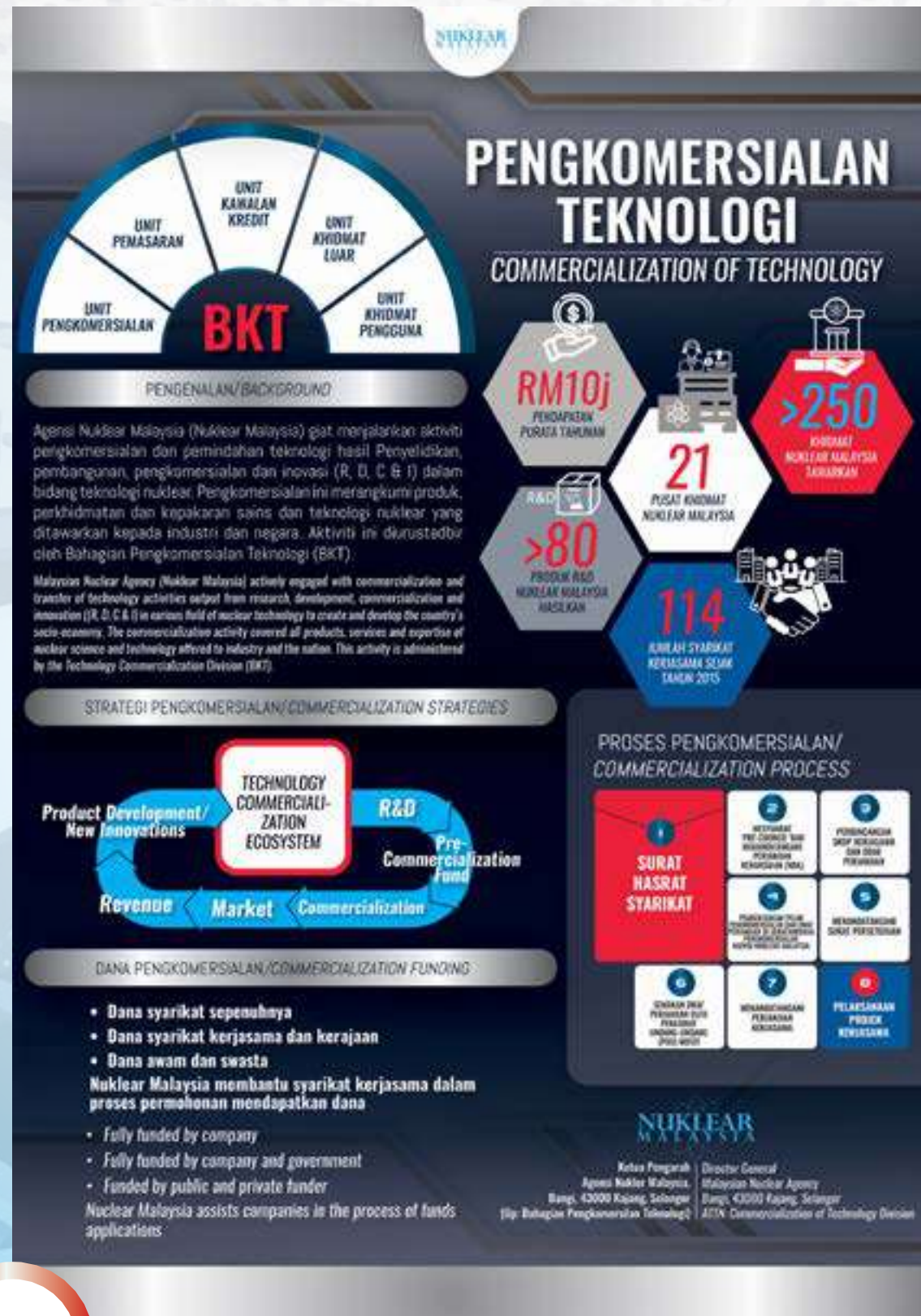
Tel: +603-8977 2100
Fax: +603-8977 2175
E-mail: abamrullah@nukleam.gov.my

SELANGOR *INTERNATIONAL EXPO*



Pameran
Sehenti *Human
Resource
Development
Fund* (HRDF)

2 Desember 2021



EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

Medical Technology Division PRODUCTS

Sodium Iodide I-131 capsules



- Sodium I-131 is taken orally either in the form of pills or liquid sodium iodide (NaI I-131).
- Sodium Iodide is a radiopharmaceutical containing the beta and gamma emitting radioisotope I-131 with a half-life of 8 hours.
- Dose: 150mCi (5.55GBq).
- Gamma: 364 keV (20%).

Usage of I-131 capsules

- Radioactive sodium iodide (NaI I-131) for the treatment of diseases related to the thyroid gland.
- Thyroid diseases include hyperthyroidism, goitre, hypothyroidism and thyroid cancer.
- Hyperthyroidism: sodium iodide will destroy hyperactive thyroid gland cells and restore its function.
- Sodium I-131 is used by the thyroid gland to absorb iodine, thereby restoring thyroid function.

Benefits of I-131 capsules

- Easy to handle.
- Effective treatment of radioactive iodine therapy treatment.
- Easy to swallow.
- Effective treatment compared to medical personnel.

Radioisotope Samarium-153



- The radioisotope Samarium-153 is labeled with the carrier EDTMP to form the radioisotomous compound Samarium-153 ethylenediaminetetramethylene phosphonic acid (Samarium-153 EDTMP).
- Sm-153 acts as a palliative agent for bone pain where it emits beta particles and gamma rays.
- The beta particles with an average energy of 0.23 MeV prevent rapid spread from reaching the brain thus preventing the brain from receiving pain signals.
- The gamma energy of 103 keV is a low energy imaging to be used using a gamma camera.
- (Beta – Pain relief)
(Gamma – Bone imaging).

Usage of Radioisotope Sm-153

- Sm-153 is indicated for relief of pain in patients with metastatic bone lesions.
- Tissue penetration by Sm-153 delivers effective radiation dose to the bone lesions with minimum effect to the surrounding healthy tissue.

Benefits of Radioisotope Sm-153

- Rapid delivery of radiation dose.
- Rapid clearance from the body.
- Improve patient's quality of life.

Ethylenediaminetetramethylene Phosphonic Acid (EDTMP) Kit



- Ethylenediaminetetramethylene phosphonic acid (EDTMP) in the form of kit (vial and syringe) is a radiopharmaceutical which can be used to relieve pain.
- This kit is suitable for the convenient one-step preparation of 153Sm-EDTMP.

Usage of EDTMP Kit

- EDTMP is specifically suitable at metastasized lesion and primarily higher at cancerous bone lesions.
- When the radioisotope Sm-153 is complexed with EDTMP and administered, the 153Sm-EDTMP will localize in the bone.
- The beta emitting radioisotope is able to provide pain relief and the gamma emission allows for bone imaging.
- (Beta – Pain relief)
(Gamma – Bone imaging).
- The pain can be extremely excruciating which significantly affects the patient's quality of life.

Benefits of EDTMP Kit

- Easy and convenient handling.
- Stable and pyrogen-free.
- High stability with good shelf life.

For more information, kindly contact:
Director General
Malaysian Nuclear Agency
Bangi, 43000 Kajang

Attn:
Ts. Dr. Mohd Ruzdi bin Ali
Medical Technology Division
mohd_ruzdi@nuklearmalaysia.gov.my

EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

Medical Technology Division

QUALITY CONTROL TESTING OF RADIOISOTOPE AND RADIOPHARMACEUTICAL PRODUCTS

TYPE OF TESTING

Radiopharmaceutical products that has not undergone quality control testing is unsafe and may give erroneous information about the patient's condition leading to inappropriate determination of therapy. Furthermore, it could lead to excess radiation exposure to non-targeted tissues and reduced efficacy. This highlights the importance of quality control testing in ensuring that all radiopharmaceuticals are safe and effective.

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For more information, kindly contact:
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Bangi, 43000 Kajang

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Medical Technology Division
mohd_ruzdi@nuklearmalaysia.gov.my

EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

CYCLOTRON FOR NUCLEAR MEDICINE APPLICATIONS



Pet Radiol isotopes

SPECT Radiol isotopes

Therapeutic Radiol isotopes

Cyclotron is a particle accelerator used to produce radioactive materials for use in medicine, agriculture and industry. In medical applications a cyclotron can produce radioactive materials called **RADIOPHARMACEUTICALS**.

RADIOPHARMACEUTICALS are radioactive compounds or drugs used in nuclear medicine for the diagnosis and treatment of diseases.



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Do you...
know that one in four Malaysians is likely to develop cancer by the time they reach the age of 75?

Most common cancers among Malaysian women

Breast Cancer	31.1%
Colorectal Cancer	6.9%
Endometrial Cancer	11.4%
Cervical Cancer	7.6%

Most common cancers among Malaysian men

Colorectal Cancer	18.6%
Prostate Cancer	14.4%
Lung, Trachea & Bronchus Cancer	14.4%
Neuroendocrine Cancer	8.4%

Growing market for nuclear medicine products in Malaysia

Nuclear medicine imaging is highly sensitive and specific and can help with **EARLY DETECTION** for **BETTER TREATMENT OUTCOME**.

3 in 5 patients with early detection of cancer have a better chance of survival.

4 in 10 patients with early detection of cancer have a better chance of survival.

3 in 10 patients with early detection of cancer have a better chance of survival.

For more information, contact: **Dr. Mohd Ridwan Ali**, Medical Technology Division, mohd_ridwan@nuklearmalaysia.gov.my

EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

Lembay(UV)ng

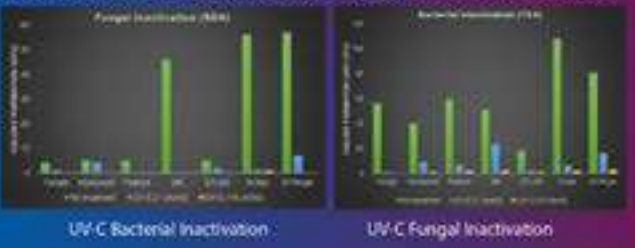
Ultraviolet Germicidal Irradiation Box



A series of UVGI box prototype was developed by Malaysian Nuclear Agency for rapid disinfection of PPE (personal protective equipment) at hospitals. It was initially meant to overcome the issue of PPE shortage at hospitals in Malaysia during the early Covid-19 outbreak in April 2019. The shortage triggered the need to make critical PPE's such as N95 face mask reusable.

The prototype which is dubbed as Lembay(UV)ng, is designed with a mask holder and equipped with top and bottom UV-C lightings for quick 5-minute disinfection. The holder can be fitted with wire mesh for disinfection of other tools and small items. At the moment, there are two available sizes (35L and 73.5 Liter capacity) for portability.

Reliable bacterial & fungal inactivation



UV-C Bacterial Inactivation

UV-C Fungal Inactivation

Commercial product



Easy to Use

- User can simply place the PPE or other small item into the box
- Turn the switch On
- Wait for 5 minutes
- The PPE is then safe & ready to use.

Benefits

- Easy to operate
- Lightweight and portable
- Quick 5-minute disinfection
- Reliable bacterial & fungal disinfection with two UV-C lamps top & bottom
- Affordable design.
- Low ozone release
- Can be used for personal usage or offices

For more information, contact: **Dr. Mohd Ridwan Ali**, Medical Technology Division, mohd_ridwan@nuklearmalaysia.gov.my

For more information, contact: **Dr. Mohd Ridwan Ali**, Medical Technology Division, mohd_ridwan@nuklearmalaysia.gov.my



Technology Preview & Showcase (TPS)

13-14 Disember 2021

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

FUTURE PINEAPPLE LEAVES PAPER

PRODUCT DESCRIPTION
Deformation issues were increased drastically every year especially in order for production of paper. The supply of paper nowadays is all depends on the wood. This experiment has been conducted to analyse the viability of pineapple leaves paper as replacement for paper production and to analyse the morphology properties of pineapple leaves fiber. Besides, the introduction of the filler in this pineapple leaves paper will improve the structure of the paper. This will give more beneficial to reduce the use of wood for making pulp and one the effect towards green technology.

NOVELTY
The Magnetic Pineapple leaves paper is developed to introduce new innovation in paper making production especially for paper mill industries by replace the uses of wood material into another material that cannot effect the environment and have the carbonless source.

USEFULNESS
This product is to provide the replacement for the use of wood fiber as paper and the non-wood fiber which is pineapple leaves fiber that in fact contain of higher lignocellulose fibers which is act as source of pulp and lower the environmental consequences like that wood. Besides, it can reduce environmental problem such as logging issues for paper making production and open burning caused by the burning of the agriculture waste.

ENVIRONMENTAL FRIENDLINESS
Reduce the uses of wood material and can reuse the source of the magnet by recycling the old magnet.

COMMERCIALIZATION POTENTIAL
Craft Industries, Printing Paper Industries, Food Wrapping and writing paper industries. Commercial capability for seed and fiber production.

RESULT
SURFACE MORPHOLOGY OF THE IRRADIATED MAGNETICS PINEAPPLE LEAVES PAPER. SURFACE MORPHOLOGY OF THE NON-IRRADIATED MAGNETICS PINEAPPLE LEAVES PAPER. EFFECT OF IRRADIATION IN MAGNETICS AND NON-MAGNETICS PINEAPPLE LEAVES PAPER.

PUBLICATIONS & AWARDS

TECHNOLOGY PREVIEW & SHOWCASE
NUCLEAR MALAYSIA 2021

Metroxylon S coat
INNOVATIVE AND ECOFRIENDLY NEW PHARMACEUTICAL AND NUTRACEUTICAL FILM-COATING

INTRODUCTION
 Metroxylon S Coat is a new film coating for pharmaceuticals and nutraceuticals tablets invented from local Metroxylon sagu (sagu) polysaccharide. Metroxylon S Coat will be used in pharmaceutical and nutraceutical industry as tablet coating material for various purposes such as taste masking, tablet identification, tablet stability, tablet protection, and etc. Metroxylon S Coat formulation is innovated by the addition of polyvinylpyrrolidone, a water soluble polymer in order to reduce film brittleness and to enhance product endurance. Metroxylon S Coat is invented in a pre-mixed ready-to-use form to shorten coating process time. The source of Metroxylon S Coat will reduce cost of tablet coating material because the product is made from local natural sources, where the price is very cheap compared to commercial tablet coating material. The extended shelf life and stability is 94%. In addition, introduction of gamma-irradiation to Metroxylon S Coat will ensure the stability of the product.

PROJECT OBJECTIVE
 To invent an aqueous based film coating material from natural resources for pharmaceutical and nutraceutical tablet through innovative modification

NOVELTY
 Natural-based and eco-friendly new tablet coating system for pharmaceutical and nutraceutical use

ADVANTAGES OF METROXYLON S COAT

- Improves taste of formulation**
 - Pleasant taste
 - Reduces bitterness
 - Reduces unpleasant taste
- Low level toxicities and easily processed**
 - Easy and fast operation
 - Simple handling
- Improves stability**
 - Reduces oxidation
 - Reduces moisture
- Ready to use formulation**
 - Ready to use
 - Easy to use

Uses of Metroxylon S coat

- Taste and odor masking
- Tablet protection
- Regulate drug release
- Tablet identification
- Ensure stability

Potential user

- Pharmaceutical Industries
- Nutraceutical Industries
- Health Industries
- Academic and Research Institutes
- Oral tablet users

ECONOMY AND SOCIAL IMPACT

- Improve quality of life of people with chronic diseases
- Generation of revenue through licensing of intellectual property
- Increase agriculture productivity & revenue
- Promote growth in pharmaceutical industries
- Improve safety among workers in pharmaceutical industries
- Reduce the volume of land through reduction of imported conventional products

MARKET POTENTIAL

Global Tablet Coatings Market

The growing of global tablet coating industry is driven by rising demand from pharmaceutical sector and advancing technology in medical. Currently, COVID-19 pandemic has increase the demand of the pharmaceuticals tablet, which in turn increased the demand of coating technology industry.

