

iNuSTEC2017,UNITEN, Putrajaya, Selangor 25th-27th September 2017



The National Energy University

PREPARE TO CREATE AN IMPACT

At UNITEN, we mould you into competent graduates that are highly coveted by the energy focused industry





UNITEN Putrajaya Campus: Jalan IKRAM-UNITEN, 43000 Kajang, Selangor. Tel: 603-8921 2020 Fax: 603-8928 7166 DU002 (B)

UNITEN Sultan Haji Ahmad Shah Campus : 26700 Bandar Muadzam Shah, Pahang, Tel: 609-455 2020 Fax: 609-455 2000 KPT/JPS/DFT/US/C 01

MALAYSIA RESEARCH ASSESSMENT

ENAGA

ASIONAL

PROGRAMME BOOK

TABLE OF CONTENTS

MESSAGE FROM VICE CHANCELLOR, UNIVERSITI TENAGA NASIONAL	I
MESSAGE FROM THE PRESIDENT, MALAYSIAN NUCLEAR SOCIETY	II
MESSAGE FROM INUSTEC2017 CHAIRMAN	III
MESSAGE FROM THE PRESIDENT, WOMEN IN NUCLEAR MALAYSIA	IV
PROGRAMME SCHEDULE	1
POSTER SESSION	7
PROGRAMME – NUCLEAR YOUTH COMPETITION 2017 (NYC2017)	9
LIST OF EXHIBITORS/ SPONSORS	10
ABSTRACTS FOR PLENARY	11
ABSTRACTS FOR KEYNOTE	13
ABSTRACTS FOR INVITED	21
ABSTRACTS FOR ORAL	24
ABSTRACTS FOR POSTERS	86
ORGANIZING COMMITTEE	97
MALAYSIAN NUCLEAR SOCIETY (MNS)	101
IN MEMORY OF ASSOC. PROF. DR ZAINI B HAMZAH	103
ANNOUNCEMENT	104

MESSAGE FROM VICE-CHANCELLOR

Nuclear Science, Engineering and Technology (SET) innovations are the key drivers for Malaysia to become an advanced nation, especially for institutions of higher education such as UNITEN. As Malaysia aspires to become top 20 nations in economic development, social advancement and innovation by 2050, SET especially nuclear based, will propel the growth of socio–economic development of Malaysia. Indeed, a nation with a strong SET will offer a competitive edge. Malaysia should, in earnest, strive to excel in SET for its sustainable socio–economic development.

The collaborations of UNITEN with other Institutions of Higher Learnings and NGOs in Malaysia for organizing this conference indeed are highly encouraged. Furthermore, this conference is held in conjunction with the 2nd Women in Nuclear (WiN) Malaysia Annual Conference 2017 and Nuclear Youth Competition 2017 shows a balanced and forward looking agenda for the nation in participation of women and youth in nuclear science, technology and engineering. This proves that the conference theme "*Crafting Nuclear Knowledge for Human Well-Being*" is indeed very well reflected. Malaysian industries and government sectors should encourage all collaborations, so that our students get all the avenues to practice hands-on skills and knowledge in science and engineering related to nuclear, whether in local or overseas projects. UNITEN will certainly provide the platform for these students to succeed in their career and proliferate their contributions toward the nation.

I would like to take this opportunity to congratulate the Organizing Committee of iNuSTEC2017 that comprises of UNITEN and MNS, the supporting organizations which are UiTM, UTM, UKM, UM, UTHM, USIM, IIUM, Nuclear Malaysia, American Society of Mechanical Engineers (ASME) Malaysia Section and Malaysian Welding and Joining Society (MWJS). The concerted efforts from all the parties involved are indeed highly appreciated. The fruitful cooperation among the NGOs, Universities and Research Institutes is definitely a key element to promote the peaceful use of nuclear science, engineering and technology in Malaysia and at the international arena.

I wish you a very successful conference.

Thank you,

DATO' PROF. DR. IR. KAMAL NASHARUDDIN MUSTAPHA VICE-CHANCELLOR UNIVERSITI TENAGA NASIONAL (UNITEN)

MESSAGE FROM THE PRESIDENT, MALAYSIAN NUCLEAR SOCIETY (MNS)

On behalf of the Malaysian Nuclear Society (MNS), I am pleased to welcome all presenters and participants to the International Nuclear Science, Technology and Engineering Conference 2017 (iNuSTEC2017). This is the second time that MNS is organizing with Universiti Tenaga Nasional, in Kajang, Selangor (first was in 2010), to bring national focus on the importance of Nuclear Science, Technology and Engineering in socio-economic development of Malaysia. Successes of proceeding series of nuclear science, technology and engineering conferences NuSTEC2014, NuSTEC2012, NuSTEC2011, NuSTEC2010 at national level, and NuSTEC2013, NuSTEC2015 and NuSTEC2016 at international level, have brought NuSTEC2017 this time more meaningful.

MNS is indeed honoured to co-organize this conference with Universiti Tenaga Nasional, and with organizations such as Nuclear Malaysia, UiTM, UKM, UTM, UM, USIM and UTHM, with the support from American Society of Mechanical Engineers (ASME) Malaysia Section and Malaysian Welding and Joining Society (MWJS). This brought to the front MNS aspiration to become more professional in nature. With the inception of a new MNS Chapter, the Institute of Nuclear Engineers, sinced 2015, MNS has moved towards greater strength in Nuclear Science, Engineering and Technology. MNS members shall strive to make it better and stronger in future.

In conjunction with this conference, MNS is also honoured to organise Nuclear Youth Competition 2017 (NYC2017) to help bring the young nuclear generation into the main stream of nuclear development and issues. This second time that Women in Nuclear Malaysia (WiN Malaysia), as Chapter of MNS and Women in Nuclear (WiN) Global, is organizing Women in Nuclear Malaysia 2017 Annual Conference to highlight the importance of women factor in the development of nuclear sector in Malaysia.

This conference, participated by experienced and young researchers, will discuss and debate latest development in all areas of nuclear technology applications for friendly purposes at international level. This would spur and catalyse further research and development leading to the sustainable and improvement of the quality of life without compromising the quality of the environment in Malaysia and in the world.

MNS is a unique non-governmental organization incorporated under the Malaysian Society Act, formed and headed by individuals that are aligned to the good usage of nuclear science and technology. Its memberships are opened to those interested in such causes. We are actively involved in promoting the advancement, information, understanding and popularization of nuclear to the public in Malaysia. This conference is a way of realizing such objective. This conference also served as public acceptance programme hosted by MNS together with institutions of higher learning an researches, with the aim of introducing the good use of nuclear science and technology to the public at large. On top of that MNS also published twice a year on regular basis the Journal of Nuclear and Related Technologies (JNRT) and Buletin Nuklear Malaysia (BNM) for researchers to share their research findings with the community. We also publish NuSTEC proceedings on yearly basis.

I wish to express my heartfelt thanks to all speakers for your willingness to share your experience with the rest of participants for the advancement of nuclear field. The contribution is not only come from Malaysian scientific community but also from distinguished guest speakers of iNuSTEC2017.

We are honoured to have distinguished international and national experts in the field of nuclear (neutron) science and engineering from supporting universities served as International Advisory and National Advisory Panels for iNuSTEC2017. We are indeed pleased to have Organizing Committees of iNuSTEC2017 and the Secretariats working with along to ensure the success of iNuSTEC2017.

We must also thank the UNITEN for hosting iNuSTEC2017, Women in Nuclear Annual Conference 2017 and Nuclear Youth Competition (NYC2017) and, all the personnel involved for their unwavering efforts to make this event a reality. I wish to also record my appreciations and thanks to all sponsors for their generous support. May all these efforts bring benefits to all of us and I wish everyone a successful conference.

"Crafting Nuclear Knowledge for Global Well-Being "

Thank you.

ASSOC PROF DR ABDUL AZIZ MOHAMED PRESIDENT, MNS

MESSAGE FROM iNuSTEC2017 CHAIRMAN

The Organizing Committee of iNuSTEC2017 is proud to organize this event with Universiti Tenaga Nasional (UNITEN) in collaboration with Malaysia Nuclear Society (MNS), Malaysian Nuclear Agency (Nuclear Malaysia), Universiti Tenaga MARA (IUTM), Universiti Kebangsaan Malaysia (UKM), Universiti Teknologi Malaysia (UTM), Universiti Malaya (UM), Universiti Sains Islam Malaysia (USIM) and Universiti Tun Hussein Onn Malaysia (UTHM) in organizing International Nuclear Science, Technology & Engineering Conference 2017 (iNuSTEC2017), and supported by American Society of Mechanical Engineers (ASME) Malaysia Section and Malaysian Welding and Joining Society (MWJS). We are also proud to be organizing iNuSTEC2017 with support from distinguished experts in nuclear science and engineering from all over the world as plenary, keynote and invited speakers, and also local experts as National Advisory Panels.

We are grateful to WiN Malaysia for agreeing to hold joint plenary sessions with iNuSTEC2017 where we will have the opportunity to listen to local and international eminent speakers. We are also organizing Nuclear Youth Competition 2017 (NYC2017) concurrent with this conference. At the national and international forefront of science and energy development, we are honoured to be able to highlight the usage of science and engineering in the nuclear field and to promote the use of nuclear science and technology for peaceful use through these conference, workshop and side meetings.

Nuclear science and technology encompasses a wide range of fields; e.g. physics, mathematics, chemistry, electronics & control, electrical equipment, mechanical components, regulatory process, law and others, including process management, especially in managing the spent fuel and radiation waste. Science and technology plays an important role in combining all these different fields together to create a safe way to harness the vast potential of nuclear energy for our daily usages.

We have seen how the use of peaceful use nuclear science and technology can be benefitted if the intention is towards peaceful uses, as evident in enhancement of national growth through the use of nuclear science and technology. We can see that nuclear science and technology, if harnessed properly could help Malaysia to prosper its economic development. This is the reason why we need to encourage the advancement of nuclear technology in the peaceful ways and shun its use in the military way.

The Organizing Committee hopes that iNuSTEC2017 will provide a platform for good discussions and knowledge sharing, so that we can create a better world through technology advancement and economical utilization of nuclear energy and science. We wish for further collaborations of experts between national universities, research institutions and their counterparts internationally, in propagating the nuclear science and energy development.

Lastly, The Organizing Committee hopes that all participants will have a wonderful experience in iNuSTEC2017 near Putrajaya and we will be able to continue in our pursuit for useful knowledge. Hope you enjoy the picturesque of Putrajaya landscape.

Thank you.

"Crafting Nuclear Knowledge for Global Well-Being "

ASSOC. PROF. DR. NASRI A HAMID, UNITEN DR. FARIDAH MOHAMAD IDRIS, MNS CHAIRS OF INUSTEC2017

MESSAGE FROM THE PRESIDENT, WOMEN IN NUCLEAR (WIN) MALAYSIA)

Welcome to the 2nd WiN Malaysia Annual Conference! This year's conference theme is "Empowering Women in Science, Technology & Innovation for Sustainable Development". We are honoured and delighted that many distinguished guests and researchers are taking part in this event of ours and we look forward to an outcome that will be beneficial to all.

WiN Malaysia was established on 28 March 2014 and was accepted as a chapter of WiN Global on 17 June 2014. Sharing a common mission with its global counterpart, WiN Malaysia hopes to bridge existing gaps between the public and the nuclear community by sharing information not only of the benefits of nuclear and radiation applications, but also of the radiation protection measures that are in place to ensure the safety of the public and the environment.

Since it is imperative that the nuclear fraternity imparts its knowledge and information to a wider audience, we therefore welcome the opportunity to hold our conference in parallel with NuSTEC2017 and to have our invited keynote speakers address the larger audience in joint plenary sessions. This will certainly benefit more participants and enhance networking among them. We would like to thank MNS and UNITEN for the opportunity to collaborate in this regard.

Women scientist and technologist have been contributing significantly towards the country's development and wellbeing. In relation to this, WiN Malaysia is therefore organising a post conference dialogue to honour these women's achievement and contribution towards the national nuclear program. They were among those who had pioneered research in nuclear applications, led international collaborative projects and developed the irradiation facilities that have been serving the nation for more than 3 decades. WiN would like to honour these women by inviting them to share their experiences and knowledge. We welcome all participants to take advantage of this bonus event to learn from the experts.

I would like to especially thank the WiN Malaysia Committee Members for their unstinting support and our friends who graciously offered their kind assistance in various ways like setting up the conference webpage and sharing of material and information that go a long way towards ensuring the success of the conference and workshop.

On behalf of WiN Malaysia, I wish everyone a fruitful conference and a wonderful stay here!

Thank you.

DR. NOOR HASNAH MOHAMED KHAIRULLAH PRESIDENT, WIN MALAYSIA

DAY 1: Monday, 25th September 2017

Morning Session

08:15		Registration Arrival of Participants and Guests		
09:00-10.10		SESSION 1: Chairman: Prof. Dr Mohd Zamri Yusoff (DVC of UNITEN) Venue: Lecture Hall DK1 (College of Computer Science & Information Technology)		
P01	09:00	CHARTING RESEARCH AND DEVELOPMENT FOR SUSTAINABLE NUCLEAR SCIENCE & TECHNOLOGY DR DAHLAN HJ. MOHD Deputy Director General, Research & Technology Development Programme, Malaysian Nuclear Agency		
P02	09:30	Plenary 2: NUCLEAR ACADEMY FOR PEACE AND SUSTAINABLE DEVELOPMENT PROF. EMERITUS DR. MASAKI SAITO Tokyo Institute of Technology, Japan		
10:10-	-10:30	Tea Break		
10:30-10:50		OPENING CEREMONY Officiating speech by Dato' Prof. Dr, Ir. Kamal Nasharuddin, Vice Chancellor of UNITEN Memorandum of Understanding (MoU) document exchange between UNITEN and NUKLEAR MALAYSIA		
		Planary 2.		
P03	10:50	NUCLEAR ENERGY PLANNING AND DEVELOPMENT IN MALAYSIA DATO' SRI NANCY SYUKRI Minister in the Prime Minister Office, Malaysia		
P03	10:50	NUCLEAR ENERGY PLANNING AND DEVELOPMENT IN MALAYSIA DATO' SRI NANCY SYUKRI Minister in the Prime Minister Office, Malaysia Photo Session		
P03	10:50 -11:30 -12.50	NUCLEAR ENERGY PLANNING AND DEVELOPMENT IN MALAYSIA DATO' SRI NANCY SYUKRI Minister in the Prime Minister Office, Malaysia Photo Session SESSION 2: Chairman: Assoc Prof Dr Abdull Aziz Mohamed (MNS/UNITEN)		
P03 11:25- 11:30- P04	10:50 -11:30 -12.50 11:30	NUCLEAR ENERGY PLANNING AND DEVELOPMENT IN MALAYSIA DATO' SRI NANCY SYUKRI Minister in the Prime Minister Office, Malaysia Photo Session SESSION 2: Chairman: Assoc Prof Dr Abdul Aziz Mohamed (MNS/UNITEN) Venue: Lecture Hall DK1 Keynote 1: NUCLEAR POWER PROGRAMME DEVELOPMENT ABDUL RAZIB DAWOOD Chief Executive Officer, Malaysia Nuclear Power Corporation (MNPC)		
P03 11:25- 11:30- P04 P05	10:50 -11:30 -12.50 11:30 12:10	NUCLEAR ENERGY PLANNING AND DEVELOPMENT IN MALAYSIA DATO' SRI NANCY SYUKRI Minister in the Prime Minister Office, Malaysia Photo Session SESSION 2: Chairman: Assoc Prof Dr Abdul Aziz Mohamed (MNS/UNITEN) Venue: Lecture Hall DK1 Keynote 1: NUCLEAR POWER PROGRAMME DEVELOPMENT ABDUL RAZIB DAWOOD Chief Executive Officer, Malaysia Nuclear Power Corporation (MNPC) Keynote 2: SUPER WOMAN JUGGLING ROLES: WHAT WORK BALANCE ARE YOU TALKING ABOUT? PROF. DR. HARLINA HALIZAH SIRAJ Head, Department of Medical Education, Faculty of Medicine, Universiti Kebangsaan Malaysia (UKM)		