REAKTOR TRIGA PUSPATI (RTP): LUTETIUM (Lu-177) PRODUCTION FOR CANCER DIAGNOSTIC AND THERAPY

TEAM MEMBERS

Dr. Azharin Keshabali¹

Dr. Julia Abdul Karim²

Wan Anwar Wan Awang³

Mohamed Zaffer Ali
Amirudine⁴

Abi Muttakin
Jalal Ilayaz⁵

Ridwan Abdul Mutalib⁶

INTRODUCTION

Since 1982, RTP with maximum power 1 MW_{th} has been in operation as a neutron source to produce various radioisotopes for medical and industrial applications. Lutetium-177 radioisotope labelled with DOTANOC is a new in-house process and procedure developed for cancer diagnostic and therapy. Lu-177 is a Beta emitting radionuclide that decays with a half-life of 6.65 days that can be produced in nuclear reactor by following reaction:

$$\text{Lu-176} \xrightarrow{\text{Direct Route}} \text{Lu-177} \rightarrow \text{Lu-177m}$$

(Lu_2O_3) 6.7 days 140 days

Lu-177 Irradiation

Lu-176 is irradiated at 750kW thermal power.

At this condition, neutrons are produced from the Uranium-235 fission reaction at the reactor core.

Duration of irradiation depends on the desired activity of Lu-177

Irradiation Number	Irradiation time (h)	Location	Cooling time (h)	Amount of Lu-177 activity (mCi) after location time
1	12	BT	4	10.3
2	48	Cadex	24	496

Lu-177 Preparation

5mg of high enrich Lu_2O_3 is used

Dissolved in 1M HNO_3 and dried in oven

Sample in quartz ampoule container

Encapsulated in aluminum capsule

Lu-177 Loading to RTP

The aluminium capsule is carefully loaded into the irradiation hole inside the reactor core using a special handling tool.

Lu-177 Product Unloading

Irradiated Lu-177 is cooled down for more than 4 hours after reactor shut down to allow the radiation level decrease to a manageable level before it is moved out from the reactor.

Irradiated Lu-177 is placed in a shielded transfer cask and transported to the medical laboratory for further processing before delivery to the hospital.

Caution: Only radiation workers can perform this activities and all radiation protection procedures are implemented for personnel radiation safety.

TECHNOLOGY
PREVIEW & SHOWCASE
NUCLEAR MALAYSIA 2021

Nuclear STE
Enriching
Resilience in
Time of Crisis

For further information, please contact:
Director General,
Malaysian Nuclear Agency
Nuclear Technology
Sector, 61000 Kuala Lumpur

Dr. Julia Abdul Karim
Senior Lecturer/Manager
Nuclear Technology Sector
Email: julia@nma.gov.my

Tel: +603-8951 0251
Fax: +603-8951 2056

TECHNOLOGY PREVIEW & SHOWCASE (TPS)



HYDROMAC ADSORBENT FROM TILAPIA FISH SCALE FOR WATER TREATMENT

DR. MINN SULIZA MUHAMMAD¹, MOHAMMAD AMAN AFIZ ARIFAN², TS. DE LEE TO CHUAN³
¹Faculty of Engineering Technology, ²Faculty of Technology Management & Business,
³Universiti Tun Hussein Onn Malaysia (UTHM)





PRODUCT DESCRIPTION

✓ Hydroxypatite macrocomposite (HYDROMAC) adsorbent [1.4x1.4 cm cube] is made from tilapia fish scale mix with cement and water.

✓ The hydroxypatite (HAP) is extracted from tilapia fish scale by grinding and calcination process.






NOVELTY & INVENTIVENESS

 New findings and knowledge on the characteristics and performances of HYDROMAC adsorbent.

 Research on the comparison of sand filter process with and without HYDROMAC adsorbent provide good fundamental knowledge for future studies.

 HYDROMAC adsorbent practices Waste-to-Wealth concept.

 In comparison to the activated carbon adsorbent, the production of HYDROMAC from waste material of fish scales are more economical & low cost.

USEFULNESS/BENEFIT TO SOCIETY

✓ CSR project for groundwater treatment of tube well in Kampung Orang Asli Kangkar Senangar, Parit Sulong, Batu Pahat in collaboration with Pejabat Daerah Muar.

✓ Remove 40-80% of contaminants in groundwater.

✓ Produce high quality and palatable water for indigenous community in Kangkar Senangar.

✓ Enhance national water security.

COMMERCIALISATION POTENTIAL

HYDROMAC is a low cost, easy to produce, environmentally friendly and sustainable adsorbent.

HYDROMAC is a potential adsorbent that can be proposed to waterworks company in Malaysia to be use along other treatment processes in the water treatment plant.

HYDROMAC can be incorporate with sand filter made to be commercialised as hybrid filter-adsorbent system.

BENCHMARKING

Material	Pure	Chemicals	Advertisement
Activated carbon (Granular)	RM 104/kg	Pheng Sion Malaysia Sdn Bhd	Art separation industry (chemicals)
Sludge gel	RM 25/kg	Century Chemical Works Sdn Bhd	Food packing, Nutrition, Nutrition, pharmaceutical, etc
Zeolite adsorbent	RM 93/kg	Green Malaysia Sdn Bhd	Oil Adsorbent material
Activated carbon (powder)	RM 50/kg	Century Chemical Works Sdn Bhd	Food, water, water treatment, etc.
Chitosan waste adsorbent	RM 27/kg	SVZ Zaidin	Industrial environments (food, gas and heavy metals)
HYDROMAC adsorbent	RM 13/kg	UTHM	Water treatment

POTENTIAL INDUSTRY PARTNER

✓ Waterworks industry: SAJ Sdn Bhd, SKKBAS, SADA, etc.

✓ Adsorbent company: Century Chemical Works Sdn Bhd

✓ Water dispenser company: PureGen water Sdn Bhd

✓ Waste management industry: Cenviro Sdn Bhd and SWM Environment Sdn Bhd

COPYRIGHT

✓ Title of work: Nanosized Hydroxypatite (HAP) Adsorbent Synthesized from Tilapia Fish Scale Waste for the Removal of Lead in Tap Water

✓ Copyright no: CREY0005588

GRANT RECEIVED

✓ TIER1: Application of Hydroxypatite (HAP) Nanopowder from Fish Waste as Potential Adsorbent for the Removal of Lead in Drinking Water (H213), RM 20,000, UTHM.

✓ GPPS: Removal of Nickel in Drinking Water by Hydroxypatite (HAP) Adsorbent Made from Fish Waste (H337), RM 20,000, UTHM.

✓ GPPS: Natural Hydroxypatite Adsorbent Extracted from Tilapia Fish Scale for the Removal of Chromium (VI) in Water (H596), RM 25,000, UTHM.

PUBLICATION

✓ A Review on Lead Sources, Determinants, Health Effects, and Treatment by Hydroxypatite (HAP) Adsorbent (2019), Suhair Omar, Minn Suliza Muhammad, Lee To Chuan, et al. *Water, Air & Soil Pollution*, Springer, 230(12), 1-21 (2021), P: 2,579.

✓ Effect of Hydroxypatite (HAP) Adsorbent (Gongg) Towards Lead Removal (2020), Suhair Omar, Minn Suliza Muhammad, et al. *International Journal of Emerging Trends in Engineering Research*, WARE, 8(1), 201-205 (Scopus Index).

✓ Response Surface Methodology for Optimization of Sodium Sulphate and Sodium Lauryl Sulphate Removal using Hydroxypatite Adsorbent (2020), Minn Suliza Muhammad, Muhammad Ridwan Johar, et al. *Proceeding Progress in Engineering Application And Technology*, UTHM, 127, ISBN:27773303.

✓ Application of Hydroxypatite (HAP) Nanopowder from Fish Waste as Potential Adsorbent for the Removal of Lead in Drinking Water (2019), Minn Suliza Muhammad, Nur Harnani Abdul Hamid, Nurhishah Mohamed Sunar, et al. *Book chapter Advanced Technology Centre Research and Innovation Series 2*, UTHM, 92, ISBN:978-967-2306-50-4.

PRODUCT PHOTO



From waste
(Tilapia fish scale)
to wealth





HYDROMAC
adsorbent

RECOGNITION

✓ Gold Medal Award, Application of Hydroxypatite (HAP) Nanopowder from Fish Waste as Potential Adsorbent for the Removal of Lead in Drinking Water, The International Research and Symposium and Exposition (IRSE) 2019, Universiti Tun Hussein Onn Malaysia.

✓ Gold Medal Award, Application of Hydroxypatite (HAP) Nanopowder from Fish Waste as Potential Adsorbent for the Removal of Lead in Drinking Water, Research & Innovative Technology Convention (RITC) 2019, Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia.

STATUS OF PRODUCT

Status of product = TRL 6: The developed HYDROMAC has been tested in laboratory scale column study for its performance as adsorbent.




TECHNOLOGY VIEW & SHOWCASE

DATE: 2021

Dr. Minn Suliza Muhammad,
 Faculty of Engineering Technology,
 Universiti Tun Hussein Onn Malaysia
 Kampus Pengerang, 86000 Pengerang

Dr. Minn Suliza Muhammad,
 Faculty of Technology Management & Business,
 Universiti Tun Hussein Onn Malaysia
 Kampus Pengerang, 86000 Pengerang

TS. De Lee To Chuan,
 Faculty of Engineering Technology,
 Universiti Tun Hussein Onn Malaysia
 Kampus Pengerang, 86000 Pengerang

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

By M.A.F. Othman, F.M.Ting, S.Seminarasamy,
M.A. Shukri, N. Idris
Malakoff Technology Division

Anticipated Technique for the Preparation of Essential Oil Based Functionalized Materials

Product: Car air-conditioning filter

Varieties of essential oils can be grafted onto the cotton wick.

Catridge

Clip

Grafted cotton roll

Innovation & Novelty

Safe

Free from any synthetic and harmful chemicals. Which itself naturally contains between 95% and 12% formalin, which can be alternative to alcohol/other solvent.

Simple

The simple method offers easy adaptation in the industry that will be a starting point for utilization of high end technology in Malaysia.

Satisfaction

The final products potentially would as any antimicrobial properties requiring materials and also air purifying agent in any closed space.

Microbial Analysis – Total Plate Count

Sample	Control	Treated
Day 1	~1000	~100
Day 2	~1000	~100
Day 3	~1000	~100
Day 4	~1000	~100
Day 5	~1000	~100

NOTE: The results show that the treatment significantly reduces microbial growth compared to the control.

Product: Car air purifier

Varieties of essential oils can be grafted onto the felt pad.

and many more!

What's inside the plant?

Take cinnamon for example:

- ✓ The volatile oil of the bark of Cinnamomum zeylanicum, is rich in cinnamic aldehyde.
- ✓ The volatile oil prepared from the leaves of the plant contains eugenol as the main constituent.
- ✓ The volatile oil obtained from the fruit of the same plant, is rich in camphor.

NOTE: It should be noted that the chemical composition of volatile oil prepared from the same organ of one species varies to some degree according to the environmental conditions under which the plant has grown.

ORANGE

Main Chemical Components: Limonene and Myrcene
Extraction: Cold pressed from rind
Primary Benefits: Cleanser and purifying agent supports a healthy immune system, uplifting

LAVENDER

Main Chemical Components: Linalool and linalyl acetate
Extraction: Steam distilled from the flowering tops
Primary Benefits: Calming, relaxing and balancing both physically and emotionally

Essential oil can be extracted from every part of plants

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

ANTICIPATED TECHNIQUE FOR THE PREPARATION OF ESSENTIAL OIL BASED FUNCTIONALIZED MATERIALS

Dr. M. A. F. Ghossein, T. H. Tng, S. Sathiyakumar, M. A. Ghossein, N. Sathiyakumar, P. Sathiyakumar, Technology Division

Radiation-induced graft polymerization – the technique



The diagram illustrates the process of radiation-induced graft polymerization. It starts with a 'Base material' (Trunk material/substrate) which is irradiated with 'Active species (Radicals)'. This leads to 'Grafting' of 'Essential oil' onto the 'Base material', resulting in a 'Grafted material' with 'Grafted chains' and an 'AM group'.

- ✓ an **ideal and efficient** technique for attaching polymer chains containing **desired chemical groups** to existing polymeric backbones.
- ✓ The attachment of **covalent bond** provides long lifetime **chemical stability** by means of introduced chains.
- ✓ Radiation-induced grafting technique was selected because it offer **clean method** where the presence of **catalyst and initiator is not essential**, therefore a number of **chemicals can be eliminated**.

The Impacts

Market opportunity
Can generate new marketing opportunity for the final products which based on existing commercial material on market

Technology fusion
Create a fusion in between existing two different industrial sectors to develop a new products with high end technique.

Chemical-less
Essential oil is natural products based that is less harmful and reduces health risk compared to the use of chemicals that cause toxic effects and mutations in humans.

Eco-friendly

	Grafting with conventional monomers	Grafting with essential oil
Eco-friendly?	Usage of inorganic type monomers	Usage of natural and organic essential oil
Less toxic?	Requires inorganic solvents	Uses water as solvent
Natural & organic?	Requires additional emulsifier	Uses hazel witch as emulsifier
Hazardous waste?	Produces residual which requires proper disposal	The residual can be safely discharged to downstream
Adaptation in industry?	Simple technique	Completely environmental-friendly, safe, and easy technique

Summary

The final grafted products offer high-efficiency antimicrobial properties with high essential oil content and also exhibit good sustainable release performance. This profound grafted material with essential oil shows good adaptation in the industry with simple, cheap, and straightforward methods. The essential oil grafted materials can be potentially used in packaging, healthcare and cosmetics industries especially in the pandemic era.

TECHNOLOGY PREVIEW & SHOWCASE
MALAYSIA 2021

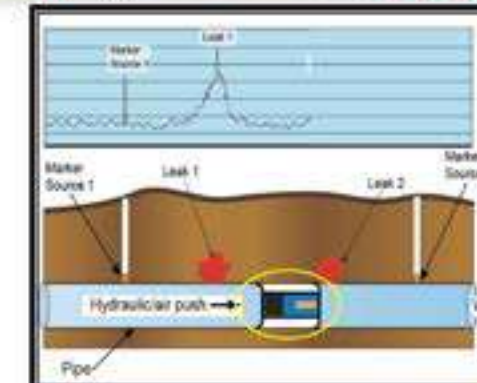
Dr. M. A. F. Ghossein, T. H. Tng, S. Sathiyakumar, M. A. Ghossein, N. Sathiyakumar, P. Sathiyakumar, Technology Division

Phone: +603-8911 1231
Fax: +603-8911 2134

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

RT-NEMO : DETECTION OF LEAKAGE IN UNDERGROUND PIPELINE

Dr. M. A. F. Ghossein, T. H. Tng, S. Sathiyakumar, M. A. Ghossein, N. Sathiyakumar, P. Sathiyakumar, Technology Division



The diagram shows a cross-section of an underground pipeline. A 'Starter Source 1' is placed at one end, and a 'Starter Source 2' is placed at the other end. A 'Hydraulic push' is applied to the pipeline. A 'Pipe' is shown with a 'Leak 1' and 'Leak 2'. A 'Detector' is shown at the end of the pipeline.

Advantages of RT-NEMO

- State-of-art
- High accuracy
- Real time detection
- Cool effective
- Low investment
- Fast response

Background of RT-NEMO

The detection of leakage in underground pipeline is significant challenge to many industries, in particular oil and gas industry. Therefore, Plant Assessment Technology (PAT) team has adopted Radiotracer technology to locate and verify the leakage location and solve the issue. Radiotracer technology (RT) is the introduction of radioactive material inside the domain and the tracing of gamma radiation emitted by this material is conducted externally using scintillation detector. Any drop of velocity or flow rate from upstream to downstream fluid flow is susceptible to potential leak area. Leak detection using radiotracer techniques is one of the most widespread applications of radiotracer in industry. RT is very sensitive, effective and competitive for on-line leak detection. It is widely used for on-line leak detection.