DAY 1: Monday, 25th September 2017

Afternoon Session

		SESSION 3:		
14:10-17:00		Session 3A: WIN MALAYSIA 1 Chairman: Salmah Moosa	Session 3B: SCIENCE & ENGINEERING 1 Chairman: Dr Hassan Mohammed	Session 3C: ENVIRONMENTAL & SAFETY Chairman: Dr Syukri Yahya
		Venue: Lecture Room BW-G-R04	Venue: Lecture Room BW-G-R05 P06B: Invited Speaker 1:	Venue: Lecture Room BW-G-R06 P06C: Nuclear and Radiological
	14.10	P06A: Invited Speaker WIN Malaysia: Nanotheranostics in Nuclear Medicine	NUCLEAR SECURITY CURRICULUM DEVELOPMENT IN MOROCCO, HASSAN II UNIVERSITY OF CASABLANCA CASE	Emergency Preparedness: Demands and Needs for Global Perspectives
P06	14:10	NAJILA MOHD JANIB Medical Technology Division, Malaysia Nuclear Agency	PROF. EL HASSAN SAYOUTY Head of Physics Department, University of Hassan II, Casabilanca, Morocco	ALTAB HOSSAIN Department of Nuclear Science and Engineering, Military Institute Science and Technology, Dhaka, Bangladesh
D 07	14:40	P07A: Enhancing Women's Participation in and Contribution to The Nuclear Industry	P07B: Small Angle X-Ray Scattering (SAXS) Technique on Powder Sample	P07C: An Assessment of Absorbed Dose and Radiation Hazard Index Around Repository Facility at Bukit Kledang, Perak, Malaysia
FV7	14.40	SHERIFFAH NOOR KHAMSEAH AL-IDID BINTI DATO' SYED AHMAD IDID Malaysia Nuclear Agency	HAFIZAL YAZID Malaysia Nuclear Agency	MOHD IZWAN ABDUL ADZIZ School of Applied Physics, Faculty of Science and Technology, Universiti Kebangsaan Malaysia (UKM)
P08	15:00	P08A: Potential Impact of Andrassy Bentonite Microbial Diversity in the Long-Term Performance of a Deep Nuclear Waste Repository	P08B: Fault Detection and identification of Reactor Safety Related Instrumentation at Reactor TRIGA PUSPATI (RTP)	P08C: Mechanism and Kinetics of Uranium Adsorption Onto Soil Around Coal-Fired Power Plant
FVO	15:00	MOHD YUHYI MOHD TADZA Faculty Of Civil Engineering & Earth Resources, Universiti Malaysia Pahang (UMP)	ZAREEN KHAN ABDUL JALIL KHAN Reactor Instrumentation and Control Section, Reactor Technology Center, Technical Support Service, Malaysian Nuclear Agency	DGKU KAMILAH PG ISMAIL Faculty of Applied Physics, Universiti Teknologi MARA (UITM)
P09	15:20	P09A: Investigation of Au-198 as radiotracer in Laboratory Porous Media Using Gamma Camera: A Preliminary	P09B: Spatial Interpolation of Gamma Dose in Radioactive Waste Storage Facility NAZRAN HARUN	P09C: Evaluation of Radiation Dose in Pediatric Head CT Examination: A Phantom Study
		NORAISHAH OTHMAN Malaysia Nuclear Agency	Waste Technology Development Centre (WasTeC) Waste Technology and Environmental Division Malaysian Nuclear Agency	NIK NORHASRINA NIK DIN Faculty of Applied Physics, Universiti Teknologi MARA (UITM)
P10	15:40	P10A: Automatic Sample Changer Control Software for Automation of Neutron Activation Analysis Process in Malaysian Nuclear Agency	P10B: The Implementation of a Charge Coupled Device (CCD) Camera in a Neutron Imaging System for Real Time and Tomography Investigation	P10C: Development of the Automated Bunker Door by using a Microcontroller- System
		NOLIDA YUSSUP Malaysia Nuclear Agency	KHAIRIAH YAZID Malaysia Nuclear Agency	MOHD.AZHAR AHMAD Malaysia Nuclear Agency
D11 16:00	16:00	P11A: GSM Module for Wireless Radiation Monitoring System via SMS	P11B: Neutron and Gamma Ray Fluxes Measurement and Simulation at Radial Beam Port 1 of TRIGA MARK II PUSPATI Research Reactor	P11C: Malaysian Nuclear Agency Education and Outreach Program – Nuclear Science and Technology for Secondary School (NST4SS)
		NUR AIRA ABD RAHMAN Malaysia Nuclear Agency	MUHAMMAD ALIFF ASHRAFF ROSDI Department of Energy Engineering, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia (UTM)	NASAAI MASNGUT Information Service Unit, Information Management Unit, Malaysia Nuclear Agency
P12 1	16:20	P12A: Experience in the Recertification of Reactor Operator for RTP	P12B: Thermal Neutron Flux Measurement at the Thermal Column of the Malaysia TRIGA Mark II reactor using Gold Foil Activation and TLD	P12C: Introduction to Neutron Diffraction Technique for Residual Stress Measurement
		JULIA ABDUL KARIM Malaysia Nuclear Agency	SAFWAN SHALBI Department of Energy Engineering, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia (UTM)	ZAIFOL SAMSU Malaysia Nuclear Agency
P13	16:40	P13A: Limitations and Challenges Towards an Effective Business Continuity Management in NUKLEARMALAYSIA	P13B: Study on the Window Cooling System of the 300 keV Electron Accelerator	P13C: XPS Analysis of Graphene Ink for Fine Solid Lines Printed on BOPP Substrate in Micro-Flexographic Printing
ГIJ		AMY HAMIJAH BINTI AB. HAMID Malaysia Nuclear Agency	LEO KWEE WAH Malaysia Nuclear Agency	SUHAIMI HASSAN Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn (UTHO)
17:00			Tea Break & Conference Adjourn	

DAY 2: Tuesday, 26th September 2017

Morning Session

09:00-10:40		SESSION 4: Chairman: Dr. Noor Hasnah Mohamed Khairullah (WiN Malaysia) Location: Lecture Hall DK1		
P14	09:00	Keynote 3: NUCLEAR REGULATORY FRAMEWORK FOR TRAINING & EDUCATION HAMRAH MOHD ALI General Director, Atomic Energy Licensing Board of Malaysia (AELB)		
P15	09.35	Keynote 4: WHAT NEUTRONS CAN DO FOR OUR LIVING? PROF. DR. SUNG MUNG CHOI President Asia-Oceania Neutron Scattering Association (AONSA) Professor and Head, Department of Quantum and Nuclear Engineering, Korea Institute of Science and Technology, Republic of Korea		
P16	10:10	Keynote 5: EMPOWERING WOMEN IN SCIENCE & TECHNOLOGY INDUSTRY (STI) FOR SUSTAINABLE DEVELOPMENT PROF. DATIN PADUKA DR. KHATIJAH YUSOFF, FASc Faculty of Biotechnology and Molecular Sciences, Universiti Putra Malaysia (UPM)		
10:40-10:55		Tea Break Poster, Exhibition & Business Networking Session		
10:55-12:55		SESSION 5: Chairman: Prof Dr Izham Zainal Abidin (UNITEN) Location: Lecture Hall DK1		
P17	10:55	Keynote 6: THE ROLE OF POLYTECHNIC INSTITUTE IN NUCLEAR HUMAN RESOURCES DEVELOPMENT IN INDONESIA: DAST, PRESENT AND FUTURE DR. ALIQ ZUHDI Mead of Research and Community Service Unit. Polytechnic Institute of Nuclear Technology, National Nuclear Energy Agency (BATAN), Yogyakarta, INDONESIA		
P18	11:35	KEYNOTE 7: THE APPLICATION NUCLEAR PHYSICS IN ASTROPHYSICS PROF. DR. HASAN BIN ABU KASSIM Head, Physics Department, Faculty of Science, University of Malaya (UM)		
P19	12:15 14:10	KEYNOTE 8: AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) ENHANCES PUBLIC WELFARE AND SAFETY ASSOC. PROF. DR. MOKHTAR AWANG Chair, American Society of Mechanical Engineers (ASME) Malaysia Section, Universiti Teknologi Petronas (UTP), Perak, Malaysia Lunch Break, Poster, Exhibition & Business Networking Session		

DAY 2: Tuesday, 26th September 2017

Afternoon Session

		SESSION 6:				
14:10-17:00		Session 6A:	Session 6B:	Session 6C:		
		WIN MALAYSIA 2 Chairman: Suzilawati Muhd Sarowi	RADTECH Chairman: Dr Nik Ghazali Nik Salleh	MATERIALS & SUSTAINABILITY 1 Chairman: Ms Rogemah Ramli		
		Location: Lecture Room BW-G-R04	Location: Lecture Room BW-G-R05	Location: Lecture Room BW-G-R06		
P20	14:10	P20A: Invited Speaker WIN Malaysia: The Role of Woman in Nuclear - Attracting Public Participation in Regulatory Decision Making Process	P20B: Invited Speaker 3: OVERVIEW OF THE INTERNATIONAL NUCLEAR SECURITY EDUCATION NETWORK (INSEN) AND PARTICIPATION OF UNIVERSITI TENAGA NASIONAL (UNITEN) IN INSEN	P20C: The Design and Dosimetric Evaluation Tannin-Based <i>Rhizophora</i> spp. Particleboard as Phantoms for High Energy Photons and Electrons		
		Head, NPP Regulatory Coordination, Malaysia Nuclear Power Corporation	ASSOC. PROF. DR. NASRI A HAMID Nuclear Engineering and Energy Group (GrEEN), Universiti Tenaga Nasional (UNITEN)	School Of Health Sciences, Universiti Sains Malaysia (USM)		
P21	14:40	P21A: Radiopharmaceuticals for Assessment of Tumor Perfusion	P21B: Properties of UV Curable Palm Oil using Laboratory Scale and Pilot Plant Scale System	P21C: Hydrothermal Growth of ZnO: A Substrate-dependent Study on Nanostructures Formation		
		NG YEN Radioisotope Technology & Innovation Malaysia Nuclear Agency	MEK ZAH SALLEH Malaysia Nuclear Agency	NUR UBAIDAH SAIDIN Materials Technology Group, Industrial Technology Division, Malaysian Nuclear Agency		
P22	15:00	P22A: Development of Protocol Treatment Using Gamma Irradiation for MD2 Pineapple in MINTec-Sinagama Plant, Malaysia RUZALINA BAHARIN MINTec-Sinagama, Technical Support Division, Malaysian Nuclear Agency	P22C: Characterization of Endopolysaccharides from Pleurotus SPP. in Submerged Culture Fermentation SHAIFUL AZUAR MOHAMAD Agro-Technology and Bioscience Division, Malaysia Nuclear Agency	P22C: Design and Performance Evaluation of Corn Starch – <i>Rhizophora</i> ssp. Particleboard as Phantom for SPECT Imaging PUTERI NOR KHATIJAH ABD HAMID School of Applied Physics, Universiti Sains Malaysia (USM)		
				P23C: Preliminary Analysis on the Water		
P23	15:20	P23A: Nuclear Reactor Technology Assessment Study in Malaysia	Technology on Solving the Unsolved Leak in Lift Pit	Quality Index (WQI) and the Defect of the Irradiated Basic Filter Elements		
		MAZLEHA MASKIN Universiti Kebangsaan Malaysia (UKM) Agensi Nuklear Malaysia	MOHD FITRI ABDUL RAHMAN Malaysia Nuclear Agency	ASYRAF ARIF ABU BAKAR Nuclear Engineering and Energy Group (GrEEN) Universiti Tenaga Nasional (UNITEN)		
P24	15:40	P24A: Neutron Flux Measurement at Radial Piercing Beamport	P24B: Adsorption Studies of Packed Column for the Removal of Dyes using Amine Functionalized Radiation Induced Grafted Fiber	P24C: The Effect of Gamma Irradiation on Chemical, Morphology and Optical Properties of Polystyrene Nano Sphere at Various Exposure Time		
		Malaysia Nuclear Agency	SARALA SELAMBAKKANNU Malaysia Nuclear Agency	JIBRIN ALHAJI YABAGI Super-Ionic Conductivity (NASICON) and Polystyrene Nano Research Group, Universiti Tun Hussain Onn Malaysia (UTHM)		
P25	16:00	P25A: Centralized Radiation Monitoring System at Nuclear Malaysia: Development and Progression MASLINA MOHD IBRAHIM	P25B: Verification of Relative Output Factor (ROF) Measurement using Gafchromic Films for Radiosurgery Small Photon Beams REDUAN ABDULLAH	P25C: Neutron Moderation Effectiveness by Alumina (Co-Fired Ceramic Based) and Polymeric Materials such as Teflon under TRIGA Neutron Environment with and without Beryllium Filter Cooled with Liquid Nitrogen		
				Malaysia Nuclear Agency	School Of Health Sciences, Universiti Sains Malaysia (USM)	ABDUL AZIZ MOHAMED Nuclear Engineering and Energy Group (GrEEN) Universiti Tenaga Nasional (UNITEN)
P26	16:20	P26A: Radiometric Glucose Uptake Assay to Measure Anti-diabetic Potential of <i>Ficus</i> <i>Deltoidea</i>	P26B: New Palm Oil Based Polyester Polyol for Drug Carrier: Synthesis and Its Characterization	P26C: Investigation of Dielectric Constant Variations of Malaysians Soil Species towards its Natural Background Dose		
		ZAINAH ADAM Malaysia Nuclear Agency	RIDA TAJAU Malaysia Nuclear Agency	KHAWARIZMI MOHD JAFERY Faculty of Science, Technology and Human Development, Universiti Tun Hussein Onn Malaysia (UTHM)		
P27	16.40	P27A: Optimizing The Efficiency of a Dielectric Barrier Discharge Reactor for Removal of Nitric Oxides in Gas Phase	P27B: The Optimization of Baking Temperature for Carbon Production from Peat Soil	P27C: Radiation Shielding Properties of Ferro-Boron Concrete		
		SITI A'IASAH HASHIM Malaysia Nuclear Agency	FAHRULRAZI MD JAMIEN Research Centre for Soft Soil (RECESS), Universiti Tun Hussein Onn Malaysia (UTHO)	MUHAMMAD SYAHIR SAKKAWI Department of Energy Engineering, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia (UTM)		
17:	17:00 Tea Break & Adiourn					

iNuSTEC2017,UNITEN, Putrajaya Campus, Selangor, Malaysia. 25 - 27 September 2017

DAY 3: WEDNESDAY, 27TH SEPTEMBER 2017

Morning Session

09:00-	09:00-13:00 Forum/Dialogue CONTRIBUTION OF WOMEN TOWARD THE NATIONAL NUCLEAR PROGRAMME Location: BW-1-R04			
09:30-	10:40	SESSION 8: Chairman: Assoc. Prof. Dr. Abdul Aziz Mohamed (UNITEN) Venue: Lecture Hall DK1		ITEN)
P28	9:30	NUCLEAR EDUCATION USING RESEARCH REACTORS AT KYOTO UNIVERSITY RESEARCH REACTOR INSTITUTE PROFESSOR KEN NAKAJIMA Vice President, Atomic Energy Society of Japan (AESJ), Kyoto University Reactor Research Institute, Japan		
10:10-	10:10-10:40 MEMORANDUM OF UNDERSTANDING SESSION BETWEEN MALAYSIA NUCLEAR SOCIETY (MNS) 10:10-10:40 & ATOMIC ENERGY SOCIETY OF JAPAN (AESJ) Commemoration address by Assoc. Prof. Dr. Abdul Aziz Mohamed, President of Malaysian Nuclear Society (MNS) Commemoration address by Prof. Ken Nakajima, Vice President of AESJ Exchange of Moll Document between MNS-AESJ			
10.40-	10.55	Tea Br	eak Poster Exhibition & Business Networking S	Session
10:55-	13:05	Session 9A: ENERGY AND INFRASTRUCTURE Chairman: Dr Syukri Yahya Venue: Lecture Room BW-G-R04	Session 9B: Session 9B: SCIENCE AND ENGINEERING 2 Chairman: Dr Hassan Mohamed Venue: Lecture Room BW-G-R05	Session 9B: MATERIALS AND SUSTAINABILITY 3 Chairman: Dr Juniza Md Saad Venue: Lecture Room BW-G-06
P29	10:55	Invited Speaker 4: P29A: RECENT ADVANCES IN OPTICAL COMPUTED TOMOGRAPHY (OCT) IMAGING SYSTEM FOR THREE DIMENSIONAL (3D) RADIOTHERAPY DOSIMETRY ASSOC. PROF. DR. TAUFEK ABDUL RAHMAN Applied Radiation and Medical Physics, Universit Technologi MARA (UITM)	P29B: The Enhancement of Heavy Metal Removal from Polluted River Water Treatment by Integrated Carbon- Aluminum Electrodes using Electrochemical Method NABIHA MOHD YUSSUF Universiti Tun Hussein Onn Malaysia (UTHO)	Invited Speaker 5: P29C: ROBOTICS AND INTELLIGENT SYSTEMS APPLICATIONS IN NUCLEAR ENGINEERING PROF. NAHRUL KHAIR BIN ALANG MD RASHID Department of Energy Engineering, Faculty of Chemical and Energy Engineering, Universit Teknologi Malaysia (UTM)
P30	11:25	P30A: Effectiveness of Mathematics Education in Secondary Schools to Meet the Local Universities Missions in Producing Quality Engineering and Science Undergraduates ABU BAKAR HASAN Faculty of Engineering and Built Environment, Universit Science Idem Meurice (USIM)	P30B: Evaluation of Potential Site for Mineral Processing Plant using Surface Moisture-Density Gauge MUHAMAD NOOR IZWAN ISHAK Plant Assessment Technology, Malaysia Nuclear Agency	P30C: Phase Formation and Microstructure of Gamma Irradiated Bi- 2223 Superconductor NATASHA ALIEYA ADNAN Nuclear Engineering and Energy Group (GrEEN), Universiti Tenaga Nasional (UNITEN)
P31	11:45	P31A: Thermal Neutron Flux Measurement Using Self-Powered Neutron Detector (SPND) at Out-Core Location of the RTP NUR SYAZWANI MOHD ALI Faculty of Chemical and Energy Engineering,	P31B: Study on Detection Geometry and Detector Shielding for Portable PGNAA System using PHITS HANAFI ITHNIN Malavsia Nuclear Agency	P31C: Nano-indentation Hardness of Gamma Irradiated Sn-Ag-Cu Lead-Free Solder WILFRED PAULUS Malavsia Nuclear Agency
P32	12:05	Universiti Teknologi Malaysia (UTM) P32A: Measurement & Simulation of Thermal Neutron Flux Distribution in RTP Core MOHAMAD HAIRIE RABIR	P32B: Monitoring Underground Water Leakage Pattern by Ground Penetrating Radar (GPR) using 800 MHz Antenna Frequency	P32C:-Influence of Electron Beam Irradiation on Optical Properties Of TiO ₂ Particles CIK ROHAIDA CHE HAK
		Malaysia Nuclear Agency	IENGKU SARAH IENGKU AMRAN Malaysia Nuclear Agency	Malaysia Nuclear Agency
P33	12:25	P33A: Adaptive Control Method for Core Power Control in TRIGA Mark II Reactor MOHD SABRI MINHAT Technical Support Division	P33B: Residential Exposure from Extremely Low Frequency Electromagnetic Field (ELF EMF) Radiation SHAMESH RAJ PARTHASARATHY	P33C: Preliminary Study of Tin Slag Concrete Mixture Formulation MOHD JAMIL B. HASHIM Malavsia Nuclear Agency
P34	12:45	Malaysian Nuclear Agency P34A: Utilization of Thorium and Irradiated U-ZrH _{1.6} Fuels in Various Heterogenous Cores for PUSPATI TRIGA Reactor ABDUL HANNAN DAMAHURI Nuclear Engineering and Energy Group (GrEEN), Universiti Tenaga Nasional (UNITEN)	Malaysia Nuclear Agency P34B: Metaheuristic Approach in Multilayer Radiation Shielding Optimization MUHAMMAD ARIF BIN SAZALI Department of Energy Engineering Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia (UTM) h. Poster, Exhibition & Business Networking Sec	P34C: Characterization of XRF and Direct Gamma-Rays Measurement Techniques for TRIGA Mark III Fresh Fuel Rod Research Reactor MADIHAH MUJAINI Nuclear Engineering and Energy Group (GrEEN), Universiti Tenaga Nasional (UNITEN) Ssion
13.00-	14.13	Edito	, . eetor, Exmonter & Business retworking de	

DAY 3: WEDNESDAY, 27TH SEPTEMBER 2017

Afternoon Session

14:10-14:50		SESSION 10: Chairman: Dr Abdul Aziz Mohamed Venue: Lecture Hall DK1
P35	14.10	Keynote 10: NUCLEAR SECURITY EDUCATION FOR TN50 ASSOC. PROF. DR. FAIZAL K.P. KUNCHI MOHAMED Head of Nuclear Science Program, Universiti Kebangsaan Malaysia (UKM)
14:50-15:40		SPECIAL SESSION: NUCLEAR YOUTH COMPETITION (NYC 2017) Chairman: Anas Muhamad Pauzi Venue: Lecture Hall DK1
		Presentation by Nuclear Youth Lecture Competition (Subject to changes) Group 1: Nuclear Medical Applications in Future (5 mins) Group 2: 3E (Energy, Economy and Environment) Issues in the World (5 mins) Group 3: Nuclear waste problem (5 mins) Group 4: TN50 without nuclear (5 mins) Group 5: Nuclear Safety, Security and Safety (5 mins) Group 6: Sustainable Nuclear Energy (5 mins)
15:40-16:30		PRIZE GIVING AND CLOSING CEREMONY Prize giving: (1) Nuclear Varsity Debate (2) Nuclear Youth Competition - Best Oral Presenter (3) Nuclear Youth Competition - Best Group Final remark by Assoc. Prof. Dr. Abdul Aziz b Mohamed, President of MNS Announcement for NuSTEC2018 Closing remark by host, UNITEN, Prof. Dr. Hj. Izham b Zainal Abidin
16.	30	Tea break & End of Conference

DAY 4: Thursday, 28th September 2017 Morning Session

09:00-13:00
O9:00-13:00
O9:00-13:00
Coordinator: Dr Hassan b Mohammed

iNuSTEC2017,UNITEN, Putrajaya Campus, Selangor, Malaysia. 25 - 27 SEPTEMBER 2017

POSTER SESSION

No. P01.	Title and authors Dose Linearity of Al2O3 Dosimeter at High Energy Photons and Electrons Mohd Fahmi Mohd Yusof, Nabil Aiman Joohari, Reduan Abdullah, Ahmad Bazlie Abd Kadir, Norriza Mohd Isa
P02.	Mass attenuation coefficients of several bio-adhesive based palm oil particleboards at 16.59-25.26 keV photon energies. Umiatul Asma Abdu Mustapa, Mohd Fahmi Mohd Yusof, Mohd Zahri Abd Aziz, Rokiah Hashim, Puteri Nor Khatijah Abd Hamid
P03.	Stakeholder Engagement Programme For Promoting The Comprehensive Nuclear-Test-Ban Treaty (CTBT) In Malaysia Faisal Izwan Abdul Rashid
P04.	Level-I Probabilistic Safety Assessment Development at Puspati TRIGA Research Reactor M. Mazleha, P.T. Phongsakorn, A. Hassan, I. Kuzmina, M.B. Fedrick, R. Zulfadli and F. Mohamed
P05.	Study on degradation of mechanical properties of wood due to water absorption using a neutron radiography Redza Rabani Md Rosli, Abdul Aziz Mohamed, Rafhayudi Jamro, Khairiah Bt. Yazid @ Khalid, faridah mohamad idris.
P06.	Comparative Study Between Single Core Model and Detail Core Model of CFD Modeling on Reactor Core Cooling Behavior Rosli Darmawan
P07.	Bent Perfect Crystal (BPC) As The Monochromator In High Focusing Neutron Diffractometer Hishamuddin Husain, Zaifol Samsu, Muhammad Rawi Mohamed Zin, Faridah Mohd Idris, Kok Kuan Ying and Abdul Aziz Mohamed
P08.	Study On Internal Integrity of Mock-Up Nuclear Fuel Pins Using Neutron and X-Ray Radiography Aman Ullah Ashraf, <u>Abdul Aziz Mohamed</u> , Rafhayudi Jamro, Khairiah Bt. Yazid@Khalid, faridah mohamad idris
P09.	Analysis of Malaysian Long-Term Energy and Electricity Demand Projection 2014-2030 Using the End-Use Methodology Muhammed Zulfakar Bin Zolkaffly
P010.	Research Reactor Current Status and the Way Forward in Malaysia M.K.A. Mustafa, N. Ramli, J. Abdul Karim, M.F. Abdul Farid, M.R. Mohamed Zain
P011.	Particle's Energy Measurement Using a Calorimeter <u>Faridah Mohamad Idris</u> , Wan Ahmad Tajuddin Wan Abdullah, Zainol Abidin Ibrahim, Fathimal Elias, Nurul Hidayah Mohamed Noor, Mohamed Javad Soleimani, Atiqah Mohamad Jainal
P012.	Neutron Shielding Behavior of Thermoplastic Natural Rubber/Boron Carbide Composite Nurazila Mat Zali, Hafizal Yazid and Megat Harun Al Rashid Megat Ahmad
P013.	Neutron Optic Simulation for Small Angle Neutron Scattering Instrument (SANS) using McSTAS. Norfarizan Mohd Said, Julie Andrianny, Azraf Azman, Rafhayudi Jamro, Khair'iah Yazid, Lojius Lombigit, Mohd Khairulezwan Abdul Manan, Hafizal Yazid and Muhammad Rawi Mohamed Zin
P014.	Dose Release During Nuclear Accidents in Chernobyl and Fukushima Sulaiman, S.N.A., Mohamed, F., Ab Rahim, A.N.
P015.	Moderators For Intense Cold Neutron Beams in Materials Research Using Low Flux Research Reactor RTP Abdul Aziz Mohamed, Nasri A. Hamid, Azraf Azman, Megat Harun Al Rashid Megat Ahmad , Zakaria Dris and Syafiq Ramli
P016.	Gamma irradiation induced method for preparation of Gd2O2S:Eu3+ phosphors: The effect of dose towards luminescent properties Sapizah Rahim, Muhammad Hassyakirin Hasim, Muhammad Taqiyuddin Mawardi Ayob, Shahrul Izwan Ahmad, Irman Abdul Rahmana, Shahidan Radiman
P017.	The Extraction Of Thorium Hydroxide in Hydrochloric acid by using Di (2-Ethylhexyl) Phosphoric acid in Kerosene Ahmad Hayaton Jamely Mohd Salehuddin
P018.	Measurement of Backscatter Factors for Kilovoltage X-ray Beam using Ionization Chamber and Gafchromic Film XR-QA2 Nor Shazleen Ab Shukor, Nurul Hazwani Mohd Asri, Syed Mohd Fahmi Syed Jaafar, Muhammad Syazwan Rosnan, Norida Ahmad & Siti Aishah Abd Aziz
P019.	Study on the Public Perception on Nuclear Power from Diverse Education Background in Malaysia Anas Muhamad Pauzi, Juniza Md Saad, Asyraf Arif Abu Bakar, Syafiq Ramli, Abdul Hannan Damahuri
P020.	Large Scale Synthesis of Tellurium Nanostructures via Galvanic Displacement of Metals <u>K. Y. Kok</u> , T. F. Choo and N. U. Saidin
P021.	Design And Development of Pc-Based Ultrasonic Goniometer System For Study Materials Surface Properties by Surface Wave Ultrasound Sunairy Sani, Mohamad Pauzi Ismail, Shukri Mohd, Noor Azreen Masenwat, Tengku Sarah Tengku Amran, Mohamad Syafiq Mohd Amin and Mohamad Ridzuan Ahmad
P022.	Ultrasonic inspection of fake gold jewelry Mohamad Pauzi Ismail, Suhairy Sani1, Mohd. Harun and Norlaili Binti Omar
P023.	Study Relation Between Personal Self Factor (PSF) & Human Error Probability (HEP) toward Prevalent Stress among Reactor Operators in RTP (Kajian Hubungkait Faktor Pembentukan Prestasi (PSF) Kebarangkalian Kesilapan Manusia (HEP) dan Prevalen Stress Dikalangan Operator Reaktor TRIGA PUSPATI) Ahmad Nabil Bin Ab Rahim, Faizal Mohamed, Mohd Fairus Abdul Farid, Mohd Fazli Zakaria, Alfred Sangau Ligam, Nurhavati Binti Ramli
P024.	Characterization of Ion-Exchange Resins from TRIGA Reactor Hasniyati Md Razi, Na'im Syauqi Hamzah, Zaredah Hashim, Tonny Anak Lanyau, Phongsakorn Prak Tom, Siti Aishah Ahmad Fuzi, Suhaimi
P025.	Analysis of Water Volume Changes and Temperature Measurement Location Effect to the Accuracy of RTP Power Calibration <u>Tonny Lanyau</u> , Na'im Syauqi Hamzah, Abi Muttaqin Jalal Bayar, Alfred Sanggau Ligam, Phongsakorn A/L Prak Tom, Julia Abdul Karim, Mohammad Suhaimi Kassim.
P026.	Characterization of XRF and Direct Gamma-Rays Measurement Techniques by CdTe and HPGe Detector for Natural Uranium Series M.Mujaini, N.A.Hamid, R.Ramli, N.Chankow

iNuSTEC2017,UNITEN, Putrajaya Campus, Selangor, Malaysia. 25 - 27 SEPTEMBER 2017

P027.	Review on the Irradiation Effect Towards Water Filtration Elements Asyraf Arif Abu Bakar, Anas Muhamad Pauzi, M.Mujaini, Abdul Aziz Mohamed, Faridah Mohamad Idris
P028.	Selective Separation and Production of High-Purity Thorium Oxide From Malaysian Monazite Che Nor Aniza Che Zainul Bahri, Aznan Fazli Ismail, Wadee'ah Mutahir Al-Areqi, Mohd Izzat Fahmi Mohd Ruf, Amran Ab. Majid
P029.	Uranium Extraction From Seawater: Prospects, Benefits And Risks For Malaysia Aznan Fazli Ismail
P030.	Natural Radioactivity Levels and The Associated Radiological Risk of Selected Building Materials in Malaysia Shittu Abdullahi, Aznan Fazli Ismail, Supian Samat & Muhamad Samudi Yasir,
P031.	Microstructural Characterization of neutron irradiation Oxide Dispersion Strengthened (ODS) ferritic steel study by Field Emission Scanning Electron Microscopy Yusof Abdullah, Farha Mizana Shamsudin, Shahidan Radiman Nasri A. Hamid and Cik Rohaida Che Hak

TENTATIVE PROGRAMME: NUCLEAR YOUTH COMPETITION (NYC) 2017

COLLEGE OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY (CSIT), UNIVERSITI TENAGA NASIONAL (UNITEN) KAMPUS PUTRAJAYA, JALAN IKRAM-UNITEN, 43000 KAJANG, SELANGOR

MONDAY, 25 th SEPTEMBER 2017		
0830-0900	REGISTRATION	
0900	Plenary Session INUSTEC 2017/ NYC 2017 & WIN Conf. 2017	
10.40	Breakfast	
11.00	Opening Ceremony and Keynote session INUSTEC 2017	
1315	Lunch	
1430-1630	ICE-BREAKING SESSION	
1630	Tea break	

MONDAN ASTH OPPTEMBED 2015

TUESDAY, 26TH SEPTEMBER 2017

0900	Join keynote session INUSTEC 2017
10.10	Breakfast
10.30	Join keynote session INUSTEC 2017
11.30-1315	 INTRODUCTION TO GROUP DISCUSSION (Tentative) 1) 3E (Energy, Economy and Environment) Issues in the world 2) TN50 Without Nuclear 3) Nuclear Waste Problem 4) Nuclear Medicine Application in the Future 5) Sustainable Nuclear Energy 6) Nuclear Security, Safety and Proliferation Threads
1315	Lunch
1430-1530	GROUP DISCUSSION
1530-1630	WORKSHOP ON EFFECTIVE PRESENTATION SKILLS
1630	Tea break
1700	Adjourn for 2 nd day

WEDNESDAY, 27TH SEPTEMBER 2017

0900	Join keynote session INUSTEC 2017
10.30	Breakfast
11.00-1315	GROUP DISCUSSION
1315	Lunch
1500-1615	PRESENTATION COMPETITION
1615	Prize giving ceremony and closing session
1700	Tea break and adjourn

Note:

The participants shall be devided into at least three groups. Each group will be given a topic to deliberate on (*subject to 1. change).