However, the conventional radiotracer technique is very expensive, requires a lot of manpower, cumbersome and very time consuming. Thus, RT-NEMO is introduced to overcome the aforementioned problems. Development of portable and compact radiotracer or RT-NEMO has been introduced inside the underground pipelines to detect leakage using radiotracer state-of-art approach.

RT-NEMO: Software Development

The development of RT-NEMO data logger involves assembly of hardware and programming of data acquisition and storage. Arduino microcontroller is used as the main processor for the data logger. The data logger utilizes the simplicity of Arduino in order to acquire the data from the ratemeter and save the data in SD card. After completion, the data logger will be incorporated in the RT-NEMO capsule.

Market Overview

Target Market	Market Objectives	Marketing Strategy
Oil & gas industries Gas District Cooling System Power Plant Utilities	More than 5000km pipeline network Constant inspection Aging pipeline Fast & accurate technology	Technology awareness & education Engagement with local industries Technology development with correct collaboration partners Conferences & Innovation Exhibitions

TECHNOLOGY PREVIEW & SHOWCASE
MALAYSIA 2021

Dr. M. A. F. Ghossein, T. H. Tng, S. Sathiyakumar, M. A. Ghossein, N. Sathiyakumar, P. Sathiyakumar, Technology Division

Phone: +603-8911 1231
Fax: +603-8911 2134

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

SIMULTANEOUS LOCALIZATION AND MAPPING (SLAM) MOBILE ROBOT IN RADIOACTIVE CONTAMINATED AREA [G26]

What is NUKLEOBOT?
Nukleobot is a robot capable of creating a map and doing measurements in a risky area exposed to radioactive rays. The robot can also move autonomously and remotely (teleoperated) and can work directly for 3 hours non-stop. The mapping process of unexplored areas can be constructed and translated through 2D and 3D maps stored using the simultaneous localization and mapping (SLAM) method. The generated map can be used for autonomous navigation in future and for post processing.

- Lidar**
Equipped with 360° 2D Lidar
- Travel speed**
Maximum 8.5km/hr
- Max payload**
~1-20 kg
- 3 hours continuous operation**
- SLAM study**
Gmapping SLAM, Hector SLAM, RTAB map (3D SLAM)
- Autonomous navigation**
OMPL local planner, ROS local planner, Trajectory planner
- 3D camera for 3D mapping**
- Skid steering drive**
- Position feedback with PID control**
On board sub-controller with PID feedback control
- WiFi remote operation (by 4G)**
WiFi access point

List of applications software used
ROS
ubuntu, OpenCV, ROS

Physical dimensions

Navigation
SLAM, Navigation, Monitoring

2D mapping process
3D mapping map

GMI
GERMAN-MALAYSIAN INSTITUTE
Training for Advanced Technology
ROS node and if tree for Nukleobot

TECHNOLOGY PREVIEW & SHOWCASE
MALAYSIA 2021

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2021 (HIKNNM 2021)

UTM-SHAFT: AN INNOVATIVE FLOATING TURBINE

UTM-SHAFT POWER GENERATOR

INTRODUCTION
UTM-SHAFT is a portable floating turbine loved by community and off-gridders around the world. It can not only charge a phone, speaker, camera, battery bank, or 12V gadget, but it can also light up a house by harvesting energy from tidal currents, rivers, and streams.

PROBLEM STATEMENT

- Remote island communities in Malaysia are still unable to enjoy adequate electricity supply, e.g. Sipadan Island
- Tidal power is one of the major renewable energy sources, but also one of the most infantile
- Lack of research on tidal energy

PRODUCT DESCRIPTION

- Small size, installed in rural area with water source
- Technology is easy to manufacture
- Lightweight and portable
- Installation on site (Plug and play)

PRODUCT PERFORMANCE

- Prototype
- pilot - in customer operation

70% decrease in the percentage of dependence on fuel

This trans disciplinary research emphasizes the use of renewable energy mainly from MSED and hydro for providing electricity to the islands in the remotely forested region.

The research is hoped to improve the generation of power supply as well as to uplift the socioeconomic status through the introduction of green activities.

NOVELTY

- The floating turbine is made of fiberglass to provide a portable pico floating turbine
- The use of fiberglass cover is to avoid corrosion of the micro-hydro turbine as well.
- Two-Way Counter-rotating Axial Flow Turbine

IMPACT

- Improve community living at the isolated archipelago of Malaysia, especially those living in the resort islands
- Passion - this product help the community in the on-going supply of electricity
- Belief - this product gets a place among residents in remote areas
- Confidence - that this product can give new hope to the community
- Commitment - hoping to help improve the quality of life in the arena with the availability of a cheap low-cost product

Target Market

School 50%, Individual 10%, Orang Asli 50%

INDUSTRIAL COLLABORATION

- HAYATECH SDN. BHD
- SGT VENTURES SDN. BHD
- MENARA REZEKI SDN. BHD

TECHNOLOGY PREVIEW & SHOWCASE
NUKLEAR MALAYSIA 2021

Project Leads:
Prof. Madya Ir. Dr. Shamsul Sarip (shamsul.sarip@utm.my)
shamsul.sarip@utm.my
Member: Dr. Harilah Mad Kaidi & Mr. Idris Bin Ali

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

MICRO HETEROGENEOUS THORIA-URANIA TRISO FUEL COMPACT DESIGN FOR MICRO-SIZED HIGH TEMPERATURE REACTORS

MICRO-MODULAR HIGH TEMPERATURE REACTOR (MMR-HTR)

U-BATTERY NUCLEAR POWER STATION
U-Battery core with outer diameter of 1.8 m

DUPLEX TRISO FUEL FOR MMR-HTR

Examples of recent interest in MMR designs with TRISO fuel:

- Wenatchee's eVinci™ micro reactor
- Holtec Generation of MoltenGen LLC
- Xe-Mobile of X-energy
- U-Battery of Urenco
- Korea Atomic Energy Research Institute's micro modular high temperature gas-cooled reactor (MMHR)

DUPLEX TRISO FUEL DESIGN IMPACT & OUTCOME

DESIGN PROPERTIES	OUTCOME	IMPACT
Longer cycle length & higher buildup of U-233	Reduces refueling frequency & reduces initial U-233 enrichment	Reduces fuel cost
Lower plutonium production, other actinides and fission product	Lower proliferation risk and reduced high-level waste volume	Reduced cost and complexity of high-level waste management (security & safety)
Simplified design based on established technology	Simplify licensing process	Possible near to mid term deployment

CURRENT RESEARCH PROGRESS

Design optimization

- Effect of packing fraction, number of Duplex TRISO rods, initial seed enrichment, burnable absorber, etc.

Whole core level analysis

- Reflector thickness, power level (power density), control rods, active core size, etc.

The fuel cycle length for duplex fuel blocks at different packing fractions.

Developed MCNPX detail model of the Micro-Modular High Temperature Reactor Core and Fuel.

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

IRRADIATED CORN PLASTIC

BRIEF OVERVIEW

- Corn plastic is a plastic that made from corn starch.
- Corn plastic also known as starch-based bioplastic.

STARCH-BASED BIOPLASTIC

DISADVANTAGES
Weak mechanical and barrier properties

ADVANTAGES

- Biodegradable.
- Did not use non-renewable resources.
- Significantly lower source.
- Contains chemicals that are non-harmful.
- Reduction of the non-biodegradable waste that leads to environmental pollution.

INVENTIVENESS

- Optimal ratio between corn starch and glycerol.
- Directly exposed the corn plastic to gamma radiation $\leq 10\text{kGy}$ doses.
- Compatible with consumer lives because its from natural resource.

PICTURE

PUBLICATION

- Feasibility of Irradiated Corn-Based Bioplastics as Packaging Material.
- The Effects of Gamma Radiation on Bioplastics.
- Effect of Radiation Treatment on Starch Bioplastic - A Review.
- Gamma Radiation Effects on Biodegradable Starch Based Blend with Different Polyester: A Review.

COMMERCIALIZATION

- A growing environmental awareness throughout the world have opened up new market opportunities for developing this product.
- Due to similar function with conventional plastic, this product is an ideal alternative in the context of environmental sustainability.
- Bulk of resources which would not be diminishing in years ahead contrasted with petroleum.

STATUS OF PRODUCT

Laboratory and functional models are available for laboratory and field testing.

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LY2019002123

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

Tajuk Rekapi : Inovasi Teknologi Nuklear Dalam Meningkatkan Hasil Padi Pesawah Yang Terkesan Akibat Pandemi Covid-19

Sabri Hussein, Abdul Rahim Bin Harun¹, Azhar M¹, James Mackester Anak Simo¹, Muhammad Ruzaini Abdul Wahab¹, Faiz Bin Ahmad¹, Shyul Azizi Bin Abdul Rahman¹, Ahmad Nazrul A W¹, Shakinah S¹, Anna Ling Plok Kiong¹, Mohd Rafi Bin Yusop¹, Asma Ilyani¹, K. Kogothavani R², Yoshihiro Hase², Aki Koike², Noorman Affendi M³, Rahinza Kamaruzaman³, Nor'Aishah Hassan³, Noraziyah Abd Aziz Shamsudin³, Norainy Md Hashim³, Dato Mansor Hj Md Noor³ & Zaidi Shaari³.

Novelty Idea Inovasi

- Varieti padi baharu yang **PERTAMA** di Negara Malaysia yang dihasilkan menggunakan teknologi nuklear dan mendapat pengiktirafan dari pihak Jabatan Pertanian Malaysia (Reg No: PBR 0159 & PBR 0158)
- Varieti padi mutan yang **PERTAMA** di Negara Malaysia yang berjaya dimasukkan ke dalam senarai skim subsidi padi sah negara
- Varieti padi mutan yang **PERTAMA** di Negara Malaysia yang mampu menghasilkan hasil padi yang tinggi iaitu ber julat diantara 7-10 t/ha (bergantung kepada lokasi dan cara pengurusan sawah)
- Varieti padi mutan yang **PERTAMA** di Negara Malaysia yang mampu bertahan kepada perubahan cuaca yang tidak menentu (Tahan kepada banjir kilat dan kemarau) / *Global climate change* dan penyakit utama padi.

Perlindungan Harta Intelek

IP for : NMR 151

Kelebihan dan Potensi Aplikasi Inovasi

IP for : NMR 152

Sasaran Penerima Faedah

Pengeluar benih beras padi, Pengeluar benih daftar padi, Pemilik benih padi sah negara, Pertubuhan Peladang Kawasan (Seluruh Malaysia), Golongan petani

TECHNOLOGY PREVIEW & SHOWCASE

NUCLEAR MALAYSIA 2021

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

FRICITION STIR WELDING ON DISSIMILAR PLATE THICKNESS OF ALUMINIUM ALLOY

INTRODUCTION & PROJECT MOTIVATION

- FSW appears as a promisingly weld joining method that enables to diminish material waste, prevent radiation and harmful gas emissions that usually associated with the fusion welding processes.
- This welding technique makes use of a non-consumable welding tool to generate frictional heat, stir and join two plates together.
- Thin plate section introduces a unique challenge. Instead of proper parameter setting, there is a need for proper setup to successfully produce a good dissimilar plate thickness joint.

OBJECTIVES

- To produce a good dissimilar plate thickness joining of aluminium alloy.
- To provide a proper setup for dissimilar plate thickness joining.

RELEVANCE

- Cater for FSW research activity at universities and companies especially for dissimilar plate thickness joining by FSW process.
- Promote FSW application for dissimilar plate joining in industrial applications such as automobiles - door panels and body frames.

BENEFIT TO SOCIETY/SIGNIFICANCE

- This process keeps environment safe. It requires no filler metal or shielding gas, and produce no fumes and arc.
- Single run only.
- No edge preparation and gap required.
- Caters variety of alloys.

INNOVATION

- A simple setup to cater for dissimilar plate thickness joining by FSW process.

PUBLICATIONS & GRANTS

- https://www.researchgate.net/profile/Azman_tumai
- <http://ojs.umsida.ac.id/index.php/ijst/article/view/10000-0001-48373423>
- SHORT TERM RESEARCH GRANT (UNIKLI) & OSAKA UNI INTERNATIONAL JOINT RESEARCH COLLABORATOR (JWRI).

IP RIGHT

- Patent Filing: PI 2014001404

In collaboration with:

UTP, KUPTM, JWRI, JMTI

JOINING SETUP

CROSS SECTION

WELD SURFACE APPEARANCE

TECHNOLOGY PREVIEW & SHOWCASE

NUCLEAR MALAYSIA 2021

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

HYDROMAC ADSORBENT FROM TILAPIA FISH SCALE FOR WATER TREATMENT

DR. MINN SULIZA MUHAMMAD¹, MOHAMMAD AMAN AFIZAH², TS. DE LEE TE CHUAN³
¹Faculty of Engineering Technology, ²Faculty of Technology Management & Business, ³Universiti Tun Hussein Onn Malaysia (UTHM)

PRODUCT DESCRIPTION

- Hydroxypatite macrocomposite (HYDROMAC) adsorbent (1.4x1.4 cm cube) is made from tilapia fish scale mix with cement and water.
- The hydroxypatite (HAp) is extracted from tilapia fish scale by grinding and calcination process.

COMMERCIALISATION POTENTIAL

HYDROMAC is a low cost, easy to produce, environmentally friendly and sustainable adsorbent.

HYDROMAC is a potential adsorbent that can be proposed to waterworks company in Malaysia to be used along other treatment processes in the water treatment plant.

HYDROMAC can be incorporate with sand filter media to be commercialised as hybrid filter-adsorbent system.

NOVELTY & INVENTIVENESS

- New findings and knowledge on the characteristics and performances of HYDROMAC adsorbent.
- Research on the comparison of sand filter process with and without HYDROMAC adsorbent provide good fundamental knowledge for future studies.
- HYDROMAC adsorbent practices Waste-to-Wealth concept.
- In comparison to the activated carbon adsorbent, the production of HYDROMAC from waste material of fish scales are more economical & low cost.

USEFULNESS/BENEFIT TO SOCIETY

- CSR project for groundwater treatment of tube well in Kampung Orang Asli Kangkar Senangar, Parit Sulong, Batu Pahat in collaboration with Pejabat Daerah Muar.
- Remove 40-60% of contaminants in groundwater.
- Produce high quality and palatable water for indigenous community in Kangkar Senangar.
- Enhance national water security.

PRODUCT PHOTO

From waste (Tilapia fish scale) to wealth

RECOGNITION

- Gold Medal Award, Application of Hydroxypatite (HAp) Nanopowder from Fish Waste as Potential Adsorbent for the Removal of Lead in Drinking Water, The International Research and Symposium and Exposition (IRSE) 2016, Universiti Tun Hussein Onn Malaysia.
- Gold Medal Award, Application of Hydroxypatite (HAp) Nanopowder from Fish Waste as Potential Adsorbent for the Removal of Lead in Drinking Water, Research & Innovative Technology Competition (RITC), 2018, Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia.

STATUS OF PRODUCT

Status of product = TRL 6: The developed HYDROMAC has been tested in laboratory scale column study for its performance as adsorbent.