2. The group deliberations shall be presented orally by a representative of each group in 5 minutes using 5 slides presentation.

The presentations shall be judged by a panel of judges appointed by Organizing Committee of NuSTEC2017 3.

4. Prizes shall be given to winners selected by the panel of judges.

5. For enquiry please contact Mr Anas b Muhamad Pauzi at anas@uniten.edu.my and

LIST OF EXHIBITORS/ SPONSORS

- E1. HITACHI-GE NUCLEAR ENERGY, LTD, JAPAN.
- E2. EKO-TEKNIK SDN BHD
- E3. ZL TECHNOLOGIES SDN BHD
- E4. RELTECH VENTURES SDN BHD
- E5. **PERSADA RIMBA SDN BHD**
- E6. SYAIZA ENGINEERING SDN BHD
- E7. CERENKOV SCIENTIFIC SDN BHD
- E8. TERAS INSTRUMENTS SDN BHD
- E9. UNIVERSITI TENAGA NASIONAL (UNITEN)
- E10. MALAYSIAN NUCLEAR AGENCY
- E11. MALAYSIAN NUCLEAR SOCIETY
- E12. WOMEN IN NUCLEAR (WIN) MALAYSIA

ABSTRACTS FOR PLENARY

25 SEPTEMBER 2017 (MONDAY)

SESSION 1

P01 Charting Research and Development for Sustainable Nuclear Science & Technology

DR. DAHLAN HJ. MOHD

Deputy Director General, Research & Technology Development Programme, Malaysian Nuclear Agency, Bangi 43000 Kajang, Selangor, Malaysia

ABSTRACT

The Malaysian Nuclear Agency is established to excel in research and applications of nuclear technology for sustainable development. Our aim is to discover, develop and utilize Nuclear Science for knowledge generation, wealth creation and societal well being towards and Technology achieving a high income advanced economy that is competitive, sustainable and inclusive. Nuclear Malaysia has been implementing its functions according to the government's policies throughout the 45 years since its establishment. These policies include Vision 2020, the various Malaysia Plans, Government Transformation Programme (GTP), Economic Transformation Programme (ETP), New Economic Model (NEM), the 2nd National Science and Technology Policy (DSTN2) and 2050 National Transformation TN50. The major Research & Development sectors which Nuclear Malaysia focuses on are industrial applications, agriculture and biotechnology, medicine and health care, environment and water resources and nuclear energy. Nuclear Malaysia has managed to secure funding to develop research facilities and to conduct Research. Development and Commercial (R&D&C) activities in the field of nuclear science and technology over the last 15 years. Sources of funding are from 5-year Development Plans, ScienceFunds, TechnoFunds and DSTN from MOSTI. Other sources of funding included international agencies such as the IAEA, Regional Cooperative Agreement (RCA) and Forum for Nuclear Cooperation in Asia (FNCA). Some research output has been commercialised through technical and consultation services to the industry. Revenue generated through Nuclear Malaysia's services is also a source of funding for R&D&C.

P02

Nuclear Academy for Peace and Sustainable Development

PROF. EMERITUS DR. MASAKI SAITO

Academy for Global Nuclear Safety and Security Agent, Tokyo Institute of Technology, Japan

ABSTRACT

Nuclear engineering education has been initiated in 1957 in the graduate course at Tokyo Institute of Technology (Tokyo Tech.). Higher Educational activities have been conducted for more than half century in Japan. Recently, the improvements of Global Nuclear Education in Tokyo Tech. have been made in cooperation with International Atomic Energy Agency (IAEA), World Nuclear University (WNU) and European Nuclear Education Network (ENEN).

In 2010, Japanese University Network was established for Global Nuclear Human Resource Development in Cooperation with 15 Universities by bringing together their limited educational resources, to promote effectively and efficiently the series of fundamental nuclear educations in Japan and also the strategic global nuclear education in Asian Countries, supported by Ministry of Education, Culture, Sport, Science and Technology (MEXT), Japan.. Based on the activities of the Japanese University Network, Asian Nuclear Education Network (ANEN) is established and under progress,

In 2011, Tokyo Tech. also established a special educational program for Global Nuclear Human Resource Development in cooperation with Hitachi-GE Nuclear Energy. The objective of this special program is to develop global nuclear engineers and researchers. Intensive courses of basic and applied nuclear science and technologies have been made in Vietnam, Malaysia and Lithuania. Some of the excellent students in those countries have been invited to the Master and Doctor Courses in Tokyo Tech. by the financial supports of Hitachi-GE Nuclear Energy.

In 2011, Academy for Global Nuclear Safety and Security Agent was initiated in Tokyo Tech. in the field of 3S (Safety, Security and Safeguard) field, sponsored by MEXT. Students in this program are expected to live in a dormitory (DOJO) with the supervisors to study not only in basic and specific nuclear science and engineering but also global liberal arts (politics, economy, philosophy, history, arts, culture, etc.). Through domestic and international internship and life at the DOJO, DOJO students are expected to become global leaders with distinguished professional competence and social literacy in the 3S field.

Based on above educational activities in Tokyo Tech., the preliminary idea of "Malaysia-Japan Nuclear Academy for Peace and Sustainable Development" will be presented in this conference. Finally, as one of the essential research topics in Malaysia-Japan Nuclear Academy in future, Proliferation Resistance Properties of U and Pu will be explained including Thorium Cycle.

ABSTRACTS FOR KEYNOTE

25 SEPTEMBER 2017 (MONDAY)

SESSION 2

P04 Nuclear Power Programme Development

Abdul RAZIB DAWOOD

Chief Executive Officer, Malaysia Nuclear Power Corporation (MNPC).

ABSTRACT

Nuclear energy is considered as one of the fuel options for electricity supply post-2020, especially for Peninsular Malaysia, as incorporated in the 10th Malaysia Plan for the period 2011 to 2015, and also in Entry Point Project (EPP) No. 11 on Deploying Nuclear Energy for Power Generation under the National Key Economic Area (NKEA) for Oil, Gas and Energy (OGE) of the Economic Transformation Programme (ETP) launched in 2010 as one of four pillars of the New Economic Model (NEM) aimed at transforming Malaysia into a highincome economy by 2020, with the target of building a twin-unit nuclear power plant with a total capacity of 2 Gigawatts, and with four critical path items or enablers to be addressed with the highest priority, viz., public acceptance; ratification of relevant international treaties; putting in place the correct regulatory framework; and approvals for plant sites, including from the local populace. For this purpose, and based on the International Atomic Energy Agency (IAEA) guidelines for countries embarking or considering to embark on a nuclear power programme, the Malaysia Nuclear Power Corporation (MNPC) was established as the Nuclear Energy Programme Implementing Organisation (NEPIO) under the Prime Minister's Department in 2011. Under the 11th Malaysia Plan for the period 2016 to 2020, the focus is on the enactment of a new comprehensive nuclear law and establishment of an independent atomic energy regulatory commission, and implementation of a Nuclear Power Regulatory Infrastructure Development Plan (NPRIDP), Nuclear Power Infrastructure Development Plan (NPIDP) and 10-Year Comprehensive Communications Plan and Strategies on Nuclear Energy, prepared under the 10th Malaysia Plan, towards ensuring energy security as one of the strategies under the 11th Malaysia Plan.

26 SEPTEMBER 2017 (TUESDAY)

SESSION 4

P14

Nuclear Regulatory Framework for Training and Education

Hamrah Mohd. Ali¹, F.C Brayon², N. F. Bakri³

¹ Director General, *Atomic Energy Licensing Board* ² Senior Assistant Director, *Policy and External Affairs ,Atomic Energy Licensing Board,* ³ Senior Assistant Director, Licensing and Assessment, Atomic Energy Licensing Board

ABSTRACT

The Atomic Energy Licensing Board (AELB) was established in 1985 under the Atomic Energy Licensing Act 1984 (Act 304). AELB is a regulatory body in Malaysia responsible for control and supervision on safety and security of nuclear and radioactive applications and the safeguards of nuclear materials in Malaysia. Currently, AELB is under the Ministry of Science, Technology and Innovation.

For this keynotes session, the presentation will provide overview and addresses national regulatory framework for energy and education in Malaysia through AELB's function. In the context of regulatory framework for energy, the Act 304 and its subsidiary regulations provide regulatory basis in addressing requirements for activities related to the application of atomic energy including for power generation. The Act 304 also allows to some extent, the flexibility for control and regulate of nuclear activities from security and safeguards point of view. This can be observed in its elaboration of function and roles of the Board. In addition, AELB's is also a responsible authority for the Strategic Trade Act 2010 (Act 708) that is independent from Act 304 but provides strong synergy that contribute to the comprehensive regulatory framework for activities related to nuclear application. This synergy requires for continuous enhancement to strengthen and to ensure safety, security and safeguards of nuclear application that will contribute to national sustainable development.

P15

What Neutrons Can Do for Our Living?

PROF. DR. SUNG MUNG CHOI

President Asia-Oceania Neutron Scattering Association (AONSA). Professor and Head, Department of Quantum and Nuclear Engineering, Korea Institute of Science and Technology, Republic of Korea.

ABSTRACT

The development of technology which we use in our daily life strongly depends on the development of new materials as it has been shown throughout the history of mankind. Over the last several decades neutron has been used a powerful tool in various sectors of materials research, including condensed matter physics, chemistry, biology, nanophase materials, and engineering materials. As new technologies require materials of more sophisticated properties, the importance and demand for neutron is ever increasing. The unique power of neutron comes from its physical properties which allow us to understand the structures of materials in atomic and nanoscale and their dynamics in femto- to 100's nanosecond timescale. In this talk, the key roles of neutron in science and technology will be discussed together with the current status of international neutron research facilities, especially those in the Asia-Oceania region and the recent activities of the Asia-Oceania Neutron Scattering Association.

P16

Empowering Women in Science & Technology Industry (STI) for Sustainable Development

DATIN PADUKA KHATIJAH YUSOF

Faculty of Biotechnology and Molecular Sciences, Universiti Putra Malaysia (UPM). *WIN Malaysia.*

ABSTRACT

A thriving, successful society will recognize and nurture the roles of both men and women, most if not all are inter-related, many reciprocate and some accentuate each other's roles. Women have always had the propensity to educate, teach, modulate and comfort, and sustain the family and the unit to the whole. These inherent and perhaps instinctive roles can be made good use of in STI as more women get involved in STI. The question is not so much to empower – as that denotes an almost condescending if not altogether misogynistic approach – but to facilitate and educate the society of the opportunities and the benefits which it would accrue if this were to be adopted as a natural reality. Obstacles, often arising from unfounded fear and misconstrued myths, need be identified and aborted. The question is how, when and what. That will be explored in this lecture.

SESSION 5

P17

Nuclear Training in the National Nuclear Energy Agency Of Indonesia (BATAN)

DR. EDY GIRI RACHMAN PUTRA AND DR. ALIQ ZUHDI

Polytechnic Institute of Nuclear Technology National Nuclear Energy Agency (BATAN) Jalan Babarsari PO Box 6101YKBB Yogyakarta 55281, Indonesia.

ABSTRACT

Over 40 years, nuclear science and technology program has been pursued in Indonesia with the establishment of three research reactors, research center and laboratories under National Nuclear Energy Agency (BATAN), and Nuclear Energy Regulatory Agency (BAPETEN) as independent body. In line with this program, educational program was also established i.e nuclear engineering program under University of Gadjah Mada (UGM), vocational program under BATAN, and nuclear physics expertise group under Bandung Institute of Technology (ITB). This paper presents the role of vocational program held by Polytechnic Institute of Nuclear Technology in developing nuclear human resources to meet the need of nuclear technologist for research, industries and universities. Since 1989, the nuclear polytechnic has contributed more 1434 graduates, from which 60% worked in industries and the rest 40% in government and universities. Due to zero growth policy of the government over one decade that cause limited vacation for nuclear polytechnic graduate and unpredictable delayed of nuclear power plant, a new strategy has been adopted to improve the competitiveness of graduates by benchmarking and reorientation of curriculum body of knowledge to suit the broad application of nuclear technology in industries, agriculture and medical which also consideration of upgrading facilities, mapping of alumni career path, increase of stakeholder engagement including the initiation of the international collaboration. The challenges in nuclear human resources development and the future opportunity are also presented.

P19

American Society of Mechanical Engineers (ASME) Enhances Public Welfare And Safety

ASSOC. PROF. DR. MOKHTAR AWANG

Chair, American Society of Mechanical Engineers (ASME) Malaysia Section, Universiti Teknologi Petronas (UTP), Perak, Malaysia mokhtar_awang@utp.edu.my

ABSTRACT

American Society of Mechanical Engineers (ASME) is a professional engineering society that serves many roles including hosting technical event, public affairs and outreach efforts, student and early career development and standards and certification. ASME conducts one of the world's largest technical publishing operations, holds numerous technical conferences worldwide, and offers hundreds of professional development courses each year. So far, ASME has been developed more than 500 internationally recognized industrial and manufacturing codes and standards. All standards promote 4 key principles which are safety; uniformity and consistency; efficiency; commerce and trade that enhance public welfare and safety.

27 SEPTEMBER 2017 (WEDNESDAY)

SESSION 8

P28

Nuclear Education Using Research Reactors at Kyoto University Research Reactor Institute

PROF. DR. KEN NAKAJIMA

Vice President, Atomic Energy Society of Japan (AESJ), c/o Research Reactor Institute, Kyoto University Asashiro-Nishi 2-1010, Kumatori-cho, Sennan-gun, Osaka 590-0494, Japan nakajima@rri.kyoto-u.ac.jp

ABSTRACT

At Kyoto University Research Reactor Institute (KURRI), various experimental education programs have been offered for the students of Japanese and foreign universities over than 40 years. The reactor laboratory course is the one of the programs using Kyoto University Critical Assembly (KUCA), a critical assembly with thermal maximum power of 100W. In recent years, approximately 150 students majoring in nuclear engineering at 12 Japanese universities participate in this course every year. The course has been opened for several foreign universities since 2003. This course is intended for the students who major in nuclear engineering and have some knowledge on reactor physics, and it achieves significant results in fostering of nuclear human resources. There are also several experimental education courses using Kyoto University Research Reactor (KUR), a multipurpose research reactor with maximum thermal power of 5MW. These courses include the reactor kinetics experiment, the neutron optics experiment, the neutron dose measurement, the Actinides extraction experiment from irradiated uranium samples, and so on. These courses are opened for the students of Kyoto University only. In the conference, the present status of our research reactors KUCA and KUR, and the education courses using those reactors will be presented. In addition, the recent activities of the Atomic Society of Japan (AESJ) will be also introduced.

SESSION 10

P35 Nuclear Security Education for TN50

ASSOC. PROF. DR. FAIZAL K.P. KUNCHI MOHAMED

Head of Nuclear Science Program, Universiti Kebangsaan Malaysia (UKM)

ABSTRACT

'Transformasi Nasional 2050' or TN50 is an initiative to plan for the future of Malaysia in the period 2020 to 2050. From the vision of becoming a developed nation, Malaysia should strive to be amongst the top countries in the world in economic development, citizen well-being and innovation. In realizing TN50, nuclear technology is a potential catalyst in implementing the plan for the future. Implementation of nuclear technology in the realization of TN50 requires the fundamental education of nuclear technology inclusive of nuclear security education. Internationally, the International Atomic Energy Agency (IAEA) has partake in delivering nuclear security education with several initiatives. Locally & currently, nuclear security education has been delivered through educational institution at both undergraduate and post-graduate level such as in Universiti Kebangsaan Malaysia and some other local universities. Furthermore, Malaysia's Education Blueprint (MEB) 2013-2025 initiated by the Ministry of Higher Education Malaysia is in line with the TN50 vision. It is hoped that the educational programmes in nuclear security will establish in-depth knowledge and subsequently foster nuclear security culture in the country and the region.

ABSTRACTS FOR INVITED

25 SEPTEMBER 2017 (MONDAY)

SESSION 3

P06B Nuclear Security Curriculum Development in Morocco, Hassan II University of Casablanca case

PROF. DR. E.H. SAYOUTY AND A.ETTOUFI

Hassan II University of Casablanca, High Energy Physics and Condensed Matter Laboratory, Faculty of Science Ain chock Km 8 Route d'El Jadida, B.P 5366Maarif 20100 Casablanca. Morocco. hassayout@yahoo.fr

ABSTRACT

Strengthening Nuclear Security Culture within organizations is based mainly on the human factor, which means the effective training of personnel, managers, scientists and engineers in the field of nuclear safety and security. Having an efficient nuclear security culture requires the involvement of all stakeholders (government, operators, research center, and universities. In this context Universities and Training Centers play an important role in developing training programs in the field of nuclear safety and security. Hassan II University of Casablanca is among the Moroccan institutions that are aware of the relevant role of education and training programs in nuclear security fields, and they are engaged in the strategy of strengthening nuclear security curriculum in Morocco. In this work we will summarize the different efforts of the university Hassan II in the field of developing a nuclear security program curriculum, we will give the various steps followed and the partnerships and cooperation which have helped. We will also highlight the achievements of our institution in this field, and the challenges in the establishing of nuclear security curriculum.

26 SEPTEMBER 2017 (TUESDAY)

SESSION 6

P20B

Overview of the International Nuclear Security Education Network (INSEN) and Participation of Universiti Tenaga Nasional (UNITEN) in INSEN

ASSOC. PROF. DR. NASRI A. HAMID

Nuclear Engineering and Energy Group (GrEEN), Universiti Tenaga Nasional, Malaysia. nasri@uniten.edu.my

ABSTRACT

In order to better address current and future requests for assistance in Educational Program in Nuclear Security, the International Atomic Energy Agency (IAEA) organized a workshop in March 2010. In the framework of the workshop, the experts and IAEA took immediate action and established the International Nuclear Security Education Network (INSEN). The mission of INSEN is to enhance global nuclear security by developing, sharing and promoting excellence in nuclear security education. Furthermore, the overall objective of INSEN is to support the promotion and establishment of nuclear security education. Malaysia belongs to a group of newcomer countries that have the potential to develop nuclear power. The national utility company, Tenaga Nasional Berhad (TNB) is expected to be one of the key players in Malaysia's ambition towards building the first nuclear power plant (NPP). As the education arm of TNB, the Universiti Tenaga Nasional (UNITEN) is given the responsibility to develop human resource capability in the areas related to nuclear engineering, science and technology, including nuclear security. UNITEN became a member of INSEN on 1st. June 2012, and is currently only the second member of INSEN from Malaysia. UNITEN participated in the INSEN Annual Meetings in Vienna, Austria where there are interactions with various working groups, regional meetings and curriculum development activities. The annual meeting served as an ideal platform to enhance networking and collaboration with other INSEN members from other member states. With regard to nuclear security, the first task of UNITEN is to develop an educational curriculum in nuclear security. In general, the curriculum covers the current issues of law, politics, military strategy, and technology in regard to weapons of mass destruction and related topics in international security, and review legal regulations and political relationship that determine the state of nuclear security at the moment. In the course, tools used to combat nuclear proliferation such as treaties, institutions, multilateral arrangements and technology controls are also discussed. To support the curriculum development, several teaching staff attended nuclear security courses offered by the International Atomic Energy Agency (IAEA) through Professional Development Courses (PDC) conducted by King's College, London.

27 SEPTEMBER 2017 (WEDNESDAY)

SESSION 9

P29A

Recent Advances in Optical Computed Tomography (OCT) Imaging System For Three Dimensional (3D) Radiotherapy Dosimetry

ASSOC. PROF. DR. AHMAD TAUFEK ABDUL RAHMAN

Head School of Physics and Material Science Universiti Teknologi MARA (UITM)

ABSTRACT

This work encompasses dosimetric studies of Ge-doped SiO2 telecommunication fibre as a 1-D thermoluminescence (TL) system and the radiochromic plastic material PRESAGETM as a 3-D dosimetric system, both for therapeutic applications. The therapy modalities used are a mercury arc lamp, a superficial X-ray beam therapy facility, a synchrotron microbeam facility and an electron linear accelerator, covering the energy range from a few eV to several MeV. The irradiations made included ultraviolet (UV) exposure at a power output of 9.85 -10.50 mW cm-2, 90 kVp X-ray exposure delivered by a superficial X-ray unit, synchrotron radiation delivered at a mean energy of 109 keV and electron and photon beam irradiations delivered by an electron linac (9 - 20 MeV for electrons and accelerating potentials of 6 - 15 MV for photons). Both dosimeters have been characterised before subsequently used in various dosimetry applications. Firstly, the fibers were used to measure UV radiation for PUVA dosimetry. The fibre was also used to measure photoelectron enhancement from iodinated contrast media as might be applied in radiation synovectomy. Another study looked into creation of test objects using PRESAGE™ for quality assurance of the associated Optical CT scanner. The test objects were created using UV radiation and synchrotron X-ray microbeam to measure the scanner spatial resolution and geometrical distortion. Finally, to illustrate the potential of PRESAGETM for use in Microbeam Radiation Therapy (MRT) dosimetry, development of a micro Optical CT scanner has been made for imaging 3-D micron spatial resolution.

ABSTRACTS FOR ORAL

25 SEPTEMBER 2017 (MONDAY)

SESSION 3B

SCIENCE & ENGINEERING 1

P07B Small Angle X-Ray Scattering (SAXS) Technique on Powder Sample

Hafizal B. Yazid

Malaysian Nuclear Agency, 43000, Bangi, Selangor, Malaysia. hafizal@nuclearmalaysia.gov.my

ABSTRACT

Small angle x-ray scattering technique was used to characterize powder samples. The technique determines the sample orientation with respect to the beam. The results also give information on specific surface of the powder in terms of m^2/g . The technique is compared with standard BET sample and yield a very close value.

P08B

Fault Detection and identification of Reactor Safety Related Instrumentation at Reactor TRIGA PUSPATI (RTP)

A.J. Zareen Khan, A.B Ridzuan, M.M Sabri, A.M Khairulezwan, A.J Nurfarhana

Reactor Instrumentation and Control Section, Reactor Technology Center, Technical Support Service, Malaysian Nuclear Agency, Kajang, Selangor, Malaysia. zareen@nuclearmalaysia.gov.my

ABSTRACT

The Reactor TRIGA PUSPATI (RTP) at Malaysia Nuclear Agency is a TRIGA Mark II type reactor and pool type cooled by natural circulation of light water. This paper describe on fault detection and identification based on reactor safety related instrument such as Wide range Neutron measurement system (WR-NMS), Instrumented Fuel element (IFE), resistance temperature detector (RTD), level Transmitter and other nuclear safety and non-safety related instrument. Various faults found on instrument during plant operation which have impact on plant reliability. Parameter are consider such as log power, linear power, period, Fuel and coolant temperature and other instrumentation and control parameter reactor. Methodology of fault diagnosis, estimation and monitoring is to evaluate and analysis of reactor parameter which is important of reactor safety and control. This study also focus on noise fluctuation from fission chamber during reactor operation using neutronic instrumentation system will use to estimate reactor log and linear power and period during reactor operation. This work will present result of online measurement of fault detection and identification from RTP instrument which indicated the safety parameter identification and initiate safety action on crossing the threshold set point trip. Conclude that optimization of monitoring fault detection and identification will improved the reactor control and safety parameter of reactor during operation.

P09B

Spatial Interpolation of Gamma Dose in Radioactive Waste Storage Facility

Nazran Harun, Muhammad Fathi Sujan & Mohd Zaidi Ibrahim

Waste Technology Development Centre (WasTeC), Waste Technology and Environmental Division, Malaysian Nuclear Agency, 43000, Kajang, Selangor, Malaysia. nazranharun@nm.gov.my

ABSTRACT

External radiation measurement for a radioactive waste storage facility in Malaysian Nuclear Agency is a part of Class G License requirement under Atomic Licensing Energy Board (AELB). The objectives of this paper are to obtain the dose data, create dose database and generate dose map in the storage facility. The radiation dose measurement is important to fulfil the radiation protection requirement to protect workers. There are 114 dose samples reading had been recorded in storage facility. The highest and lowest reading for external radiation recorded is 651 microSv/hr and 0.648 microSv/hour respectively. The calculated annual dose shows the highest and lowest reading is 1302 mSv/year and 1.3 mSv/year while the highest and lowest effective dose reading is 260.4 mSv/year and 0.26 mSv/year. The result shows that the ALARA concept along time, distance and shield principles shall be adopted to ensure the dose for the workers is below dose limit regulated by AELB which is 20 mSv/year for radiation workers. This study is important for the improvement of planning and the development of shielding design.

P10B

The Implementation of a Charge Coupled Device (CCD) Camera in a Neutron Imaging System for Real Time and Tomography Investigation

<u>Khairiah Yazid</u>, Muhammad Rawi Mohamed Zin, Rafhayudi Jamro, Azraf Azman and Faridah Mohamad Idris

Malaysian Nuclear Agency, 43000 Kajang, Selangor, Malaysia. khairiah@nuclearmalaysia.gov.my

ABSTRACT

Malaysian Nuclear Agency (Nuclear Malaysia) operates the one and only research reactor in Malaysia, Reactor TRIGA PUSPATI (RTP) of Mark II type, commissioned on 28 June 1982. It has a nominal power of 1 MW designed to effectively implement various fields of basic and applied nuclear research or services, education and training. The PUSPATI TRIGA is a swimming pool-type light water research reactor with enriched uranium-zirconiumhydride 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 1MW and at this operating power the thermal neutron flux at the edge of the reactor core is around 2.797×10¹²n/cm²/sec. Neutron radiography has been developed at one of the radial beam ports since 1980s, but with a stagnation of a long period. 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. A process has begun to upgrade the neutron radiography facility from film-based neutron radiography into digital neutron radiography. Now, the neutron radiography facility has been re-developed during these years, a new improved collimator has been planned and designed and a new instrument for neutron radiography and computed tomography will be set up at the neutron facility. A major step in the improvement of the neutron radiography activity at PUSPATI TRIGA Reactor is the implementation of digital neutron detector for fast neutron radiography. The new neutron detector is based on a 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 neutron camera has been done using SANS beam port due to neutron facility is currently under construction. The neutron beam intensity at SANS beam port is estimated to be ~ 10^3 n/cm²/s with the TRIGA reactor operating at 750kW. Several experiments have been performed on this experimental station using the new digital neutron CCD camera. The results have demonstrated that the new digital neutron CCD camera 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 using the new digital neutron CCD camera at neutron facility beam port. The most important property, the performance of the imaging instruments will be quantified.

P11B

Neutron and Gamma Ray Fluxes Measurement and Simulation at Radial Beam Port 1 of TRIGA MARK II PUSPATI Research Reactor

<u>Muhammad Aliff Ashraff Rosdi¹</u>, Goh Pei Sean¹, Faridah Idris², Safwan Shaibi¹, Muhammad Syahir Sarkawi¹, Nur Syazwani Mohd Ali¹, Nur Liyana Jamsari³, Nurul Aishah Mohd Nasir³, Ahmad Syafiq Ramli⁴, Azraf Azman²

 ¹Nuclear Engineering Department, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia, 81310, Johor Bharu, Malaysia.
 ²Malaysian Nuclear Agency, Bangi 43000 Kajang, Selangor, Malaysia.
 ³Universiti Kebangsaan Malaysia, 43600 Bangi, Sleangor, Malaysia.
 ⁴Universiti Tenaga Nasional, 43000 Kajang, Selangor, Malaysia. aliffashraff.utm@gmail.com

ABSTRACT

Neutron and gamma ray fluxes are the important criteria to be looked at in a neutron diffractometer system facility design. The flux is defined as the number of neutrons and gamma rays travel through a unit area in a unit time. Currently, the facility for neutron diffractometer system are planned to be developed at radial beam port 1 of TRIGA MARK II PUSPATI research reactor (RTP). The aim of this research is to determine the value of neutron and gamma ray fluxes produced at the end of radial beam port 1 and to identify the shielding materials suitable for neutron and gamma ray. In order to achieve this aim, an experiment has been designed to obtain the neutron and gamma dose rate by using TLD-600 and TLD-700. The results from this experiments are converted into neutron and gamma ray fluxes and are then compared with the results from simulation. The comparison shows that both results meet an agreement on the feasibility of shielding material for neutron diffractometer system. Our research result may be of help in the design of shielding material for neutron diffractometer facility at RTP

P12B

Thermal Neutron Flux Measurement at the Thermal Column of the Malaysia TRIGA Mark II reactor using Gold Foil Activation and TLD

<u>Safwan Shalbi¹,</u> Wan Norhayati Salleh¹, Faridah Idris², Nur Liyana Jamsari³, Muhammad Aliff Ashraff Rosdi¹, Nurul Aishah Mohd Nasir³, Muhammad Syahir Sarkawi¹, Nur Syazwani Mohd Ali¹

¹Nuclear Engineering Department, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia, 81310, Johor Bharu, Malaysia.
²Malaysian Nuclear Agency, Bangi 43000 Kajang, Selangor, Malaysia.
³Universiti Kebangsaan Malaysia, 43600 Bangi, Sleangor, Malaysia.
safwan.shalbi@gmail.com

ABSTRACT

The feasibility study of BNCT at the thermal column was conducted since 2001. The previous feasibility study found that the thermal neutron flux inside the G7 stringer of thermal column was 1.17×10^{10} cm⁻² s⁻¹ which was higher than the standard flux used for BNCT application $(1.0 \times 10^9 \text{ cm}^{-2} \text{ s}^{-1})$ around the world in which the thermal column was use for the BNCT facilities. In the current study, the main objective was focused on the thermal neutron flux measurement at the thermal column and outside of the thermal column and door. In this measurement, pure gold and cadmium were used to obtain the thermal and epithermal neutron fluxes from inside and the outside of the thermal column door at certain reactor power using a gold foil activation method, and are compared with neutron fluxes using TLD 600 and TLD 700.
P13B

Study on the Window Cooling System of the 300 keV Electron Accelerator

<u>K.W. Leo</u>, R.M. Chulan, S.A. Hashim, M. Azhar, Y. Dalim, M. Mohtar, A.H. Baijan, R.M. Sabri, M. Faiz, A. Azaman, R. C. Rosli

Malaysian Nuclear Agency, 43000, Bangi, Selangor, Malaysia. leo@nm.gov.my

ABSTRACT

This paper describes the method used to identify the parameters required for the window cooling system. This locally designed low energy electron accelerator with the present energy of 140 keV will be upgraded to 300 keV. The heat will be increased due to the increment of the beam energy; therefore an appropriate cooling system is required to prevent the breaking of the few µmm titanium window. The broken window will disrupt the beam transportation inside the vacuum environment of the accelerating tube and also the high voltage will be breakdown if the vacuum environment couldn't be sustained. Therefore, a desired air cooling system to cool down the 9 kwatt (30 mA, 300 keV) beam power has been designed. As the result, the window cooling system with the required pressure based on the beam powers have been calculated and identified.