COMMERCIALISATION POTENTIAL

BENCHMARKING

Adsorbent	Price	Performance	Application
Activated carbon (granular)	RM 104/kg	Heavy Metal Adsorption (Pb, Cu, Zn)	Air separation, industrial effluent treatment
Silica gel	RM 25/kg	Organic Adsorption	Food packaging, humidity control, pharmaceuticals, etc.
Zeolite adsorbent	RM 12/kg	Organic Adsorption (Pb, Cu, Zn)	Oil Adsorption, industrial effluent treatment
Modified Activated carbon	RM 30/kg	Organic Adsorption (Pb, Cu, Zn)	Food packaging, humidity control, pharmaceuticals, etc.
Clay-based adsorbent	RM 27/kg	Organic Adsorption (Pb, Cu, Zn)	Industrial effluent treatment, food packaging, humidity control, pharmaceuticals, etc.
HYDROMAC adsorbent	RM 15/kg	UTHM	Water treatment

POTENTIAL INDUSTRY PARTNER

- Waterworks industry: SAJ Sdn Bhd, STREAS, SADA, etc.
- Adsorbent company: Century Chemical Works Sdn Bhd
- Water dispenser company: PureGin water Sdn Bhd
- Waste management industry: Ceyrio Sdn Bhd and SWM Environment Sdn Bhd

COPYRIGHT

- Title of work: Nanosized Hydroxypatite (HAp) Adsorbent Synthesized from Tilapia Fish Scale Waste for the Removal of Lead in Tap Water
- Copyright no.: CRNY00055988

GRANT RECEIVED

- TIER1: Application of Hydroxypatite (HAp) Nanopowder from Fish Waste as Potential Adsorbent for the Removal of Lead in Drinking Water (H213), RM 20,000, UTHM.
- GPPS: Removal of Nickel in Drinking Water by Hydroxypatite (HAp) Adsorbent Made from Fish Waste (H337), RM 20,000, UTHM.
- GPPS: Natural Hydroxypatite Adsorbent Extracted from Tilapia Fish Scale for the Removal of Chromium (VI) in Water (H596), RM 25,000, UTHM.

PUBLICATION

- A Review on Lead Sources, Occurrences, Health Effects, and Treatment by Hydroxypatite (HAp) Adsorbent (2019), Suhair Omar, Minn Suliza Muhammad, Lee Te Chuan, et al. Water, Air & Soil Pollution, Springer, 230(1/2), 1-21 (2019), I.P. 2529.
- Effect of Hydroxypatite (HAp) Adsorbent Towards Lead Removal (2020), Suhair Omar, Minn Suliza Muhammad, et al. International Journal of Emerging Trends in Engineering Research, WJER, 8(1.2), 201-205 (Scopus Index).
- Response Surface Methodology for Optimization of Sodium Sulfate and Sodium Lauryl Sulfate Removal using Hydroxypatite Adsorbent (2020), Minn Suliza Muhammad, Muhammad Ridwan Jolias, et al. Proceeding Progress in Engineering Application And Technology, UTHM, 127, ISBN:17733303.
- Application of Hydroxypatite (HAp) Nanopowder from Fish Waste as Potential Adsorbent for the Removal of Lead in Drinking Water (2019), Minn Suliza Muhammad, Nur Husein Abdul Hameed, Nurulhuda Muhammad Tahir, et al. Book chapter Advanced Technology Centre: Research and Innovation Series 2, UTHM, 92, ISBN:978-967-2306-50-4.

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

CERAMIC AIRCRETE

IP NUMBER:
 • Copyright MyIPO: CRB.Y00010820
 Date: 3 September 2019
 • PATENT FILING: P020000064
 Date: 24 February 2020

INVENTOR:
 TS. DR. NORANI MARSI
 FACULTY OF ENGINEERING TECHNOLOGY (FTK)
 UNIVERSITI TUN HUSSEIN ONN MALAYSIA (UTHM)
 EMAIL: norani@uthm.edu.my

CO-INVENTORS:
 TS. NORAMAH KASSIM, HAFIZUDDIN HAKIM SHARIFF, TAN ENG WEI, EPE, YUSRIANTO, IZZATI ABUL MANAF

PRODUCT BACKGROUND

- Ceramic Aircrete is a lightweight concrete produced from Green Autoclaved Aerated Concrete (AAC) Ceramic Waste. The fabrication is produced from 50% of ceramic waste (20% tile & 30% gypsum) mixed with the composition of sand, lime, cement, water and aluminum paste (Expanding Agent) by using Formulation Bubbles Method into Autoclaved Machine.
- Ceramic Aircrete has a dry density of approximately 710 kg/m³ and can withstand fire resistance up to 1200°C for 4 hours at 500kPa (BS EN 12615-1:1999).
- Ceramic Aircrete is cost effective due to lower dead load which is 55% total weight of wall, saving energy at 150 kWh/m² with compressive strength up to 25 MPa with Young Modulus, E = 540 GPa.
- Ceramic Aircrete is the sustainable energy (zero waste) capabilities integrates economic, social and environmental friendly.

PRODUCT CHARACTERISTICS/ RESULTS

Fig. 1: The excellent thermal insulation properties can reduce the total load of refrigeration and air conditioning.

Fig. 2: CERAMIC AIRCRETE wall withstand up to 1200°C for 4 hours compare with concrete.

Fig. 3: 2x better wall insulation rate. To reduce interior applications rate and 50% saving on electrical made CERAMIC AIRCRETE is better insulation.

Fig. 4: SEM image of the normal & fire resistance (BS EN 12615-1:1999).

NOVELTY/ ORIGINALITY/ INVENTIVENESS

FABRICATION METHODS

ACHIEVEMENT/ AWARD

- GOLD AWARD, International Research and Innovation Symposium and Exposition 2019 (RISE 2019), "0-CERAMIC AIRCRETE"
- TOTAL GRANT: RM 201,900.00 (GPPS, INDUSTRY GRANT, FORS KPT)

PUBLICATION

- Vikneshvaran Genesan and Norani Marsi (2019). The Characterization of Lightweight Ceramic Aircrete for Brick Applications. Thesis FYP, UTHM

COLLABORATION/ INDUSTRIAL PARTNER

金和嘉建筑材料有限公司
 KH HOE TINE BUILDING MATERIALS SDN BHD

BENEFITS/ USEFULNESS/ APPLICABILITY

- BENEFITS:** Environment Friendliness; No Chemical Usage; Sustainable; Reusable; Zero Waste fabrication
- USEFULNESS:**
- APPLICABILITY:** Partition Wall, Party Wall, Fire Compartment Walls, Thermal Walls, Sound Barriers, Basement Skin Walls, etc.

COST ANALYSIS

Comparison of cost between concrete and ceramic aircrete. Ceramic aircrete is 55% lighter than concrete, saving energy at 150 kWh/m² with compressive strength up to 25 MPa with Young Modulus, E = 540 GPa.

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

In Collaboration with CHERAS REHABILITATION HOSPITAL

REHABILITATION MONITORING (MyHomeR) APPLICATIONS FOR POST-STROKE PATIENT

REHABILITATION MONITORING (MyHomeR) APPLICATIONS FOR POST-STROKE PATIENT

MyHomeR FEATURES

- App User:**
 - post-stroke patients, caregivers, clinicians, and doctors
- MyHomeR Mobile Apps:**
 - Home guidance
 - Game and routine activities
 - Entertainment menu (music and video)
 - Clinical appointment
- System development:**
 - Flutter
 - noSQL

Programs: Upper Limb, Lower Limb, Speech Analysis, Sleep Analysis

Remote monitoring: Activities, Health and rehabilitation record

INITIAL APP PREVIEW

TECHNOLOGY PREVIEW & SHOWCASE

For more information, please contact:

ENGINEERING & TECHNOLOGY DEPT.
FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY
UNIVERSITI TEKNOLOGI MALAYSIA
KUALA LUMPUR

Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

COLLABORATION BETWEEN UNIVERSITI SAINS MALAYSIA & MALAYSIA NUCLEAR AGENCY

Chemoradiotherapy

TRIPLE COMBINATION OF BISMUTH OXIDE NANOPARTICLES, CISPLATIN AND BAICALEIN-RICH FRACTION AS RADIOSENSITIZERS FOR BREAST CANCER RADIOTHERAPY

Noor Nabillah Talik Sisin¹, Khairunisaq Abd. Razak¹, Nor Fazila Che Mat¹, Wan Fatimah Wan Sohaimi¹, Azahari Kasbollah¹, Siti Selina Abd Hamid¹, Wan Nordiana Wan Abdul Rahman¹
Universiti Sains Malaysia¹, Malaysia Nuclear Agency²

1. PROBLEM STATEMENTS

- ✓ Cisplatin (Cis) is a widely used chemotherapy drug and radiosensitizer.
- ✓ Cis has many adverse effects.
- ✓ It is proposed other agents that could reduce toxicities, and enhance the effect of radiotherapy on the cancer cells while sparing the surrounding normal tissue.

2. NOVELTY OF INVENTION

- Previous works emphasized on the dose enhancement by individual nanoparticles (NPs), and combination of NPs with commercial drug.
- This project is the **first to invent** the radiosensitizer combination involving metallic NPs (BiONPs), commercial drug (Cis) and natural compound (BRF) for the breast cancer radiotherapy.

3. DATA VALIDATION

- ✓ Pre-clinical tests had been conducted MCF-7 and MDA-MB-231 (breast cancer cells) for photon beam (6 MV), electron beam (6 MeV), and brachytherapy (192-Ir).
- ✓ It was verified that combination of BiONPs, Cis and BRF enhance the effect of radiotherapy on the breast cancer cells.
- ✓ The combination with BRF natural product could deliver a triple effects of Cis drug and the BiONPs.

4. IMPACTS OF INVENTION

The use of the triple combination of the BiONPs, Cis and BRF:

- is economical and environment-friendly (BiONPs synthesis methods)
- could minimize the toxic effects towards the body as only low doses of radiation would be used (usage of BRF).

5. TARGET OF INVENTION

In future, this prospective radiosensitizer combination may be applicable for breast cancer patients which will undergo radiotherapy.

TECHNOLOGY PREVIEW & SHOWCASE

For more information, please contact:

Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI
Dr. NURUL HUDA RIZKI

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

NANOZINN: A Potent Antifungal Nanodelivery System for Ganoderma Disease Treatment for Oil Palm

PATENT NO. P12172002 (Ganoderma Antifungal Nanodelivery System) (Patent)

INTRODUCTION

- Oil palm is one of the largest crop and economical tree in Malaysia. As in 2018, Malaysia has planted 5.85 million hectares of oil palm covering more than 60 % of its agricultural land.
- However, the oil palm faces the threat of a devastating disease which is particularly caused by a pathogenic fungus, *Ganoderma boninense* (G. boninense) that eventually leads to the severe decline of the yield and shorten the productive life of oil palm.
- As a result, Ganoderma has caused significant loss to the oil palm industry, with the estimated yield loss due to this disease can reach up to RM1.5 billion.

INVENTION

- The aim of the invention is to develop a green formulation of fungicide nanodelivery system.
- The controlled release formulation (CRF) of fungicide aims to reduce the fungicide toxicity, enhance the efficient delivery of active ingredient to the target site, able to sustain in a longer time and consequently improved fungicide efficacy.
- Moreover, its also aims to enhance uptake, minimizing volatilization, leaching and runoff of fungicide that can cause environmental concerns.

ADVANTAGES

The use of NANOZINN in combating Ganoderma disease in oil palm cultivation has many advantages such as

- High efficacy (9 times higher antifungal)
- Slow release formula and long circulation time (30 times increase)
- No phytotoxicity, no cytotoxicity and no genotoxicity
- Green innovation
- Reduced runoff, leaching and volatilization
- Reduced labor cost

MARKET POTENTIAL

Consumer/End User

- Palm oil estates/small holder/farmers.

Industry

- Agricultural industry
- Oil palm market and industry
- Palm oil market and industry

Research Grant : RM1 million (under LRGS- NanoMiTe program)
Industry Collaboration : Malaysian Palm Oil Board (MPOB)

Project Leader : Prof. Dr. Mohd Zobir Hussein
Team members : Dr. Farhatun Najat Makin, Dr. Idris Abu Seman and Prof. Dr. Sharida Fakurazi
Dept./Faculty : Institute of Advanced Technology, Universiti Putra Malaysia
Email : mzobir@upm.edu.my
Phone : 03-9769 8092/012-343 3858
Expertise : Nanomaterials synthesis and their applications

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

MANAGING THORIUM FROM RARE-EARTH EXTRACTION RESIDUE VIA ELECTROSORPTION TOWARDS CONVERTING LARGE WASTE VOLUME TO SMALL WASTE PACKAGE

Dr. Azman Fadzil (Senior Lecturer), Ms. Ch. Syahidah Azman (PhD)

BACKGROUND

INNOVATION TOWARDS SOLVING THE PROBLEM

Electrosorption

Advantages

- 1. High efficiency and low cost
- 2. High selectivity and high capacity
- 3. High stability and long life
- 4. High safety and low risk
- 5. High flexibility and adaptability

Future outlook

Publications

TECHNOLOGY PREVIEW & SHOWCASE (TPS)



M100

PROBIOTIC BIOFERTILIZER

Innovation 1

The New 3rd generation Multifunctional Biofertilizer

-  **SINGLE STRAIN**
-  **TARGET ACTION**
 - NUTRIENT
 - PROLIFERATION
 - SOLUBILIZATION
-  **PROBIOTIC PROTECTION**
- 8 MONTH SHELF LIFE**
- LOW COST**

Innovation 2

Various cultivation systems

-  **FOUNTAIN APPLICATION**
-  **SOIL APPLICATION**

Probiotic function

Innovation 3

Mass production system: "BIOBOOSTER"

Copyright on SOP of "Bioculture Booster" LY2020004978

-  **1400% less costly than conventional system**
-  **100% less costly per run than conventional system**
-  **500% higher production capacity than conventional system**



Innovation 4

pqq Biomarker

 **pqq Biomarker as a specific marker indicating presence of Acinetobacter sp. M100 in the soil, part of Quality Assurance of the biofertilizer.**

TECHNOLOGY REVIEW & SHOWCASE

DATE: 2021

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

BERSAMA SAMA MELAKSANAKAN TRANSFORMASI

Lateks Getah Asli Para-Pemvulkanan Hibrid Ultralbayung-peroksida

Sufian Ibrahim, Chai Chee Kiong, Nizam Shahr, Mohd Nurazlan, Mui Latun, Ahmad Saipia Abdul Kahar, Nur Hani M. A., Khairul Anwar, Md Yusoff, Nur Mohd Fauzan Ruzaid & Hafizuddin Masri

BACKGROUND

At present, there are 3 commonly known vulcanization processes being used in natural rubber latex industries; namely sulphur, radiation and peroxide vulcanizations. Sulphur vulcanization produces products with superior mechanical properties compared to radiative and peroxide vulcanization. However, sulphur vulcanization (SPVL) process may produce by-products such as nitrosamines and nitroisotables, i.e. carcinogenic materials which may cause cancer and chemical allergies.

On the contrary, radiation vulcanization of natural rubber latex (RVNRL) and peroxides vulcanization of natural rubber latex (PVNRL) have several advantages over the sulphur vulcanization such as:

- Free from nitrosamines and nitroisotables
- Low risk on Type I (chemical) and Type IV (protein) allergies
- Cleaner industrial effluents (less environmental pollution)
- No copper staining on electronic component
- Biodegradable

Radiation and peroxide vulcanizations failed to produced pre-vulcanized natural rubber latex with high mechanical strength even though the preparation process was cleaner and "green". This led us to hybridize the radiation and peroxide vulcanizations in order to produced a new generation latex that is comparable (mechanical properties) to sulfur vulcanization. However, issues such as high construction cost on irradiation plants as well as legal issues (safety & security) are expected to hinder efforts to transfer this technology to the industries.

Alternatively, preparation of Hybrid UV-peroxide pre-vulcanized natural rubber latex using commercial uv lamps has been proposed to replace the use of gamma radiation from the Cobalt-60.

Preparation of Hybrid Uv-Peroxide Pre-vulcanized Natural Rubber Latex

```

graph TD
    A[Latex + E.B. Separately dissolved in water] --> B[The separated latex added gradually to prepared solution]
    B --> C[Mixture becomes viscous - 2.5 ml gel per hundred natural rubber]
    C --> D[Precipitated by addition with 2% NaOH solution - 1.5 g/ml]
    D --> E[Sulfuric acid at 1.5 g/ml - 1.5 g/ml]
    E --> F[Wash the slurry with distilled water]
    F --> G[Dry for 30 minutes and follow by microwave under VUV for 30 minutes]
    G --> H[Pre-vulcanized natural rubber latex]
    H --> I[Test 2.2 part per hundred natural of vulcanized and up to 15 hours]
    
```

The diagram illustrates the multi-step process for creating pre-vulcanized natural rubber latex. It begins with separating latex and E.B. into water, followed by gradual addition to a prepared solution. The mixture becomes viscous (2.5 ml gel per hundred natural rubber), then precipitates with 2% NaOH (1.5 g/ml). After adding 1.5 g/ml of 1.5% sulfuric acid, the slurry is washed with distilled water and dried for 30 minutes before microwaving under VUV for another 30 minutes. The final product is pre-vulcanized natural rubber latex, tested at 2.2 parts per hundred natural of vulcanized material for up to 15 hours.