SESSION 3C

ENVIRONMENT & SAFETY

P06C

Nuclear and Radiological Emergency Preparedness: Demands and Needs for Global Perspectives

<u>Altab Hossain¹</u>, A.Z.M. Salahuddin¹, M.S. Akbar², Abdul Aziz Mohamed³

¹Department of Nuclear Science and Engineering, Military Institute Science and Technology, Dhaka-1216, Bangladesh. ²Bangladesh Atomic Energy Commission, Dhaka, Bangladesh. ³Nuclear Engineering and Energy Group, College of Engineering, Universiti Tenaga Nasional, Malaysia. altab@nse.mist.ac.bd, altab76@gmail.com

ABSTRACT

Emergency preparedness is an important issue for every aspects of life. It is more crucial for nuclear and radiological establishments. Nuclear radiation is an unseen energy which may affect human and other living beings as well as the environment for its unconscious use and in case of an accident. Although all the nuclear and radiological facilities have guite good infrastructure, it needs improvement especially for the disposal program of the existing and future radioactive materials. Therefore, this study has given an exposure about the emergency preparedness in the context of nuclear and radiological matters in case of emergency period. The use of sources of radiation in different fields of practice other than in reactors is growing daily. Despite safety precautions in design and operations, accidents involving radiation sources do occur more frequently than reactor accidents. Unlike reactor accidents, the impact of any such accidents generally affects only a small number of people. However, the impact on these few people may be serious. Specific tools, exact procedures and reliable data are required to evaluate protective actions during a reactor accident. The analysis has been done using several key factors based on policy and strategy, regulatory authorities and their regulations, implementing organizations, participation of stack-holders and financial system. Furthermore, this study provides generic response procedures to protect the public and emergency workers for different types of radiological emergencies; including the accidents involving sealed and unsealed radioactive materials, radiation generators, and transport accidents. By considering the international trends, the institutional infrastructure of nuclear and radiological emergency preparedness needs to be improved.

P07C

Assessment of Absorbed Dose and Radiation Hazard Index around Repository Facility at Bukit Kledang, Perak, Malaysia

Mohd Izwan Abdul Adziz, Khoo Kok Siong

School of Applied Physics, Faculty of Science and Technology, Universiti Kebangsaan Malaysia (UKM), 43600, Bangi, Selangor, Malaysia. izwan.adziz@gmail.com

ABSTRACT

The process of natural decay of radionuclides that emit gamma rays can infect humans and other living things. In this study, soil samples were taken at various locations which have been identified around the Long Term Storage Facility (LTSF) in Bukit Kledang, Perak. In addition, the respective dose rates in the sampling sites were measured at 5cm and 1m above the ground using a survey meter with Geiger Muller (GM) detector. Soil samples were taken using a hand Auger and then brought back to the laboratory for sample prepreparation process. The measuring of radioactivity concentration in soil samples were carried out using gamma spectrometer counting system equipped with HPGe detector. The obtained results show, the radioactivity concentration ranged from 11.98 – 29.93 Bq/kg for Radium-226 (226 Ra), 20.97 – 41.45 Bq/kg for Thorium-232 (232 Th) and 5.73 – 59.41 Bq/kg for Potassium-40 (40 K), with mean values of 20.83 ± 5.88 Bq/kg, 32.87 ± 5.88 Bq/kg and 21.50 ± 2.79 Bq/kg, respectively. To assess the radiological hazards of natural radioactivity, radium equivalent activity (Raeq), the rate of absorption dose (D), the annual effective dose and external hazard index (Hex) was calculated and compared to the world average values.

P08C

Mechanism and Kinetics of Uranium Adsorption onto Soil around Coal-Fired Power Plant

Dgku Kamilah binti Pg Ismail

Faculty of Applied Physics, Universiti Teknologi MARA (UITM), Shah Alam Selangor, Malaysia. deekay1705@yahoo.com

ABSTRACT

A study has been performed to determine the mechanism and kinetics of Thorium adsorption onto soil collected from Jimah Energy Venture coal-fired power plant located at Jimah, Port Dickson. Batch adsorption experiment of Thorium with various initial concentrations were carried out. Parameters that were set constant includes amount of soil used was 5g each and the volume of concentration prepared were 50 ml. Parameters tested were initial concentration, pH, and contact time. The K_d values for each type of soil were determined in this batch experiments which was based on US EPA method, in order to estimate adsorption capacity of the soil. From the study, the optimum condition of maximum adsorption capacity for thorium on the Jimah soil were 25 ppm at pH 5 with 140 minutes of contact time at 99.984%. The result shows that it follow Langmuir adsorption model.

P09C

Evaluation of Radiation Dose in Pediatric Head CT Examination: A Phantom Study

Nik Norhasrina Nik Din

Faculty of Applied Physics, Universiti Teknologi MARA (UITM), Shah Alam Selangor, Malaysia. nikhasrina@gmail.com

ABSTRACT

The aim of this study was to evaluate the radiation dose in pediatric head CT examination. It was reported that decreasing tube voltage in CT examination can reduce the dose to patients significantly. A head phantom was scanned with dual-energy CT at 80 kV and 120 kV. The tube current was set using automatic exposure control mode and manual setting. The pitch was adjusted to 1.4, 1.45 and 1.5 while the slice thickness was set at 5 mm. the dose was measured based on CT Dose Index (CTDI). Results from this study show that the image noise increases substantially with low tube voltage. By choosing 80 kV at 10-30 mAs average dose was 2.60 mGy of average dose, however choosing 120 kV average dose was 17.19 mGy. With a reduction of the tube voltage from 120 kV to 80 kV at head CT, the radiation dose can be reduced by 12.1% to 15.1% without degradation of contrast-to-noise ratio.

P10C

Development of the Automated Bunker Door by using a Microcontroller-System

M.A. Ahmad, K.W. Leo, G.H.P. Mohamad, A. Ahmad, S.A. Hashim, R.M. Chulan, A.H. Baijan.

Malaysian Nuclear Agency, Bangi 43000 Kajang, Selangor, Malaysia. mohdazhar@nm.gov.my

ABSTRACT

The new low energy electron accelerator bunker was designed and built locally to allocate a 500 keV electron accelerator at Block 43T Nuclear Malaysia. This bunker is equipped with a locally made radiation shielding door of 10 tons. Originally, this door is moving manually by a wheel and fitted with a gear system. However, it is still heavy and need longer time to operating it manually by manpower. To overcome those issues, a new automated control system has been designed and developed. In this paper, the complete automated control system based on the microcontroller (PIC16F84A) will be described.

P11C

Malaysian Nuclear Agency Education and Outreach Program – Nuclear Science and Technology for Secondary School (NST4SS)

<u>Nasaai Masngut</u>, Haizum Ruzanna Sahar, Mohd Hafizal Yusof, Norzehan Ngadiron and Habibah Adnan

Information Management Division, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia. nasaai@nm.gov.my

ABSTRACT

Nuclear Malaysia as one of research agency based on nuclear science and technology has done their task on promoting this subject to the public especially students and teachers. Starting from 1980s, agency has done talk and exhibition program for secondary schools continued with 'Projek Anak Angkat', Icon Scientist Roadshow and 3V Nuclear Camp. Because of this active involvement in this education and outreach program, in 2015, International Atomic Agency (IAEA) has invited Malaysia as a pilot country in implementing 'Nuclear Science and Technology for Secondary Schools (NST4SS)'. This program has been organized by Malaysian Nuclear Agency in national level. This project was implemented under IAEA regional program RAS0065: Supporting Sustainability and Networking of National Nuclear Institutions in Asia and Pacific Region. Officially implemented in 2015 and after two years, this project still continues. This paper will discuss the implementation progress as well as overview on modules and devices provided for the program.

P12C

Introduction to Neutron Diffraction Technique for Residual Stress Measurement

Zaifol Samsu, Hishamuddin Husain, Muhammad Rawi Mohamed Zin and Faridah Mohd Idris

Malaysian Nuclear Agency, 43000, Bangi, Selangor, Malaysia. zaifolsamsu@nuclearmalaysia.gov.my

ABSTRACT

Structural failure is a critical phenomenon in construction industry. Failure occur due to the presence of residual stress combined with service stress that over the safety limit. Residual stress is the stress that exists within a material without application of an external load. There are few method for determination of residual stress. Neutron diffraction is a non-destructive method of determination of residual stresses in crystalline materials. Neutron diffraction provides the values of elastic strain components parallel to the scattering vector which can be converted to stress. Its measures strain components from changes in crystal lattice spacing. In this paper, the method of the neutron diffraction technique will be discuss for measuring the residual stress of the crystalline material.

P13C

Analysis of Graphene Ink for Fine Solid Lines Printed on BOPP Substrate in Micro-Flexographic Printing

S. Hassan^{1, a)}, M.S.Yusof^{1, b)}, Z.Embong^{2, c)}, S. Ding^{3,d)} and M.I.Maksud^{1, e)}

 ¹Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia, 86400 Batu Pahat, Johor, Malaysia.
 ² Faculty of Science, Technology and Human Development, Universiti Tun Hussein Onn Malaysia, 86400 Batu Pahat, Johor, Malaysia.
 ³School of Aerospace, Mechanical and Manufacturing Engineering, RMIT University East Campus, Melbourne, VIC 3083, Australia.
 Malaysian Nuclear Agency (Nuklear Malaysia), Ministry of Science, Technology and Innovation (MOSTI), Bangi, 43000 Kajang, Selangor, Malaysia.
 ^{a)}suhaimihas@uthm.edu.my
 ^{b)}mdsalleh@uthm.edu.my
 ^{c)}zaidi@uthm.edu.my
 ^{e)} midris1973@gmail.com

ABSTRACT

Micro-flexographic printing is a combination of flexography and micro-contact printing technique. It is a new printing method for fine solid lines printing purpose. Graphene material has been used as depositing agent or printing ink in other printing technique like inkjet printing. This graphene ink deposit is printed on BOPP by using Micro-flexographic printing technique. The choose of graphene as a printing ink is due to its wide application in producing electronic and micro-electronic devices such as RFID and printed circuit board. The graphene printed on the surface of BOPP substrate was then analysed using X-Ray Photoelectron Spectroscopy (XPS). The position for each synthetic component in the narrow scan of C 1s and O 1s are referred to the electron binding energy (eV). This research is focused on 2 narrow scan regions which are C 1s and O 1s. Further discussion of the spectrum evaluation will be discussed in detail. Here, it is proposed that from the surface adhesive properties of graphene, it is suitable as an alternative printing ink medium for micro-flexographic printing technique in printing multiple fine solid lines at micro to nano scale feature. Hence, this paper will describe the capability of this particular metal in a practice of Micro-flexographic printing technique for fine solid lines image feature.

26 SEPTEMBER 2017 (TUESDAY)

SESSION 6B

RADIATION TECHNOLOGY (RADTECH)

P21B

Properties of UV Curable Palm Oil Using Laboratory Scale and Pilot Plant Scale System

<u>Mek Zah Salleh</u>, Khairul Azhar Abdul Halim, Nurul Huda Mudri, Mohd Sofian Alias, Rida Tajau and Nik Ghazali Nik Salleh

Radiation Technology Division, Malaysian Nuclear Agency, Bangi, 43000 Kajang Selangor, Malaysia. mekzah@nm.gov.my

ABSTRACT

This paper presents synthesis and characterization of epoxidized palm oil acrylate (EPOLA) resins which were synthesized at two different production scales; 2 litters laboratory scale and 100 litters pilot plant scale. The reaction were confirmed by several analytical data i.e. oxirane oxygen content (OOC), acid value (AV) and IR spectrophotometer method. The results for both samples were compared and it was found that both production scales of 2L and 100 L show similar trend of significant decrease in both acid value and oxirane oxygen content. The characteristic of the epoxy acrylate obtained was investigated by FTIR which revealed that EPOLA was successfully synthesized for both production scales with the presence of acrylate peaks at absorption of 1632, 1405 and 987 cm⁻¹ and also the absence of oxirane at absorption of 834 cm⁻¹. It was observed via DSC analysis that both systems possess glass transition temperature (T_g) below 0°C. Furthermore, the EPOLA resin was found curable when subjected to ultraviolet irradiation with incorporation of photo initiator.

P22B

Characterization of Endopolysaccharides from *Pleurotus* spp. in Submerged Culture Fermentation

<u>Shaiful Azuar Mohamad¹</u>, Choong Yew Keong², Mohd Yusof Hamzah¹, Muhammad Rawi Mohamed Zain¹, Hafizal Yazid¹, Khairuddin Abdul Rahim¹, Wan Mohtar Wan Yusoff³

 ¹Agrotechnology and Bioscience Division, Malaysia Nuclear Agency, Kajang Selangor, Malaysia.
 ²Herbal Medicine Research Centre, Institute for Medical Research, Kuala Lumpur, Malaysia.
 ³Faculty of Science and Technology, National University of Malaysia, Bangi Selangor, Malaysia.
 azuar@nm.gov.my

ABSTRACT

Two mushroom species (Pleurotus flabellatus and Pleurotus pulmonarius (irradiated)) were selected and produced in submerged culture fermentation. Both species were screened for the presence of β -(1,3:1,6) glucan. The yield of β -(1,3:1,6) glucan from endopolysaccharide of Pleurotus flabellatus and Pleurotus pulmonarius (irradiated) were 7.70±1.11 g/100 g. and 16.70 g/100 g respectively. The endopolysaccharides from both species were fractioned column chromatography. The column chromatography of P. flabellatus usina endopolysaccharde yield four fractions. The fourth fraction (F₄) showed the presence of polysaccharide with high molecular weight (3.058×10⁶ and 1.282×10⁴ Da). The column chromatography of P. pulmonarius (irradiated) endopolysaccharide yield seven fractions. The first fraction (F₁) showed the presence of polysaccharide with high molecular weight (2.08×10⁵ and 1.41×10⁴ Da). The presence of polysaccharide with high molecular showed potential application in the medical field. Preliminary work has been done to further characterize the endopolysaccharide using nuclear technology (neutron scattering and xray scattering).

P23B

Application of Radiotracer Technology on Solving the Unsolved Leak in Lift Pit

<u>Mohd Fitri Abdul Rahman</u>, Jaafar Abdullah, Hearie Hassan, Mohamad Rabaie Shari, Airwan Mohamad Affandi and Mior Ahmad Khusaini Adnan

Plant Assessement Technology Group, Malaysian Nuclear Agency, Bangi 43000 Kajang Selangor, Malaysia.

ABSTRACT

Radiotracers have been used in many fields to optimize processes, solve problems, improve product quality, save energy and reduce pollution. The radiotracer technology is a proven reliable technique and recognized by many sectors such as medical, industrial and environmental. In this work, an unsolved leak problem was present in lift pit within a building in Malaysia. Many techniques have applied such as dye techniques, chemical analyses and engineering plaster to overcome the problem. Unfortunately, none of the techniques solve the problem. Radiotracer was used to find the unidentified source of leak. Basically, Technetium (Tc-99m) has been injected to the several injection points and flow of the tracer was monitored with radiation detectors that have been placed at various locations. The results were successful and pinpoint the problems.