Novelty

New hybrid UV-peroxide pre-vulcanized natural rubber latex

MARKET POTENTIAL

Year	Total Sales	Vulcanized Rubber	Unvulcanized Rubber
2010	~10,000	~8,000	~2,000
2011	~10,500	~8,500	~2,000
2012	~11,000	~9,000	~2,000
2013	~11,500	~9,500	~2,000
2014	~12,000	~10,000	~2,000

Mechanical & Physical Properties of Hybrid UV-Peroxide Pre-vulcanized Natural Rubber Latex Compared to Other Vulcanization Method

Mechanical & physical properties	Sulphur vulcanized latex	Hybrid vulcanized latex	Hybrid UV-peroxide pre-vulcanized NR	Systems & Requirements
Tensile strength (MPa)	32	32	31	Min 31, ISO 149
Elongation (%)	6.8	6.5	6.6	6.50 – 6.70 (ISO 149)
Mechanical stability time (min)	100	100	100	Min 100 (ISO 149)
Shrinkage ratio	20	20	20	20–25 (ISO 149)
Tensile strength index	26	27	26	Min 26 (ASTM D3057)
Preparation time (days)	10	5	5.5	-

Preparation time

- Need only 15 minutes to prepare Hybrid UV-peroxide pre-vulcanized natural rubber latex

Advantages

- Mechanical & physical properties are comparable to conventional pre-vulcanized latex (sulphur) and complied with manufacturers standards & requirements.
- Produced pre-vulcanized latex that free from nitrosamines and accelerator induced allergies, low in cytotoxicity, ash content and biodegradable.
- Low risk on Type I (chemical) & Type IV (protein) allergies

Potential customers:

Surgical gloves, examination gloves, baby boot, dental dams, finger coats, condoms, catheters and balloon manufacturers

TECHNOLOGY PREVIEW & SHOWCASE
JULY 2015

For further information, please contact:
Direktori Inovasi Teknologi Industri
Kementerian Perdagangan
BANGSA, 43000 Kajang,
SELANGOR

No. 10, Jalan Perindustrian,
Pusat Komersial,
Bangsa, 43000 Kajang,
Selangor

+603-2-3700000

TECHNOLOGY PREVIEW & SHOWCASE (TPS)

3D PRINTED ANTHROPOMORPHIC RADIOTHERAPY HEAD PHANTOM

Nur Emirah Mohd Zain¹, Amirah Jamil¹, Fazizulafizi Madin¹, Siti Selena Abd Hamid², Azhari Kasbollah², Wan Fatimah Wan Sohaimi¹, Wan Nordiana Rahman^{1*}

¹Medical Radiation Department, School of Health Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kota Bharu, Kelantan.
²Ageniti Nuklear Malaysia, 4000 Kajang, Selangor.
³Department of Nuclear Medicine, Radiotherapy & Oncology, Hospital Universiti Sains Malaysia, 16150 Kubang Kerian, Kota Bharu, Kelantan.
^{*}Corresponding author email: wanndiana@usm.my



PRODUCT DESCRIPTION

3D Printed Anthropomorphic Head Phantom is developed to ensure the accuracy and precision of radiotherapy treatment. It is applicable for treatment setup designed for planned dose on various patient sizes. The development of this phantom ensures the radiation imposed only on the tumor without harming the normal tissues. This phantom plays an important role in ensuring effective and safe patient treatment especially in the radiation treatment of brain tumor.

TRL 5

NOVELTY AND INVENTIVENESS

Current Problem with Commercialized Phantom	3D Printed Head Phantom
Very Expensive More than RM 300 000	Very low cost RM 5000
High chance of treatment error Standard human size which can cause treatment error because patient come in different size and shape.	More accurate and reduce treatment error Custom made according to patient specific anatomy
The tissue equivalent characteristic is not available	Optimized and cheap tissue equivalent materials
Not applicable for various radiation exposure test Not suitable for complex treatment	Used as radiation exposure test Real-size human treatment setup performed to figure out the best treatment setup
Fixed into one size	Custom made For personalized cancer with complex radiotherapy setup, teaching and research

CONTRIBUTION TO THE NUCLEAR SECTOR AND SOCIETY

Absorbed dose determination from radiation source can be tested before treatment to reduce radiation exposure to the patient.

APPLICATION

Clinical use Inspecting quality assurance to make sure the correct dose is implied to the phantom before treating the real patients	Produce various size phantom according to patient anatomical features for treatment planning	Radiation dose verification for different anatomy	Custom made based on particular focus on tumor site
Research Used for dosimetry study	Education Practical demonstration and hands-on purposes in radiotherapy technique and positioning		

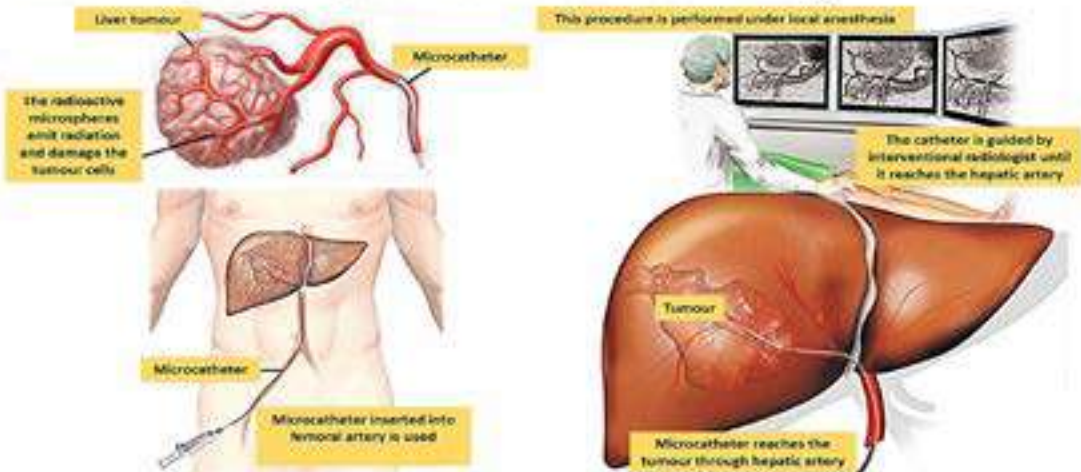
TECHNOLOGY PREVIEW & SHOWCASE (TPS)

BIODEGRADABLE SAMARIUM-153 LOADED MICROSPHERES FOR HEPATIC RADIOEMBOLIZATION

BIODEGRADABLE RADIOACTIVE SAMARIUM-153 LOADED POLY-L-LACTIC ACID (PLLA) MICROSPHERES FOR HEPATIC RADIOEMBOLIZATION OF LIVER CANCER

Liver cancer is the 6th most common diagnosed cancer and the 4th leading cause of cancer death worldwide yearly. Hepatic radioembolization is a combination of embolization and internal radiation therapy to treat intermediate and advanced stage liver cancer. A biodegradable radioactive Samarium-153 (¹⁵³Sm) microspheres formulation with desired physicochemical properties has been developed in this project. The ¹⁵³Sm emits both diagnostic gamma energy and therapeutic beta radiation, renders the synthesized microspheres an ideal theranostics agent for hepatic radioembolization.

Basic Principles of Hepatic Radioembolization Therapy

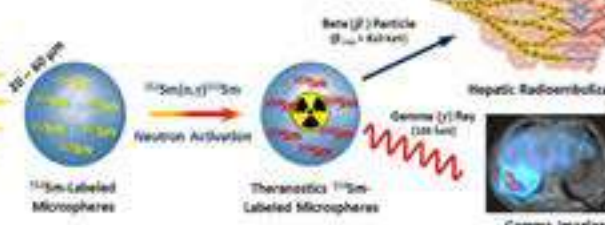


This procedure is performed under local anesthesia. The catheter is guided by interventional radiologist until it reaches the hepatic artery. The radioactive microspheres emit radiation and damage the tumour cells. The microcatheter reaches the tumour through hepatic artery.

Biodegradable Radioactive Samarium-153 Microspheres

Theranostics

- ✓ Biodegradable
- ✓ Cost effective
- ✓ Non-radioactive during manufacturing
- ✓ Can be produced locally



¹⁵³Sm loaded PLLA microspheres are potentially useful for hepatic radioembolization due to their biodegradability, favorable radiation characteristics and excellent retention efficiency. The preparation of the formulation does not involve ionizing radiation hence it reduces the costs of production.

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Refleksi

95

Refleksi

TECHNOLOGY PREVIEW & SHOWCASE (TPS)



Pameran
Kemahiran
Selangor
15 Disember 2021

PAMERAN KEMAHIRAN SELANGOR

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION PLATFORM
EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

RESEARCHER-INDUSTRY SCIENTIFIC EXCHANGE (RISE)

Platform perkongsian kepakaran di sektor awam kepada industri bagi meningkatkan inovasi dan produktiviti industri

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polymer materials
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occupational exposure and hazard
multitouch
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ceramics

For further information, please contact:
STI Encouragement and Service Division,
Ministry of Science, Technology and Innovation (MOSTI),
Level 5, Block C5, Complex C,
Federal Government Administrative Centre,
62602 Putrajaya

riset@mosti.gov.my
riset@mosti.gov.my
Tel: +603 - 8950 3100/3024

PAMERAN KEMAHIRAN SELANGOR

Industrial Technology Division
EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES

INTELLIGENT SUBSURFACE INVESTIGATION FOR ROAD SUBSURFACE CONDITION ASSESSMENT (INSi™)

Solutions
Intelligent Subsurface Investigation (INSi™)

Service Description
Road subsurface condition assessment is an inspection technology to detect subsurface condition such as void, saturated water under pavement, pavement layer and other subsurface objects and structures using highest accuracy non-destructive remote technologies.

Why Need Road Subsurface Condition Assessment ?

- Early Void detection
- Quality of actual road base
- Future planning for repair the road
- Ensure safety to user

Current Issue On Subsurface Condition

The development of INSi is a fusion method using this following technology:

- Ground Penetrating Radar (GPR) with high resolution data
- Cable and Pipe locator
- Global Positioning System Real Time kinematic (GPS RTK)
- Theodolite system
- Troxler density gauge
- Resistivity
- GIS Software
- 3D Software

INSi™ Data Collection

INSi™ Report

Pavement layer

Layer	Depth (m)
Asphalt	0.25
Road base	0.6
Subbase	1.2
Subgrade	>1.3

3D Pavement layer

Sinkhole detection

Location	Depth (m)	Description
Point A	0.5	Shallow sinkhole at the edge of the road.
Point B	1.0	Medium depth sinkhole in the center of the road.
Point C	1.5	Deep sinkhole near the drainage ditch.

3D Sinkhole

For further information, please contact:
Director General,
Malaysia Nuclear Agency
Puchong Perdana,
BANDAR 43000 KAJANG
SELANGOR

Abd. Mohamad Ridwan Ahmad
Industrial Technology Division
E-mail: ridwan_ahmad@nuklear.gov.my

Tel: +603 - 8911 3221
Fax: +603 - 8911 3154

Industrial Technology Division
EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES
INTELLIGENT UTILITY MAPPING (IUMap™)

Utility Mapping
A utility map shows the positioning and identification of buried pipes and cables beneath the ground. The procedure involves detecting things like sewers, electric cables, telecoms cables, gas and water mains. Combine this mapping process with a topographical survey and the results will provide you with a comprehensive detailed map of anything that is hidden underground or directly related to any above ground features.

Why it is important
Utility maps are important any time you are breaking ground as they show accurate positions of the buried utilities you will encounter. It also helps to prevent digging into or damaging any utilities that may cause harm to the public or your workforce.

Current Situation Utility Mapping In Malaysia

- Low quality data*
- Unacceptable accuracy*
- Insufficient to be used as based data for excavation work*
- Lack of expertise*

TECHNOLOGY
Combination of Surveyor, GPR, algorithm analysis and 3D software.
3D/2D
Provide high quality data and information underground up to 4m depth
DATA RELIABILITY
High accuracy for detection metal and non metal buried underground.
GPR LINE
Ensure on site data reliability and repeatability
EXPERTISE
Technology developed and verified by NDT expert from Agensi Nuklear Malaysia

Advantages Of IUMap™

- ✓ Assist on making decision in approve utility work.
- ✓ Provide high accuracy utility mapping
- ✓ Assist on re-alignment utility at saturated utility area.
- ✓ Scanning on damaging/sediment road base and drain area
- ✓ Provide 2D & 3D subsurface mapping
- ✓ Provide accurate information for HDD technique implementation.

2D view
Easy for viewing

3D View
Easy for planning of utility

Cross section view
Easy to interpreted utility data

FOOTNOTES:
*Current Situation on Underground Utility Mapping in Malaysia (2006) from: Survey, Kuala Lumpur, Kuala Lumpur, 2006. *Accuracy and quality of utility mapping data. *Insufficient to be used as based data for excavation work. *Lack of expertise. *Insufficient to be used as based data for excavation work. *Lack of expertise.

For further information, please contact:
Director General,
Malaysia Nuclear Agency
(Nuclear Malaysia)
BANGI, 43000 KAJANG,
SELANGOR

Attn: Muhammad Ridwan Ahmad,
Industrial Technology Division
E-mail: ridwan_ag@nma.gov.my

Tel: +603 - 8911 1221
Fax: +603 - 8911 2104

For more information
please visit here:

Industrial Technology Division
EXHIBITION OF NUKLEAR MALAYSIA PRODUCTS & SERVICES
GPR ROADSCAN: PORTABLE MOUNTING SYSTEM

PRODUCT DESCRIPTION

- Complete, integrated with radar/data acquisition/data processing system for highway pavement inspection applications.
- Installed with versatility design to corporate with three different GSSI GPR antennas 400, 300/800 and 900 MHz.
- Rugged, design for vehicular installation (sedan @ 4WD).
- Installed with linear actuators to move the antenna up and down that give the GPR antenna air-coupled concept

PROBLEM STATEMENT
Ground Penetrating Radar (GPR) is an imaging technology used for pavement testing, concrete structure and subsurface exploration. GPR uses electromagnetic wave propagation to image and identify changes in electrical and magnetic properties in ground. Most commercial GPR systems are developed as conventional ground-based radar system which conducted normally using a hand pushed cart type device. The majority of GPR surveying requires night-time road works or lane closure and affecting the carriageway and walkways to safely undertake them.

In order to help mitigate the time taken to undertake the GPR scanning process, the GPR RoadScan: Portable Mounting System was designed to fully incorporated the GPR system into the vehicle including the survey wheel encoder for distance measuring and linear actuators to move the antenna up and down that give the GPR antenna air-coupled concept. The air-coupled concept has several advantages such as it can create clearer image on radargram as it can reduce the overlapping of the emitted and reflected signals from the surface (Leng, 2011). Besides, air-coupled technique also can avoid the friction between antenna and asphalt pavement that later may worn out the antenna body.

The result is that in larger areas such as the highway and larger, cleared pedestrian areas, the vehicle can be used to cover the area more rapidly and reduce the number of shifts required to undertake the works, thus reducing public disruption. It is also eliminates the need for lane closures and provide a safer working environment. This mounting system provide an attachable and removable option for uses on sedan or four-wheel drive vehicle. This mount can be easily broken down for storage and transportation.

COMMERCIAL POTENTIAL
Contractor and Civil Engineering Industries eg. PLUS, LPT, PBT, Gamuda

MAIN FINDING

- ✓ Save time
- ✓ Safety
- ✓ Easy to use

NOVELTY
The portable mounting system design

COLLABORATORS
FASCOMER, UNIVERSITI MALAYSIA PERLIS, MOA, MOU

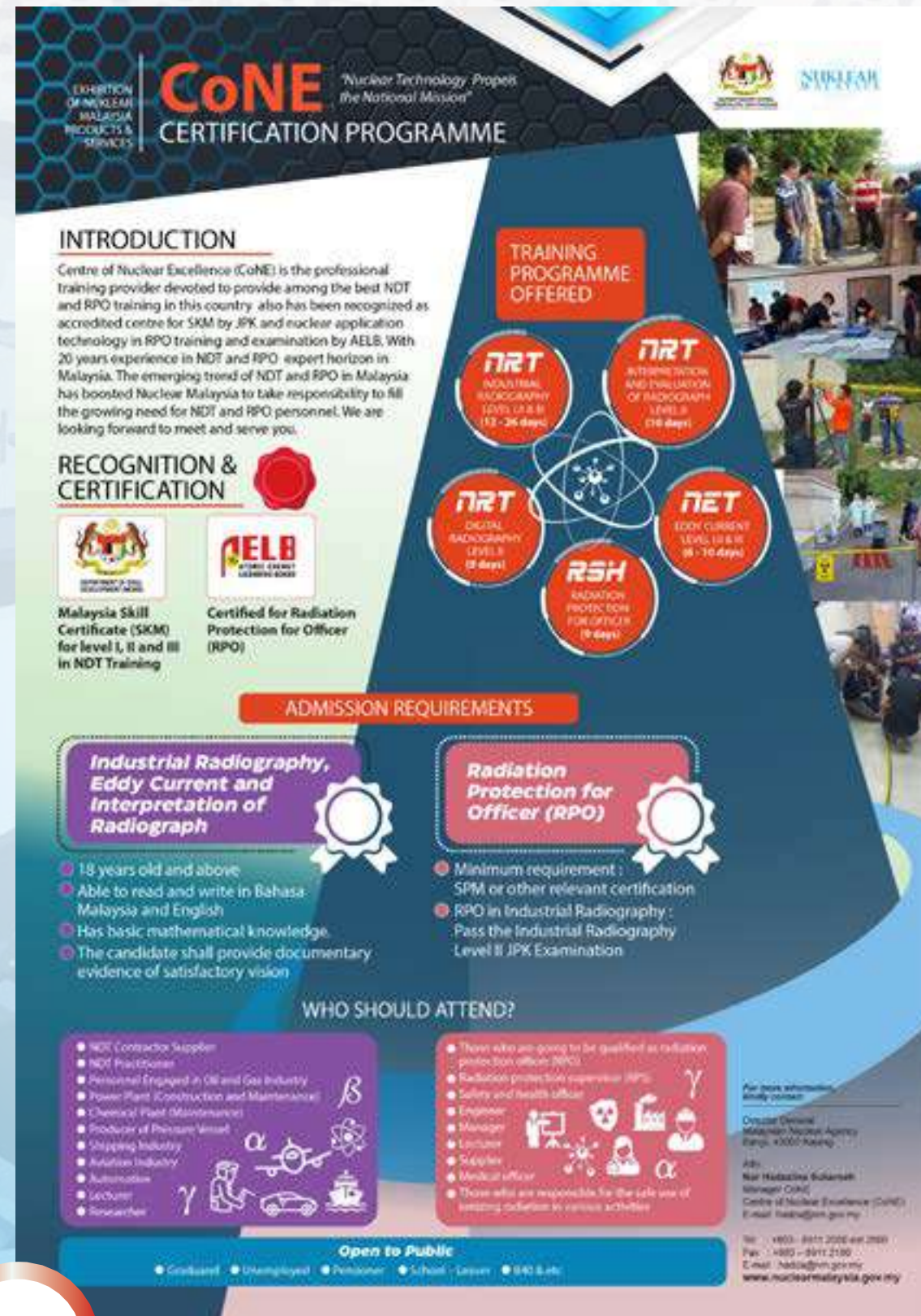
For further information, please contact:
Director General,
Malaysia Nuclear Agency
(Nuclear Malaysia)
BANGI, 43000 KAJANG,
SELANGOR

Attn: Muhammad Ridwan Ahmad,
Industrial Technology Division
E-mail: ridwan_ag@nma.gov.my

Tel: +603 - 8911 1221
Fax: +603 - 8911 2104

For more information
please scan here:

PAMERAN KEMAHIRAN SELANGOR



CoNE "Nuclear Technology Propels the National Mission"
CERTIFICATION PROGRAMME

EDITION OF NUCLEAR MALAYSIA PRODUCTS & SERVICES

INTRODUCTION
Centre of Nuclear Excellence (CoNE) is the professional training provider devoted to provide among the best NDT and RPO training in this country, also has been recognized as accredited centre for SKM by JPK and nuclear application technology in RPO training and examination by AELB. With 20 years experience in NDT and RPO, expert horizon in Malaysia. The emerging trend of NDT and RPO in Malaysia has boosted Nuclear Malaysia to take responsibility to fill the growing need for NDT and RPO personnel. We are looking forward to meet and serve you.

RECOGNITION & CERTIFICATION

Malaysia Skill Certificate (SKM) for level I, II and III in NDT Training

Certified for Radiation Protection for Officer (RPO)

TRAINING PROGRAMME OFFERED

- IRT** INDUSTRIAL RADIOGRAPHY LEVEL I & II (12 - 26 days)
- IRT** INTERPRETATION AND EVALUATION OF RADIOGRAPH LEVEL I (10 days)
- IRT** DIGITAL RADIOGRAPHY LEVEL I (8 days)
- IRT** EDDY CURRENT LEVEL I & II (8 - 10 days)
- RSH** RADIATION PROTECTION FOR OFFICER (10 days)

ADMISSION REQUIREMENTS

Industrial Radiography, Eddy Current and Interpretation of Radiograph

- 18 years old and above
- Able to read and write in Bahasa Malaysia and English
- Has basic mathematical knowledge
- The candidate shall provide documentary evidence of satisfactory vision

Radiation Protection for Officer (RPO)

- Minimum requirement : SPM or other relevant certification
- RPO in Industrial Radiography : Pass the Industrial Radiography Level II JPK Examination

WHO SHOULD ATTEND?

- NDT Contractor/Supplier
- NDT Practitioner
- Personnel Employed in Oil and Gas Industry
- Power Plant Construction and Maintenance
- Chemical Plant Maintenance
- Producer of Pressure Vessel
- Shipping Industry
- Aviation Industry
- Automotive
- Lecturer
- Researcher

Those who are going to be qualified as radiation protection officer (RPO)

- Radiation protection supervisor (RPS)
- Safety and health officer
- Engineer
- Manager
- Lecturer
- Supervisor
- Medical officer
- Those who are responsible for the safe use of ionizing radiation in various activities

Open to Public

Graduated • Unemployed • Prisoner • School • Lecturer • B40 & etc

For more information, kindly contact:

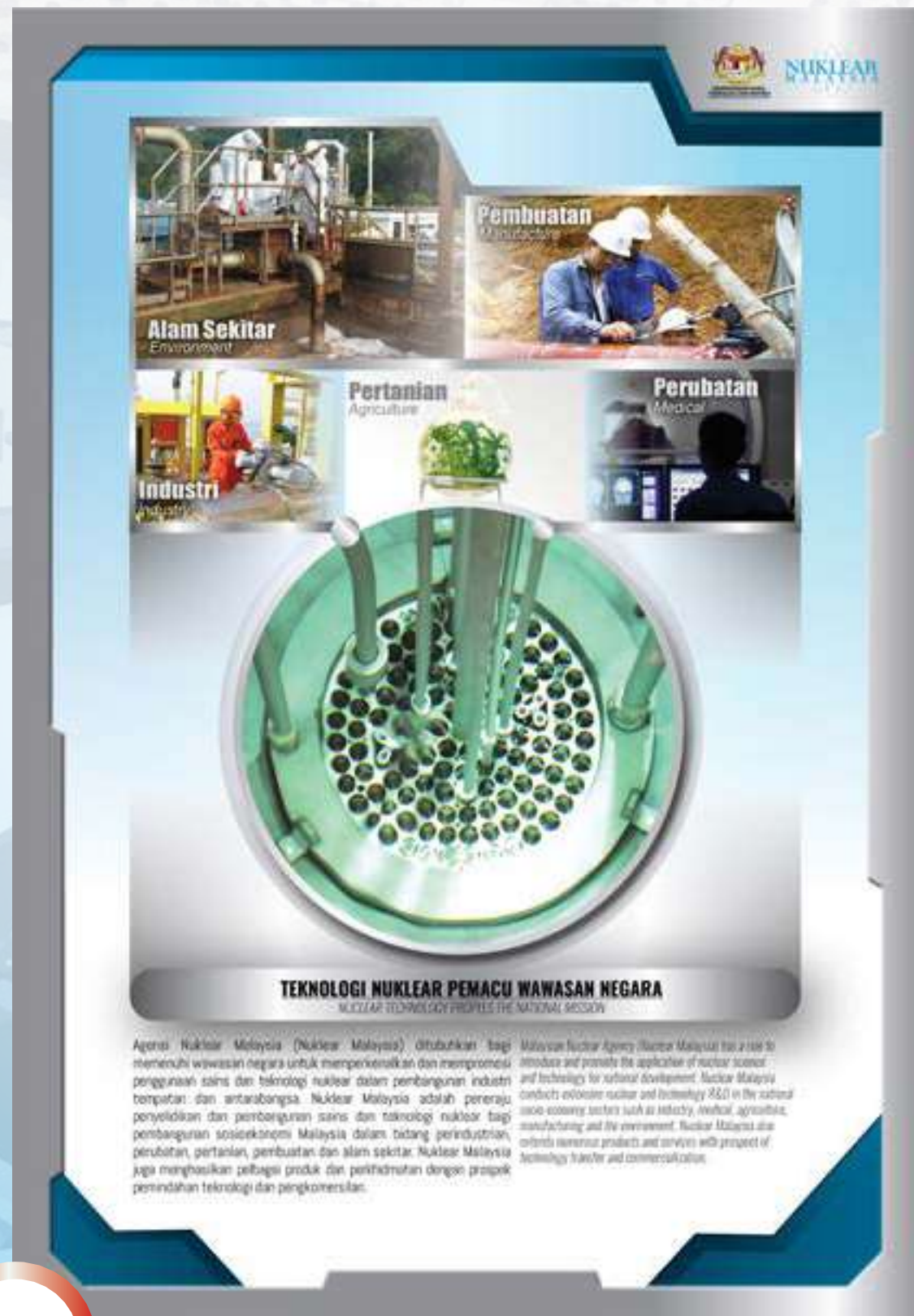
Director General
Malaysian Nuclear Agency
(Bangi, 43000 Kajang)

Attn: Nur Hafizah Sulaiman
Manager CoNE
Centre of Nuclear Excellence (CoNE)
E-mail: hns@nma.gov.my

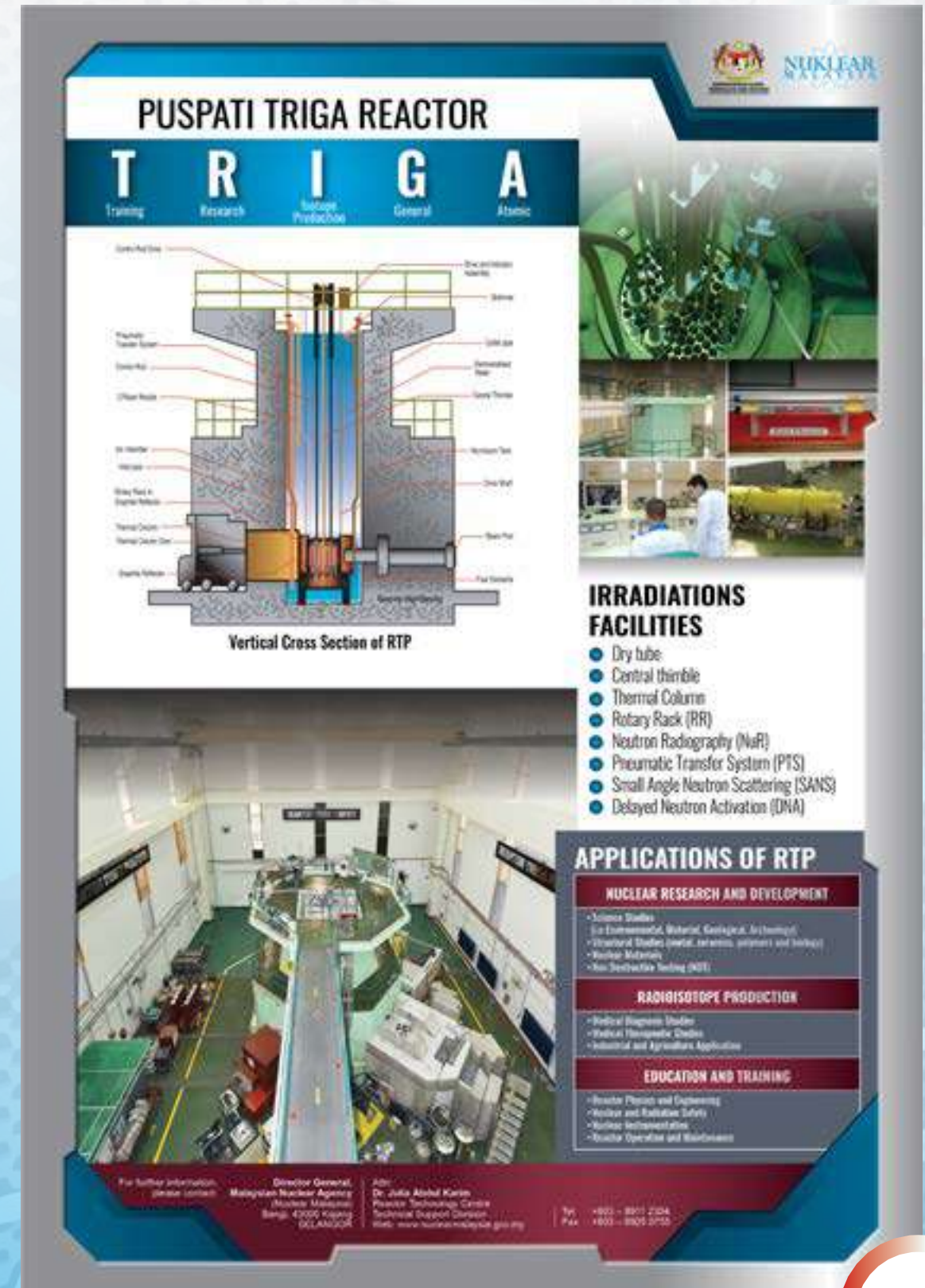
Tel : +603 - 8911 2000 ext 2000
Fax : +603 - 8911 2100
E-mail : hns@nma.gov.my
www.nuclearmalaysia.gov.my