P24B

Adsorption Studies of Packed Column for the Removal of Dyes Using Amine Functionalized Radiation Induced Grafted Fiber

Sarala Selambakkannu¹, Khomsaton Abu Bakar¹ and Haris Murshidi Mohd Ramli²

¹Malaysian Nuclear Agency, Radiation Processing Technology, Bangi, 43000, Kajang, Selangor, Malaysia.

²The University of New South Wales, UNSW Sydney NSW, 5052 Australia. sarala@nuclearnuclearmalaysia.gov.my

ABSTRACT

In this paper, the adsorption performance of packed bed column with amine functionalized radiation-induced grafted fibers (AFF) for the removal of acid blue 80 (AB 80) was investigated. Pre-treated banana fibers were grafted with glyceryl methacrylate (GMA) with the assistance of electron beam irradiation and subsequently functionalized with imidazole (IMI) which was used as the precursor of anionic dye adsorption. The effect of flow rate, bed height and inlet concentration on the breakthrough curves were analysed in terms of AFF adsorption performance. Increase in bed height and inlet concentration promotes the adsorption efficacy whereas reduction was observed while flow rate increases. The highest bed capacity obtained was 38.98 mg/g at adsorption condition of 5 ml/min flow rate, 100 ma/l inlet concentration and 50 mm of bed height. In order to determine the operational parameters the data were been collected via the experiment fitted into Yoon and Nelson, Thomas and bed depth service time (BDST) mathematical models. At different condition, Thomas model defines well the behaviours of breakthrough curve. The maximum adsorption capacity which been calculated from Yoon and Nelson and Thomas models increases with increase in flow rate and inlet concentration however reduction is observed with increase in bed height. Meantime, the BDST model exhibits good agreement with experimental data and higher correlation coefficient value $r^2 \sim 0.99$ were attained which indicates the validity of BSDT model for the column adsorption system with AFF.

P25B

Verification of Relative Output Factor (ROF) Measurement using Gafchromic Films for Radiosurgery Small Photon Beams

Reduan Abdullah

School of Health Sciences, Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia. reduan@usm.my

ABSTRACT

Particular attention may be paid to reassess for treatment planning systems (TPSs) that deal with specialized techniques such as stereotactic radiosurgery. It is important for clinical medical physicist to be able to quantify errors involved in the dosimetric parameter data before it can be downloaded into the TPS. The purpose of this study was to verify the measurement of relative output factor (ROF), which is one of the dosimetric parameter data required for Stereotactic Radiosurgery (SRS) treatment planning. ROF of 5 mm to 45 mm diameter Radionic circular cone collimators were measured using PTW Pinpoint Ionization Chamber (0.016 cc) and compared with two types of gafchromic films, which were aafchromic EBT2 and EBT3(ISP Product, USA). The ROF measurements were verified using a Monte Carlo (EGSnrc) validated model and other previous studies. In conclusion. gafchromic EBT3 film gave the most reliable ROF result for field size from 5 mm to 45 mm compared to pinpoint ionization chambers used in this study. The ROF measurement using pinpoint ionization chamber was in good agreement with the Monte Carlo calculation (±4.9%) percentage deviation). Therefore for measurement of ROF for SRS circular field size using film dosimetry, gafchromic EBT3 is good as pinpoint ionization chamber was suggested due to its accuracy. This ROF validation test can be carried out during the commissioning and installation of the new TPS and also for annually quality assurance (QA).

P26B

New Palm Oil Based Polyester Polyol for Drug Carrier: Synthesis and Its Characterization

<u>Rida Tajau^{1,2}, Rosiah Rohani¹, Wan Nor Roslam Wan Isahak¹, Mek Zah Salleh²</u>

 ¹Department of Chemical and Process Engineering, Faculty of Engineering and Built Environment, National University of Malaysia, 43600 UKM, Selangor, Malaysia.
 ²Division of Radiation Processing Technology, Malaysia Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia.
 rosiah@ukm.edu.my, rroh006@gmail.com

ABSTRACT

The palm oil-based polymers such as polyester polyol is considered as a promising material for developing drug delivery carrier due to its natural and biocompatible properties. This has attracted more work to develop this biopolymer as it may be comparable to the common synthetic polymer of its class. Bio-based polyester is classified as biodegradable polymer in comparison to the other synthetic polymers and thus would be best suited for the said application. Therefore, new polyester polyol from palm oil-based precursor was synthesized and characterized in this study. The polyester polyol was produced via alcoholysis of diol (palm oil based precursor) with triethanolamine and lithium hydroxide catalysts for three hours. From the results, the yield of polyester polyol reached 90.73% and displayed high hydroxyl value at 126.69 mg KOH/g with molecular weight obtained is 5001.86 g/mol. The hydrolysable ester (C-O) backbones chemical structure which represent the biodegradable point of the polyester polyol, was confirmed its appearance at the range of v_{max}/cm^{-1} 1300 -1000 through the FTIR spectroscopy. Consequently, the presence of the ester proton (-COO-CH₂-) and the ester carbons (i.e. CH₂CH₂COO-, CH₂COO-, CH₂OCOO-) is confirmed by δ_{H} - and δ_{C} -NMR spectra, which indicated that the polyester polyol structure is biodegradable. The polyester polyol displayed three stages of decomposition temperature (T_d) : 203.56 °C (T_{d1}) , 362.79 °C (T_{d2}) and 481.91 °C (T_{d3}) . The glass transition temperature (T_q) of the polyol polyester was found at -46.18 °C. From the results, the analyses affirmed that this palm oil-based polyester polyol can be classified as a degradable polymer due to present of their hydrolysable ester bonds linkages. Its low molecular weight and low-melting biodegradable properties could potentially indicate the faster degradation compare to the synthetic polymers, which commonly found of higher molecular weight. This bio-based polyester polyol is a preferable candidate for developing drug delivery carrier due to its promising physicochemical properties and good thermal property which can be widely used in drug delivery development.

P27B

The Optimization of Baking Temperature for Carbon Production from Peat Soil

<u>FahrulRazi Md Jamien</u>², Zaidi Embong^{1,2}, Saiful Azhar Ahmad Tajudin^{1,3}, Salawati Ahmad⁴, Abul Adli Anuar⁶, Azwan Mat Lazim⁵

 ¹Research Centre for Soft Soil (RECESS), Office for Research, Innovation, Commercialization and Consultancy Management (ORICC), Universiti Tun Hussein Onn Malaysia.
 ²Faculty of Science, Technology and Human Development, Universiti Tun Hussein Onn Malaysia.
 ³Faculty of Civil and Environment Engineering, Universiti Tun Hussein Onn Malaysia ⁴Centre for Language Study, Universiti Tun Hussein Onn Malaysia.
 ⁵School of Chemical Sciences and Food Technology, Universiti Kebangsaan Malaysia.
 ⁶Malaysia Nuclear Agency 42300, Kajang, Selangor zaidi@uthm.edu.my, fahrulrazi_93@yahoo.com.my

ABSTRACT

This study aims to find the optimised baking temperature for carbon extraction from peat soil from various baking temperatures. The carbon from peat soil was prepared by the pyrolisation process at temperature, T = 200, 300, 400, 500, 600 and $700^{\circ}C$ for 5 hours. The carbon, C and silica, Si content from various temperatures were measured by using EDX at 3 points on the sample surface. High atomic percentage of carbon (95.44%) was measured at T = 400°C, while the highest atomic percentage of silicon was recorded at T = 700°C (30.79%). The surface morphology of peat soil was analysed by using SEM at 800 magnifying power. The structural parameters of the carbon were measured by using Laser Raman spectroscopy. The peak positions of D-band and G-band for raw peat were observed at Raman shift of 1379.62 and 1549.02 cm-1, respectively. Meanwhile, the D-band for baking temperature of 400°C was 1391.56 cm-1 and G-band has peak position of 1562.16 cm-1. From the Raman spectra of the optimum baking temperature at 400°C, it was revealed that the carbon structural is mainly attributed by graphite and diamond structure.

SESSION 6C

MATERIALS & SUSTAINABILITY 1

P20C

The Design and Dosimetric Evaluation Tannin-Based *Rhizophora* spp. Particleboard as Phantoms for High Energy Photons and Electrons

<u>Mohd Fahmi Mohd Yusof</u>^{1,2}, Puteri Nor Khatijah Abd Hamid¹, Abd Aziz Tajuddin¹, Reduan Abdullah², Rokiah Hashim³, Sabar Bauk¹

¹School of Physics, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia.
²School of Health Sciences, Universiti Sains Malaysia, Kota Bharu, Kelantan, Malaysia.
³School of Industrial Technology, Universiti Sains Malaysia, 11800 Minden, Penang Malaysia.
Malaysia.
mfahmi@usm.my

ABSTRACT

A set of phantom with an external dimension of 30 cm x 30 cm was constructed from tanninbased Rhizophora spp. particleboards similar to the external dimensions of solid water phantoms. The dosimetric charateristics of the particleboard phantoms were evaluated at high energy photons and electrons by measuring the beam output at 6 MV photons and 6 MeV electrons based on IAEA TRS 398:2000 codes of practice. The tissue-phantom ratio (TPR_{20.10}) was measured at 6 and 10 MV photons. The beam output calibration of the tanninbased Rhizophora spp. particleboards were in good agreement to water and solid water phantoms at 6 MV photons with percentage difference of 1.7 and 6.2% respectively. The beam output calibration of the tannin-based Rhizophora spp. particleboards at 6 MeV electrons on the other hand were in excellent agreement to water with percentage difference of 0.3%. The results showed that the TPR_{20,10} and the beam output in the tannin-based Rhizophora spp. particleboards wre in good agreement to water and solid water phantoms within 5% percentage of difference at all photon energies. The percentage depth dose of tannin-based Rhizophora spp. particleboards were in agreement to water and solid water within 4.5% when measured using ionization chamber and EBT2 film. The electron beam parameters of R₅₀, R₈₀ and R₉₀ at 6 MeV electron also were in good agreement to water and solid water phantoms. The overall results had indicated the suitability of tannin-based *Rhizophora* spp. particleboards as water substitute phantom materials for igh energy photons and elecrons.

P21C

Hydrothermal Growth of ZnO: a Substrate-dependent Study on Nanostructures Formation

Choo Thye Foo, Nur Ubaidah Saidin and Kok Kuan Ying

Materials Technology Group, Industrial Technology Division, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia.

ABSTRACT

ZnO has received lots of attention in recent years because of its unique properties, rendering it a good candidate material for various industrial applications. Amongst the methods used for synthesizing ZnO structures, hydrothermal technique offers a simple, cost-effective and yet environment friendly synthesis route for the materials. To investigate the effect of substrate on the formation of hydrothermally grown ZnO, several types of substrates were used and the structures of the ZnO were systematically studied by field emission scanning electron microscopy (FESEM). It was demonstrated that the type of substrates used had a great influence on the morphologies, density and alignment of the ZnO formed. Pre-coated substrate with Au yielded highly aligned ZnO nanorod arrays compared to bare Si and Al substrates. Possible mechanisms for the variation of morphology obtained are discussed.

P22C

Design and performance evaluation of corn starch – *Rhizophora* spp. particleboard as phantom for SPECT imaging

<u>Puteri Nor Khatijah Abd Hamid</u>¹, Mohd Fahmi Mohd Yusof¹, Rokiah Hashim², Abd Aziz Tajuddin¹

¹School of Physics, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia.
²Division of Bioresource, Paper and Coatings Technology, School of Industrial Technologies, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia. pnkah14_phy063@student.usm.my

ABSTRACT

A phantom for single photon emission computed tomography (SPECT) was designed from corn starch-bonded *Rhizophora* spp. particleboards. The particleboard phantom was designed in according to the Jaszczak phantom commonly used in SPECT imaging with dimension of 220 mm diameter and 180 mm length. Six holes with different diameter were drilled for radiopharmaceutical vials insertion. The vials were filled with 10 mCi of ^{99m}Tc unsealed source. The particleboard phantom was scanned using dual-head gamma camera and the SPECT images were obtained. The contrast of each vial for particleboard phantom were measured and compared to Perspex® and Jaszczak phantom. The results showed that average contrast value of particleboard is near to 1.0 and in good agreement with Perspex® and water. The diameter and volume of the radiopharmaceuticals did not influence the contrast of the images. The overall results showed the potential of corn starch-*Rhizophora* spp. as phantom for quality assurance and dosimetry works in SPECT imaging.

P23C

Preliminary Analysis on the Water Quality Index (WQI) and the Defect of the Irradiated Basic Filtrated Elements

<u>Asyraf Arif Abu Bakar</u>¹, Anas Muhamad Pauzi¹, Abdul Aziz Mohamed¹, Syazrin Syima Sharifuddin²

¹College of Engineering, Universiti Tenaga Nasional, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia. ²National Hydraulic Research Institute of Malaysia, Kuala Lumpur, Malaysia. aasyraf@uniten.edu.my

ABSTRACT

Simple water filtration system is needed in times of extreme floods. Clean water for sanitation at evacuation centres is essential and its production is possible by using the famous simple filtration system consisting of empty bottle and filter elements (sands, gravels, cotton/coffee filter). This research intends to study the effects of irradiated filter elements on the filtration effectiveness through experiments. The filter elements will be irradiated with gamma and neutron irradiation using the facilities available at Malaysia Nuclear Agency. The filtration effectiveness is measured using the water quality index (WQI) that is developed in this study to reflect the quality of water. The WQI of the filtered water using the system with irradiated filter elements is then compared with that of the system with non-irradiated filter elements.

P24C

The effect of gamma irradiation on chemical, morphology and optical properties of polystyrene nanosphere at various exposure time

<u>Jibrin Alhaji Yabagi</u>^{1,2}, Mohammed Isah Kimpa^{1,3}, Muhammad Nmayaya Muhammad^{1,2}, Saiful Bin Rashid⁴, Embong Zaidi¹ and Mohd Arif Agam¹

¹Department of Science, Universiti Tun Hussein Onn Malaysia 86400 Parit Raja, Batu Pahat, Johor.

²Department of Physics, Ibrahim Badamasi Babangida University Niger State Nigeria 286 Lapai.

³Department of Physics, Federal University of Technology Minna Niger State Nigeria 09 Bosso.

⁴Department of Physics, Faculty of Science, University of Technology Malaysia81310 Skudai, Johor. jibrinbida@yahoo.com, arif@uthm.edu.my

ABSTRACT

Irradiation of polymers causes structural, chemical and the optical properties changes. Polystyrene nanosphere was deposited onto substrate by drop coating method and the gamma irradiation was carried out in a Cesium-137 (Cs-137) source chamber at different time (1-5 hours) with constant dose of 30 kGy. Fourier transformation infrared spectroscopy (FTIR) and Raman spectroscopy were employed to characterize the chemical properties of irradiated polystyrene while Field emission scan electron microscopy (FE-SEM) and atomic force microscopy (AFM) were used to study the surface morphological changes of the samples. The energy band gap and Optical properties of the thin films were investigated and studied using transmittance and absorbance measurements. The results obtained revealed that as irradiation time increases the optical properties changes and polystyrene gradually undergoes crystallization from its amorphous state. The average particles diameter and roughness of the samples decreases with increasing in irradiation time.

P25C

Neutron Moderation Effectiveness By Alumina (Co-Fired Ceramic Based) And Polymeric Materials Such As Teflon Under Triga Neutron Environment With and Without Beryllium Filter Cooled With Liquid Nitrogen

Abdul Aziz Mohamed¹, Nasri A. Hamid¹, A. Syafiq Ramli¹, Azraf Azman²

 ¹Nuclear Energy and Engineering Research Group, College of Engineering, Universiti Tenaga Nasional, 43000 Kajang, Selangor, Malaysia.
 ²Materials Technology Group, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia.

azizm@uniten.edu.my, nasri@uniten.edu.my, syafiqramli45@gmail.com

ABSTRACT

.