Sudut Pameran
Linkway Reaktor
18 Disember 2021

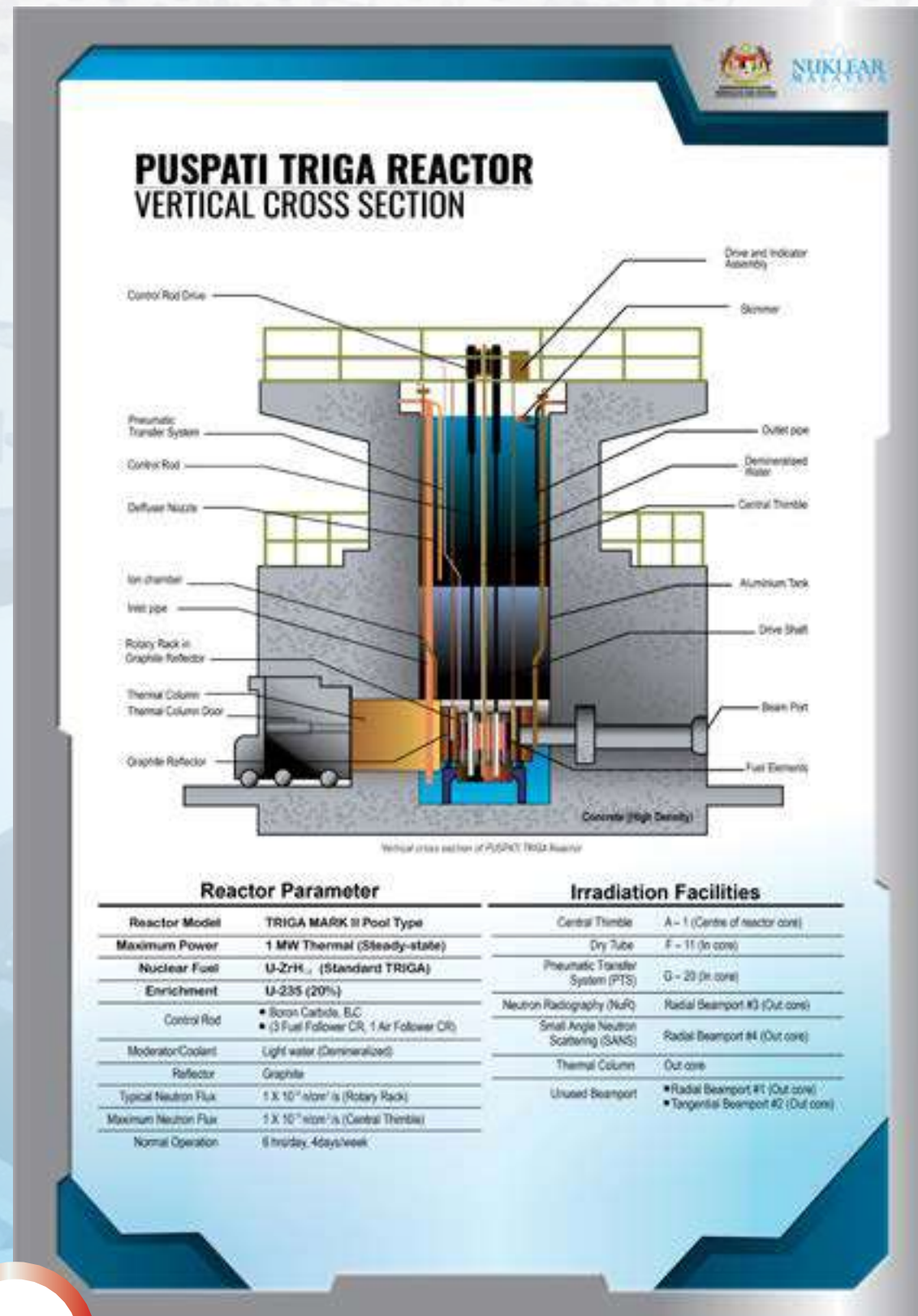
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RTP NUCLEAR SECURITY



"...THEFT, SABOTAGE, UNAUTHORIZED ACCESS, ILLEGAL TRANSFER OR OTHER MALICIOUS ACTS INVOLVING NUCLEAR MATERIAL, OTHER RADIOACTIVE SUBSTANCES OR THEIR ASSOCIATED FACILITIES."

NUCLEAR SECURITY PROTECTION POLICY OBJECTIVE

Protect persons, property, society and environment from malicious acts involving nuclear material and other radioactive material.

UNAUTHORIZED REMOVAL

- Protect against theft and other unlawful taking of nuclear material.
- Ensure the implementation of rapid and comprehensive measures to locate and, where appropriate, recover missing or stolen nuclear material.

SABOTAGE

- Protect nuclear material and nuclear facilities against sabotage.
- Mitigating or minimize the radiological consequences of sabotage.

The nuclear security policy to achieve the objectives through:

- Prevention of a malicious act by means of deterrence and by protection of sensitive information.
- Management of an attempted malicious act or a malicious act by integrated system of detection, delay and response.
- Mitigation of the consequences of a malicious act.



RTP is a 1000-kW nuclear research reactor that can offer neutron irradiation to produce radioisotopes for medical and industrial applications. Production of Samarium (Sm-153) is currently carried out for cancer patients. Most of the cancer patients (e.g. prostate, breast or lung) have to endure extreme pain in the bones. This radioisotopic treatment is meant to relieve pain instead of using steroid which may affects patients' physical activities. Sm-153 can be produced by bombarding neutrons into target material which is Samarium Oxide (Sm-152).



REAKTOR TRIGA PUSPATI (RTP): SAMARIUM (Sm-153) PRODUCTION FOR PALLIATIVE TREATMENT OF CANCER PATIENT

Sm-152 Preparation

Sm-152 is prepared by laboratory technician closed quartz tube and encapsulated in aluminum capsule.

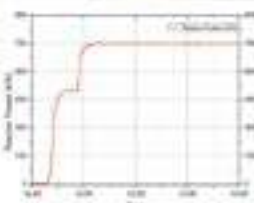


Sm-152 Loading to RTP

The aluminum capsule is carefully loaded into the irradiation hole inside the reactor core using a special handling tool.



Sm-152 Irradiation



Sm-152 is irradiated at 750kW thermal power. At this condition, neutrons are produced from the Uranium-235 fission process at the reactor core. Duration of irradiation depends on the desired activity of Sm-153 requested by the client (e.g. 8, 12 or 24 hours).



Sm-153 Product Unloading

Irradiated Sm-153 is cooled down for more than 8 hours after reactor shut down to allow the radiation level decrease to a manageable level before it is moved out from the reactor. Irradiated Sm-153 is placed in a shielded transfer cask and transported to the medical laboratory for further processing before delivery to the hospital.

Caution: Only radiation workers can perform this activities and all radiation protection procedures are implemented for personnel radiation safety.




For further information,
please contact:
Director General
Nuclear Science Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
<http://www.nuklear.mestek.gov.my>

Attn:
Dr. Julia Abdul Kader
Research Technology Center
Technical Support Division
Tel: +603-89412000 ext. 1134
Email: jula@nuklear.gov.my

THE IMPLEMENTATION OF CCD CAMERA TYPE DETECTOR IN DIGITAL NEUTRON IMAGING AT LOW FLUX TRIGA REACTOR

Khairul Yazid, Rofayyoh Jazwi, Amir Azhar, Mohamad Razi Mohamed, Dr. Julia and Faridul Hafidz bin Yusoff
Nuclear Science Agency, 43000 Bangi, Selangor, Malaysia
*Corresponding author: khairul@nuk.gov.my

Neutron Radiography Facility (NRF) was installed at one of the radial beam port of the 1 MW PUSPATI TRIGA MARK II research reactor in Malaysia in 1984 for non-destructive testing (NDT) application with an objective to utilize the reactor more potentially. A major step in the improvement of the neutron radiography activity at PUSPATI TRIGA Reactor is the implementation of digital neutron detector for neutron radiography. The new neutron detector is based on a LiF-ZnS scintillator, a front coated mirror, lenses and a cooled scientific CCD camera. We present here some information on the neutron radiography activities and the current status of the improvement.

1. INTRODUCTION

The development of neutron radiography in Malaysia started with the availability of the country's first research reactor, the 1 MW PUSPATI TRIGA Reactor, commissioned in June 1982, mainly as a tool for research and development purposes. The PUSPATI TRIGA is a swimming pool-type light water research reactor with enriched uranium-zirconium-hydro fuel and graphite reflector. There are three radial beam ports, one tangential beam port and one thermal column. The maximum steady state operating power of the reactor is 1 MW and at this operating power the thermal neutron flux at the edge of the reactor core is around $2.75 \times 10^{14} \text{ n/cm}^2 \cdot \text{s}$.

Neutron radiography facility was installed at one of the radial beam ports since 1984, has been used as a basic R&D and inspection tool for archaeological and biological objects, aircraft and industrial components. The direct exposure technique using Gadolinium foil converter and Kodak SR45 (SR5) film was established using this facility. However, this facility has low thermal neutron intensity at the sample position, which leads to long irradiation times; it gives many limitations for the industrial applications. As the result, the neutron radiography facility is being upgraded starting 2015 with aim to increase neutron flux and to reduce gamma at the exposure plane. In addition, the new facility will consist of a new collimator design and new imaging system using CCD camera. The new neutron detector is based on a LiF-ZnS scintillator, a front coated mirror, lenses and a cooled scientific CCD camera.

Recently, preliminary testing after the implementation of digital neutron radiography based on CCD camera has been done using SANS beam port due to the neutron facility is currently under construction. The neutron beam intensity at SANS beam port is estimated to be $\sim 10^{12} \text{ n/cm}^2 \cdot \text{s}$ with the TRIGA reactor operating at 750 kW. Several experiments have been performed on this experimental cradle using the new neutron detector. The results have demonstrated that the new neutron detector at SANS beam port show high potential to inspect low thickness samples. Until now just a few experiments were studied and a systematic study is still pending. More work will be explored on real time neutron radiography and neutron tomography using the new neutron detector at neutron facility beam port. The most important properties, the performance of the imaging instruments will be quantified using standard test phantoms.

2. EXPERIMENTAL SETUP

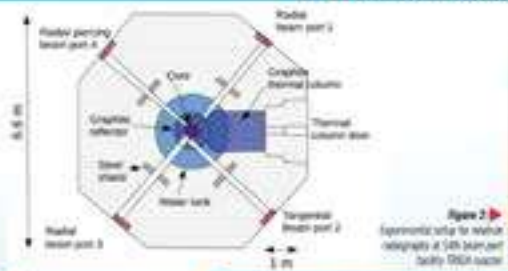


Figure 1: Core cross section of a TRIGA Mark II reactor with a typical thermal power of 1 MW. The fuel core provides a thermal flux at about $2.75 \times 10^{14} \text{ n/cm}^2 \cdot \text{s}$ with a moderator.



Figure 2: Experimental setup for neutron radiography at SANS beam port facility TRIGA reactor.

3. RESULTS

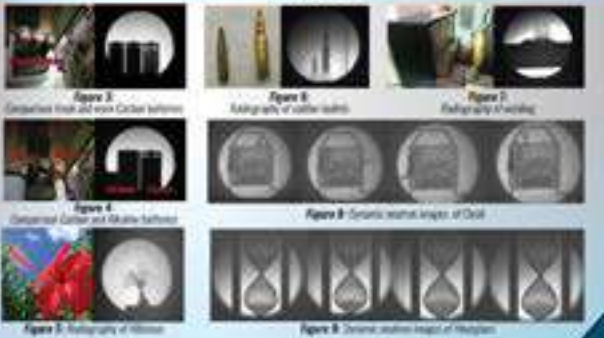


Figure 3: Comparison of old and new detector before.

Figure 4: Comparison of old and new detector after.

Figure 5: Radiograph of coffee beans.

Figure 6: Radiograph of fuel assembly.

Figure 7: Radiograph of fuel assembly.

Figure 8: Radiograph of fuel assembly.

Figure 9: Radiograph of fuel assembly.

Figure 10: Radiograph of fuel assembly.

Figure 11: Radiograph of fuel assembly.

Figure 12: Radiograph of fuel assembly.

For further information, please contact:
Director General
Nuclear Science Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuk.gov.my

Dr. Julia Abdul Karim
Reactor Technology Center
Technical Support Division
Tel: +603-89112000 ext. 1734
email: julia@nuk.gov.my

i-PFRx **INTELLIGENT PIPE FAILURE RATE ASSESSMENT METHOD FOR WATER-COOLED REACTOR**

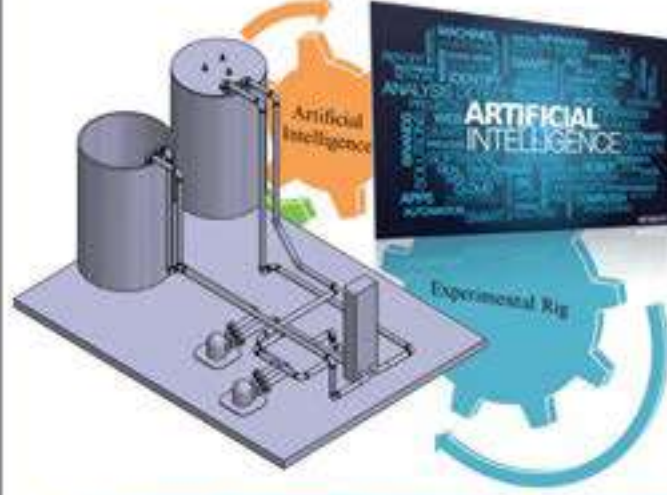
Abu Jafar Karim, Tawfik Lamsan, Mohd Ali Dzahir, Nurazli B. Yusoff, Hashim Mohd, Anwar Dzaif, Khairul Yazid, Rofayyoh Jazwi

INTRODUCTION

This work aims to design and innovate an experimental test rig by simplifying the primary piping system in a typical nuclear reactor facility such as TRIGA PUSPATI (RTP).

The cooling system consists of numerous pipelines network poses significant problems including the one in a nuclear research reactor. Thermal and irradiation activities, corrosion, embrittlement mechanism as well as aging provide an environment susceptible to increased pipe failure rates (PFR).

The occurrence of PFR is most likely due to the aging mechanism including (a) thermal embrittlement, (b) low and high cycle thermal fatigue, (c) stress corrosion cracking mechanisms, and (d) Flow Accelerated Corrosion (FAC) and high cycle mechanical fatigue that causing loss of material toughness.



MOTIVATION

To assess the PFR of the reactor due to the internal initiating events

- Numerous suitable approaches and techniques to assess the fault detection in the piping system are available to explore for this purpose.
- The relationships are established between time-dependent pipe rupture frequencies and observable parameters that describe the failure, inspection, and repair processes to support the application of the models.
- A piping reliability database in the cumulative operating experience of water-cooled reactor (WCRs) piping systems shall be developed.

To investigate the potential of artificial intelligence approach to predict PFR

- Using a range of measurable parameters of the system such as pipe age, diameter, depth, length, pressure, the length of piping, the number of welds and joints, and other associated components.

ADVANTAGES

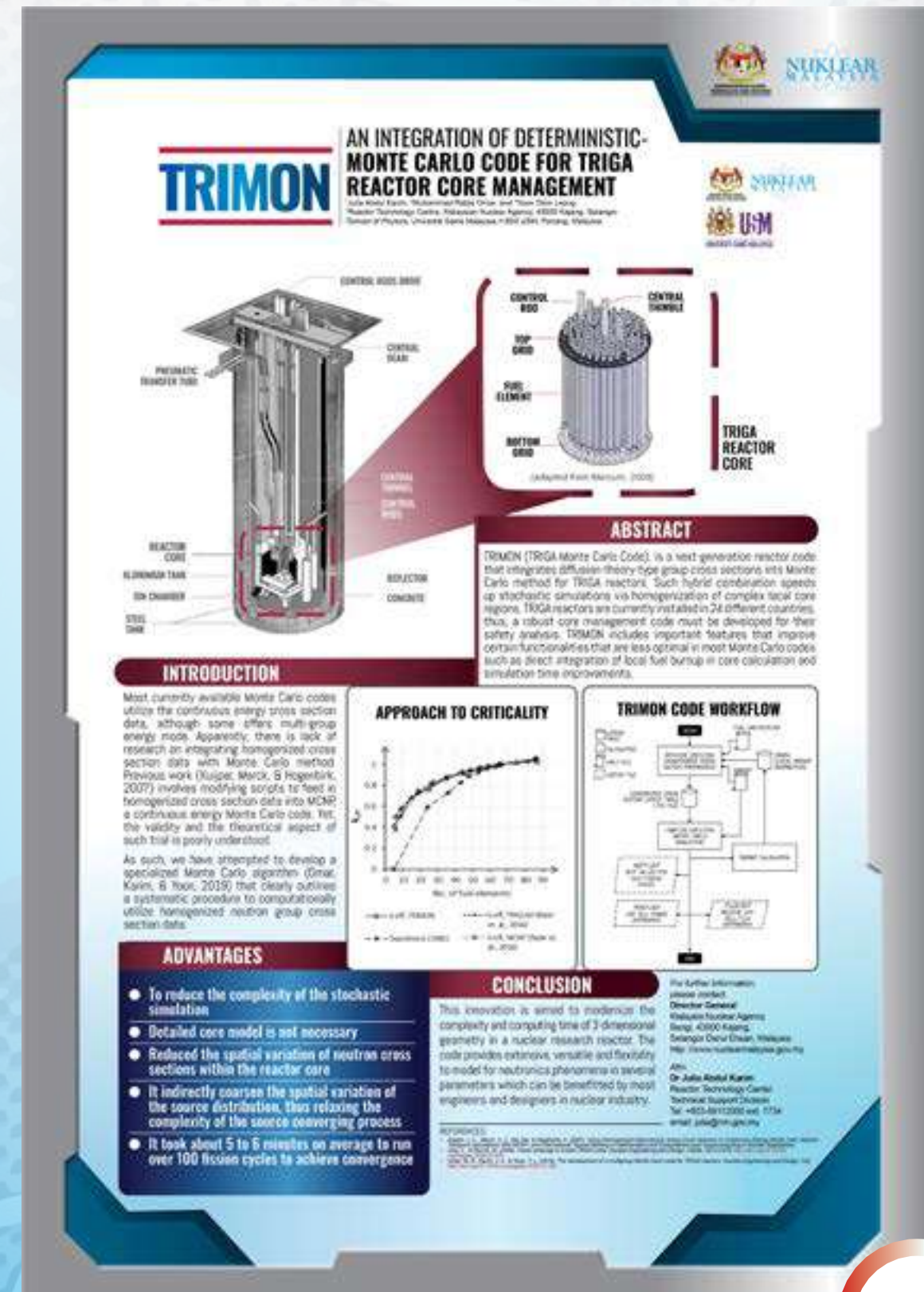
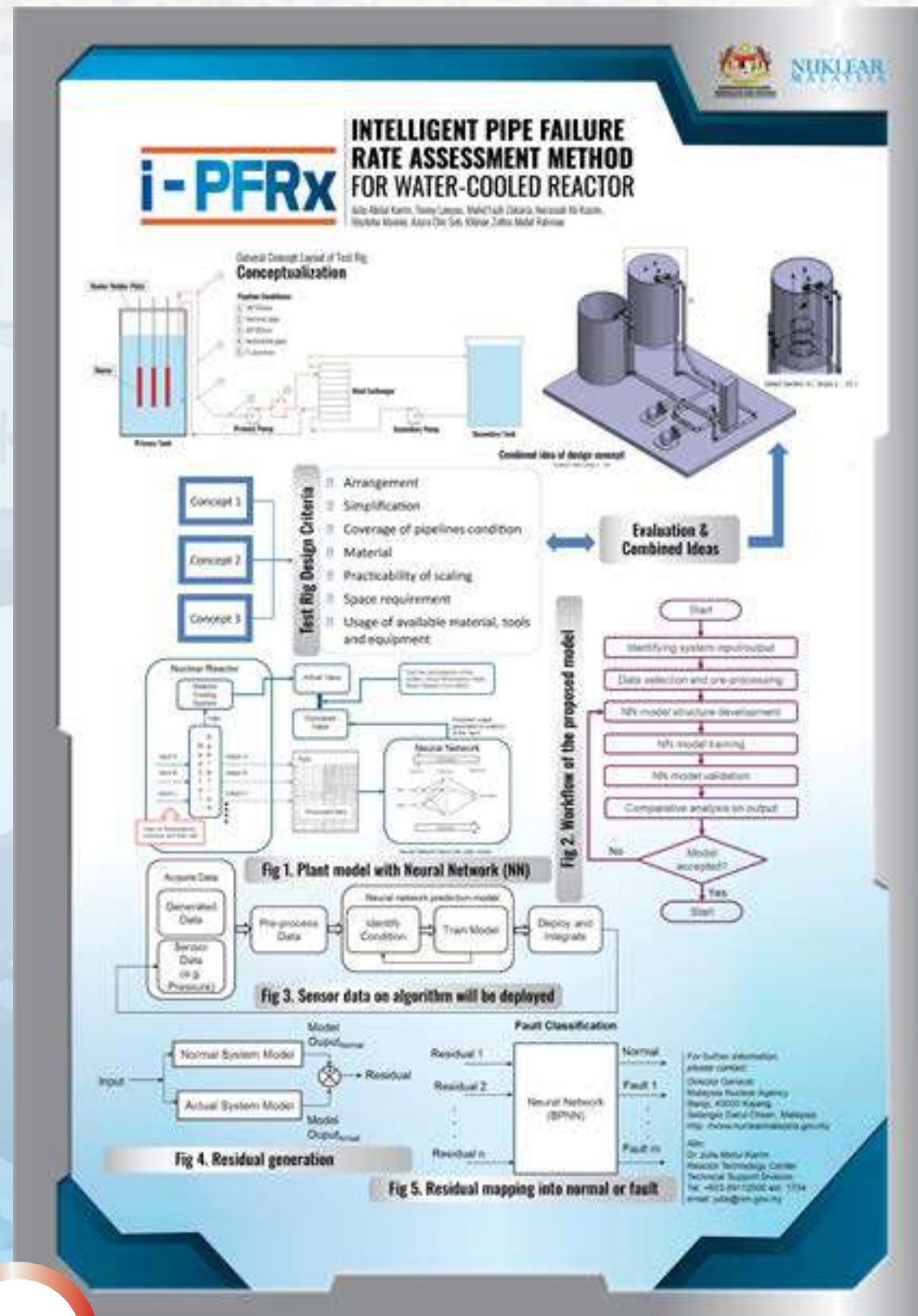
- using artificial intelligence philosophy to predict early detection of PFR in complicate pipeline
- online information, easily access via computing media
- less human intervention, eg manual inspection, limited access to space & pipeline orientation
- minimize and reduced disruption of operation that requires very long maintenance period for replacement of the system

OUTPUT

This innovation is aimed to revolutionize the philosophy and methodology of assessing pipe failure rates in water pipeline system, especially in the water-cooled reactor. However, this application is not limited to the nuclear industry but also invited for other beneficiaries that having a common problem to assess the pipeline for efficiency and diligence of the system. In line with the revolutionary towards of digitalization and industrial 4.0, the application of internet of things, artificial intelligence methodology applicable to minimize human intervention in many kinds of process and makes ease of life in future.

For further information, please contact:
Director General
Nuclear Science Agency
Bangi, 43000 Kajang,
Selangor Darul Ehsan, Malaysia
http://www.nuk.gov.my

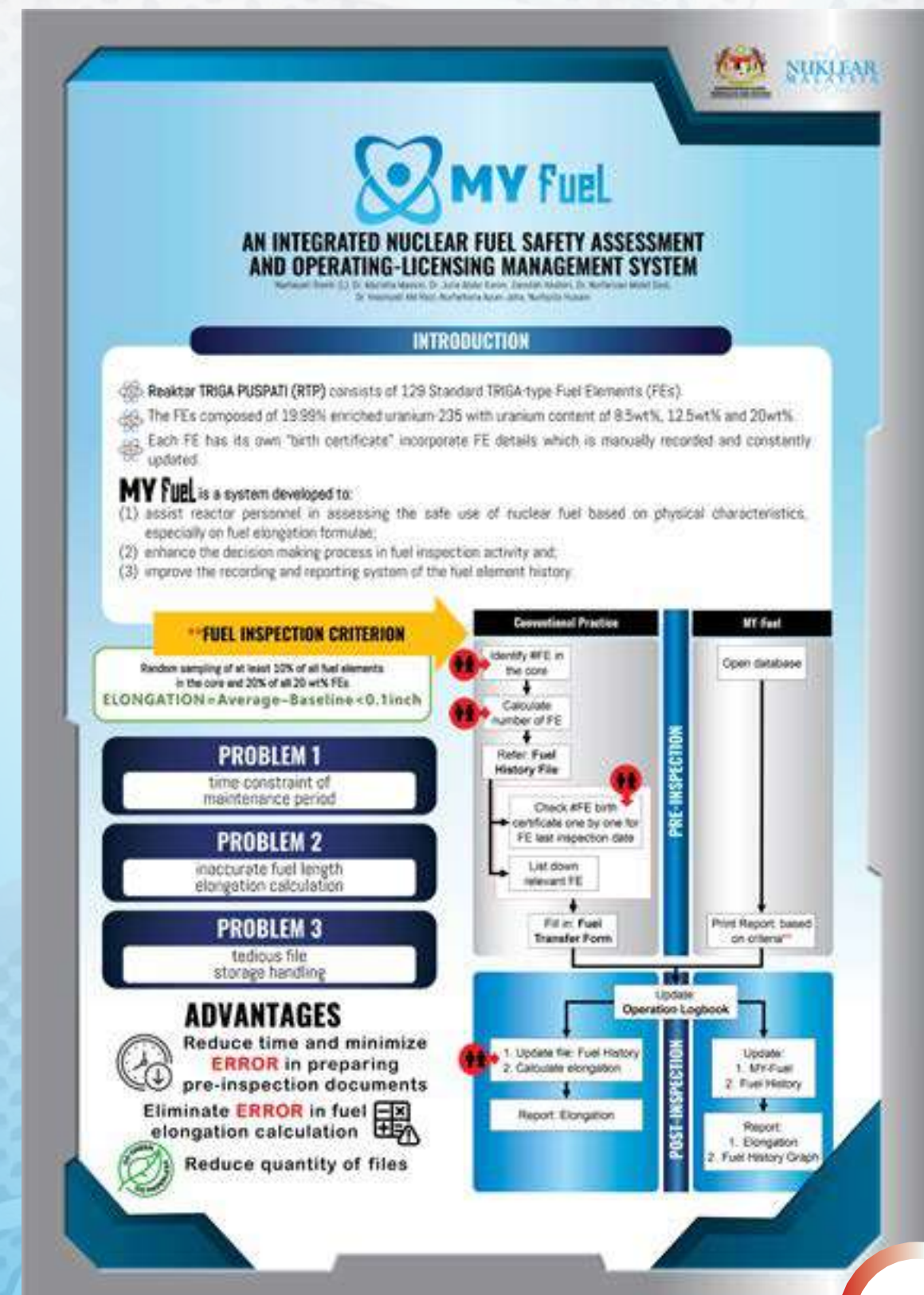
Abu
Dr. Julia Abdul Karim
Reactor Technology Center
Technical Support Division
Tel: +603-89112000 ext. 1734
email: julia@nuk.gov.my



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16

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POSTER PAMERAN

JENIS SINARAN MENTION

Terdapat tiga jenis sinaran mention iaitu alfa, beta dan gama. Setiap jenis sinaran ini memiliki perbezaan dari segi komposisi, daya menembusan, keupayaan pengionan dan kegunaan. Grafik ini meringkaskan setiap bentuk sinaran mention tersebut.

Alfa

2 proton dan 2 neutron

CARA PENEMBUSAN

Sinaran alfa tidak dapat menembusi kulit dan mampu disekat dengan menggunakan sehelai kertas.

KEUPAYAAN PENGIONAN

KEGUNAAN

Kebanyakan alat pengesan asap mengandungi americium-241 yang mana memancarkan sinar alfa bagi membantu mengionkan asap. Unsur pancaran sinar alfa juga turut digunakan sebagai bateri bagi alat perendak peritum dan Mars Curiosity Rover, sejenis kenderaan yang digunakan dalam misi penjelajahan planet Makh serta beberapa peralatan bagi penerokaan angkasa lepas.

Beta

Elektron berenergi tinggi

CARA PENEMBUSAN

Sinaran beta dapat menembusi badan manusia tetapi tidak dapat menembusi lapisan aluminium.

KEUPAYAAN PENGIONAN

KEGUNAAN

Pancaran sinar beta banyak digunakan dalam bidang perubatan termasuk pengiraan imej dalam badan bagi rawatan kanser. Dalam bidang pertanian pula, ia digunakan untuk mengesan kebocoran paip air bawah tanah dan mengukur ketebatan bahan semasa proses pembuatan.

Gama

Sinaran elektromagnetik (EM) berenergi tinggi

CARA PENEMBUSAN

Sinaran gama boleh menembusi badan manusia dan memerlukan kepingan konkrit atau logam plumbum untuk mengikat penembusannya.

KEUPAYAAN PENGIONAN

KEGUNAAN

Sinaran gama dimanfaatkan dalam proses pensterilan alat perubatan dan bahan makanan untuk tujuan eksport. Selain itu, ia juga digunakan dalam beberapa jenis selektrop untuk penghasilan imej. Sinar gama juga diaplikasikan untuk membantu membunuh sel-sel kanser dalam rawatan kanser.

Agensi Nuklear Malaysia | nuklearmalaysia | @NuklearM | www.nuklearmalaysia.gov.my

POSTER PAMERAN

Live WEBINAR

09th Sept. 2021
Thursday
9.00 am to 12.30 pm

DOES UV RADIATION KILL COVID-19 VIRUSES?

Preamble
UV radiation has been commonly used to kill bacteria and viruses. Ultraviolet germicidal irradiation (UVGI) is a disinfection method that uses short wavelength ultraviolet (ultraviolet C or UV-C) radiation to kill or inactivate the microorganisms. The use of UVC in combating COVID-19 spread has been used widely in many countries. There are many Ultraviolet Germicidal Irradiation (UVGI) device available in the market and easily accessible to the consumer. Besides of its effectiveness for disinfection of bacteria and viruses, the use of UVC should be monitored for safety reasons as the UV radiation exposure is hazardous to human. UVC is categorised as non-ionising radiation and over exposure to UVC radiation is very harmful to skin and eye. There is concern whether UVGI device is safe to be used as a consumer product. This webinar will focus on the use of UVC for disinfection and its efficacy, its potential hazard to human, regulatory requirement & current international standard on UV radiation application.

Objective To disseminate information and awareness on UV radiation safety and its efficacy for COVID-19 viruses disinfection

Who should attend?
OPEN TO ALL, FREE

Please scan this QR code for registration

SCAN ME

Speakers:
Prof. Ng Kwan Hoong (UMMC)
Dr. Tsutomu Okuno (ICNRP)
Dr. Mohd Yusof bin Hamzah (Nuclear Agency)
Ms. Roza binti Tukimin (Nuclear Agency)
Dr. Rosa binti Sarimin (JOM)

Time **Topic** **Speaker**

9.15 am	Registration	Ts Dr. Siti A'iesah binti Hashim Director General of Malaysian Nuclear Agency
9.30 am	Opening and welcoming remark	Ms. Roza binti Tukimin (Nuclear Agency)
9.45 am	UV Radiation and Nuclear Malaysia's Role	Prof Dr. Ng Kwan Hoong (Universiti Malaya Medical Centre)
10.05 am	Safety Concern on UV Radiation Usage	Dr. Tsutomu Okuno International Commission for Non-ionising Radiation Protection (ICNRP)
10.30 am	UV Radiation Hazards and ICNRP Guidelines	Dr. Mohd Yusof bin Hamzah (Nuclear Agency)
11.15 am	UV Germicidal 101: Efficacy and Its Importance	Dr. Rosa binti Sarimin (Ministry of Health)
11.35 am	Ultraviolet Device in Medicine: Evidence Based Approach	
12.00 pm	Forum (Question & Answer Session)	

Contact person:
Ms. Sabariah Kader Ibrahim
sabariah_ibrahim@nm.gov.my
sk15668@gmail.com
018-3557903

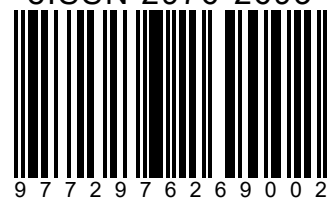
Ms. Roza Tukimin
roha@nm.gov.my
roha2000@gmail.com
013-2945954

Organized by:
MALAYSIAN NUCLEAR AGENCY

Dr. Rasif bin Mohd Zain
Moderator

Ts Dr. Siti A'iesah binti Hashim
Director General
Malaysian Nuclear Agency
Opening and Welcoming Remark

eISSN 2976-2693



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