This research is to study neutron moderation effectiveness by alumina (co-fired ceramic based) and polymeric materials such as teflon under triga neutron environment with and without beryllium filter cooled with liquid nitrogen. Neutron moderation is a process of reducing energy of fast neutron to the thermal region by elastic scattering through a moderating medium. The material used for the neutron moderation is called a moderator. A good moderator should have three nuclear properties which are have large scattering cross section, small absorption cross section, and large energy per collision. This report will highlight work on investigating the neutron moderation effectiveness by alumina (co-fired ceramic based) and polymeric materials such as Teflon as neutron moderator under TRIGA neutron environment with and without beryllium filter to produce cold-neutron. Low flux research reactor, such as TRIGA Mark II, was not fully utilized for moderator research.

P26C

Investigation of Dielectric Constant Variations of Malaysians Soil Species Towards Its Natural Background Dose

<u>Khawarizmi Mohd Jafery</u>¹, Zaidi Embong^{1, 4}, Yee See Khee^{2,5}, Samsul Haimi Dahlan^{2,5}, Saiful Azhar Ahmad Tajudin^{3,4}, Salawati Ahmad⁶, Siti Kudnie Sahari⁷, Omeje Maxwell⁸

¹Faculty of Science, Technology and Human Development, Universiti Tun Hussein Onn Malaysia, Malaysia.

 ²Faculty of Electrical and Electronic Engineering, Universiti Tun Hussien Onn Malaysia.
 ³Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia.
 ⁴Research Center for Soft Soil (RECESS), Office for Research, Innovation, Commercialization and Consultancy Management (ORICC), Universiti Tun Hussein Onn Malaysia.

⁵Research Centre for Applied Electromagnetic (EMCenter), Office for Research, Innovation, Commercialization and Consultancy Management (ORICC), Universiti Tun Hussein Onn Malaysia. ⁶Centre for Language Study, Universiti Tun Hussein Onn Malaysia

⁷Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), 94300 Kota Samarahan, Sarawak, Malaysia.

⁸College of Science and Technology, Department of Physics, Covenant University, Ota, Ogun State, Nigeria.

khawarizmijafery@hotmail.com

ABSTRACT

The correlation of natural background gamma radiation and real part of the relative complex permittivity (dielectric constant) for various species Malaysian soils were investigated in this research. The sampling sites were chosen randomly according to soils group that consist of sedentary, alluvial and miscellaneous soil which covered around the area of Batu Pahat, Kluang and Johor Bahru, Johor state of Malaysia. There are 11 types of Malaysian soil species have been studied which consist of Peat, Linau-Sedu, Selangor-Kangkong, Kranji, Telemong-Akob-Local Alluvium, Holvrood-Lunas, Batu Anam-Melaka- Tavy, Harimau Tampoi, Kulai-Yong Peng, Rengam-Jerangau, and Steepland soils, In-situ exposure rate of each soil species were measured by using portable gamma survey meter and ex-situ analysis of real part of relative permittivity was performed by using vector network analyser assists by DAK (Dielectric Assessment Kit). Results revealed that the highest and the lowest background dose rate was 94 ±54.27 µR hr-1 and 5 ±2.8 µR hr-1 which contribute by Rengam Jerangau and Peat soil species respectively. For dielectric constant measurement, it was performed in the range of EM frequency between 100 MHz to 3 GHz. The measurements of each soils species dielectric constant are in the range of 1 to 3. At the low-level frequencies in the range of 100 MHz to 600 MHz, it was observed that signal from the dielectric measurement for each soil species are fluctuated and in inconsistent form. But it remained steady in flat line form of signal at higher frequency at range above 600 MHz. From the comparison of each dielectric measurement from each soil dielectric measurement at above 600 MHz of frequency, it was found that Renggam-Jerangau soil species give the highest reading and followed by Selangor-Kangkong species. The average dielectric measurement for both Selangor-Kangkong and Renggam-Jerangau soil species are 2.34 and 2.35 respectively. Meanwhile, peat soil species exhibits the lowest dielectric measurement of 1.83. At a glance, it also clearly seen that the pattern of dielectric measurement for every soil at the frequency above 600 MHz demonstrated in specific distribution which can be classified into two main region which are higher and lower between the range of 1.83 to 2.35. Pearson correlation analysis between a frequency of 100 MHz and 2.6 GHz respect to exposure rate for every soil species was r = 0.34 and r = 0.48, respectively. This indicates that the correlation between both parameter, natural background dose and soils dielectric for each soils sample are not in strong correlation. This factor could be contributed by major and minor elements contain in each soils sample species, especially Ferum, Fe and Silica. Si.

P27C

Radiation Shielding Properties of Ferro-Boron Concrete

<u>Muhammad Syahir Sarkawi¹</u>, Muhammad Rawi Mohamed Zin², Mohamad Hairie Rabir², Faridah Mohamad Idris², Jasman Zainal¹

¹ Department Energy Engineering, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia.
² Malaysian Nuclear Agency, 43600 Kajang, Selangor, Malaysia. syahirsarkawi@gmail.com

ABSTRACT

The problem of shielding against gamma and neutron radiation in nuclear facility have always attracted a great deal of attention. Typically, the best known materials for shielding both gamma-ray and fast neutrons are concrete. However, due to low neutron cross section in ordinary concrete it can only weakly absorbed thermal neutrons. In order to increase the neutron cross section capture, additional compound was mixed into the original concrete. In this paper we have used ferro-boron compound to enhance radiation shielding properties of concrete. Ferro-boron is an alloy, which is formed by combining iron with boron compound content between 10% to 17%. In this work, Monte Carlo N-Particle X (MCNPX) is used to simulate the radiation shielding properties of ferro-boron compound into concrete mixture can significantly enhance radiation shielding properties of concrete. Keywords: Radiation shielding, Monte Carlo code, Ferro-Boron, Concrete mixture Area of research: Material and Radiation Shielding

27 SEPTEMBER 2017 (WEDNESDAY)

SESSION 9A

ENERGY AND INFRASTRUCTURE

P30A

Effectiveness of Mathematics Education in Secondary Schools to Meet the Local Universities Missions in Producing Quality Engineering and Science Undergraduates

Abu Bakar Hasan¹, Abdul Fatah Abdul and Zalilah Selamat

¹Faculty of Engineering and Built Environment, USIM, Malaysia. abakarh@usim.edu.my

ABSTRACT

Critical claims by certain quarters that our local undergraduates are not performing well in Mathematics, Statistics and Numerical Methods needs a serious thinking and actions. Yearly examinations results at the SPM and STPM levels have been splendid whereby it is either increasing or decreasing in a very tight range. A good foundation in mathematics and additional mathematics will tremendously benefit these students when they enter their university education especially in engineering and science courses. This paper uses SPM results as the primary data, questionnaires as secondary, and apply the Fish Bones technique for analysis, and the outcome shows that there is a clear correlation between the causes and effect.

P31A

Thermal Neutron Flux Measurement Using Self-Powered Neutron Detector (SPND) at Out-Core Location of the RTP

Nur Syazwani Mohd Ali

Nuclear Engineering Programme, Universiti Teknologi Malaysia, Skudai, Johor, Malaysia. nsyazwanimali68@gmail.com

ABSTRACT

The thermal neutron flux measurement has been conducted at the out-core location using self-powered neutron detectors (SPNDs) to calculate the flux and power distribution through the interaction between neutrons and emitter materials of the SPNDs. Three SPNDs were used to measure the flux at four different radial locations which located at the fission chamber cylinder, 10cm above graphite reflector, between graphite reflector and tank liner and fuel rack. The measurements were conducted at 750 kW reactor power. The output from SPNDs were collected through data acquisition system and were corrected to obtain the actual neutron flux due to delayed responses from SPNDs. The measurements show that the thermal neutron flux between fission chamber location to the tank liner and fuel rack were between 4.20×10^{11} nv to 2.50×10^{10} nv. The average thermal neutron flux showing a good agreement level of consistency with those of previous studies that has been made using simulation of the same core configuration.

P32A

Measurement and Simulation of Thermal Neutron Flux Distribution in RTP Core

Mohamad Hairie B. Rabir, Abi Muttaqin B. Jalal Bayar, Na'im Syauqi B. Hamzah, Muhammad Khairul Ariff B. Mustafa, Julia Bt. Abdul Karim, Muhammad Rawi B. Mohamed Zin, Yahya B. Ismail, Mohd Huzair B. Hussain, Mat Zin B. Mat Husin, Roslan B. Md Dan, Ahmad Razali B. Ismail, Nurfazila Bt. Husain, Zareen Khan B. Abdul Jalil Khan, Shaiful Rizaide B. Mohd Yakin, Mohamad Fauzi B. Saad, Datin Zarina Bt. Masood

Reactor technology Centre, Technical Support Division, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia. m hairie@nuclearmalaysia.gov.my

ABSTRACT

The in-core thermal neutron flux distribution was determined using measurement and simulation methods for the Malaysian's PUSPATI TRIGA Reactor (RTP). In this work, online thermal neutron flux measurement using Self Powered Neutron Detector (SPND) has been performed to verify and validate the computational methods for neutron flux calculation in RTP calculations. The detail in-core neutron flux distributions were estimated using MCNP mesh tally method. The neutron flux mapping obtained revealed the heterogeneous configuration of the core. Based on the measurement and simulation, the thermal flux profile peaked at the centre of the core and gradually decreased towards the outer side of the core. The results show a good agreement (relatively) between calculation and measurement where both show the same radial thermal flux profile inside the core: MCNP model over estimation with maximum discrepancy around 20% higher compared to SPND measurement. As our model also predicts well the neutron flux distribution in the core it can be used for the characterization of the full core, that is neutron flux and spectra calculation, dose rate calculations, reaction rate calculations, etc.

P33A Adaptive Control Method for Core Power Control in Triga Mark II Reactor

Mohd Sabri Minhat¹, Hazlina Selamat², Nurul Adilla Mohd Subha²

¹Reactor Electronics, Instrumentation and Control Section, Reactor Technology Centre, Malaysian Nuclear Agency, Kajang, Selangor.
²Control and Mechatronics Engineering Department, Faculty of Electrical Engineering, Universiti Teknologi Malaysia, Skudai, Johor. sabri@nuclearmalaysia.gov.my

ABSTRACT

The 1MWth Reactor TRIGA PUSPATI (RTP) Mark II type undergoes more than 35 years operation. The existing core power control was used Feedback Control Algorithm (FCA). It is challenging to keep the core power stable at the desired value within acceptable error bands for the safety demand of the RTP due to the sensitivity of nuclear reactor. Currently, the system is not satisfied with power tracking performance and can be improved. Therefore, a new design core power control is very important to improve the current performance in tracking and regulate reactor power by control the movement of control rods. In this paper, the adaptive controller and focus on Model Reference Adaptive Control (MRAC) and Self-Tuning Control (STC) were applied to the control of the core power. The model for core power control was based on mathematical models of the reactor core, adaptive controller model, and control rods selection programming. The mathematical models of the reactor core were based on point kinetics model, thermal hydraulic models, and reactivity models. The adaptive control model was presented using Lyapunov method to ensure stable close loop system and STC Generalised Minimum Variance (GMV) Controller was not necessary to know the exact plant transfer function in designing the core power control. The performance between proposed adaptive control and FCA will be compared via computer simulation and analysed the simulation results manifest the effectiveness and the good performance of the proposed control method for core power control.

P34A

Utilization of Thorium and Irradiated U-Zrh_{1.6} Fuels in Various Heterogenous Cores for PUSPATI TRIGA Reactor

<u>Abdul Hannan Bin Damahuri¹,</u> Hassan Mohamed¹, Abdul Aziz Mohamed¹, Faridah Idris²

¹College of Engineering, Universiti Tenaga Nasional, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia. ²Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia. ahannan@uniten.edu.my

ABSTRACT

The use of thorium as the fuel has been a tantalizing prospect for many years and will be great significance to nuclear power generation. There is an increasing need for more research on thorium as Malaysian government is guite active in its Thorium Flagship Project. which was launched in 2014. The thorium project, which is still in phase 1, focuses on the research and development of the thorium extraction from mineral processing ore. Thus, the aim of the study is to investigate other alternative Puspati TRIGA Reactor (RTP) core designs that can fully utilize thorium and yet will have a similar performance of the existing core configuration. Currently, the RTP reactor has an average neutron flux of 2.797 x 10¹² cm^{-2}/s^{-1} and an effective multiplication factor, K_{eff} of 1.0010510. The Puspati TRIGA Reactor (RTP) has a circular array core configuration with six circular rings. Each ring consists of either 6, 12, 18, 24, 30 or 36 U-ZrH_{1.6} fuel rods. There are three main enrichments, namely 8.5 wt%, 12 wt% and 20 wt%. The reactor core is modeled and simulated by using Monte Carlo n-particle. For this research, uranium zirconium hydride U-ZrH_{1.6} fuel pins in RTP are replaced by thorium oxide fuels. Each ring is replaced with thorium oxide fuel rods, beginning from the second innermost ring to the outermost ring of the core. Therefore, hence this work analyzes six different configurations. Besides, the seed-blanket core configuration is also studied, in which the uranium zirconium hydride will act as the seed and the thorium oxide will be the blanket. The seed is situated at the center of the core while the blanket is located surrounding the seed. The outcomes of the study are the neutron multiplication factor and heat flux distribution for all investigated configurations with thorium fuels.

SESSION 9B

SCIENCE AND ENGINEERING 2

P29B

The Enhancement of Heavy Metal Removal from Polluted River Water Treatment by Integrated Carbon-Aluminium Electrodes Using Electrochemical Method

<u>Nabiha Mohd Yussuf</u>², Zaidi Embong^{1,2}, Shakila Abdullah², Mohd Idrus Mohd Masirin^{1,3}, Saiful Azhar Ahmad Tajudin^{1,3}, Salawati Ahmad⁴, Siti Kudnie Sahari⁶, Abul Adli Anuar⁵, Omeje Maxwell⁷

 ¹Research Centre for Soft Soil (RECESS), Office for Research, Innovation, Commercialization and Consultancy Management (ORICC), Universiti Tun Hussein Onn Malaysia
 ²Faculty of Science, Technology and Human Development, Universiti Tun Hussein Onn Malaysia
 ³Faculty of Civil and Environment Engineering, Universiti Tun Hussein Onn Malaysia
 ⁴Centre for Language Study, Universiti Tun Hussein Onn Malaysia
 ⁵Malaysia Nuclear Agency 42300, Kajang, Selangor
 ⁶Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), 94300, Kota Samarahan, Sarawak, Malaysia
 ⁷College of Science and Technology, Department of Physics, Covenant University, Ota, Ogun State, Nigeria

ABSTRACT

The heavy metal removal performance from polluted river water using two types of electrode configuration was evaluated and compared between integrated carbon-aluminium and with a conventional aluminium plate electrode using laboratory-scale experiments. In the integrated electrode systems, the electrode surface was coated with carbon using mixed slurry containing carbon black, polyvinyl acetate and methanol. The electrochemical treatment was conducted on the parameter condition of 90V applied voltage, 3cm of electrode distance and 60 minutes of electrolysis operational time. Surface of both electrodes was investigated for pre and post electrolysis treatment by using SEM-EDX analytical technique. Comparison between both of the electrode configuration exhibits that more metals were accumulated on carbon integrated electrode surfaces for both anode and cathode, and more heavy metals were detected on the cathode. The atomic percentages of metals distributed on the cathode integrated electrode surface were O (75.40%), AI (21.06%), Zn (0.45%), Mn (0.22), Fe (0.29%), Cu (0.84%), Pb (0.47%), Na (0.94%), Cr (0.08%), Ni (0.02%) and Ag (0.22%), while on anode contain Al (3.48%), Fe (0.49 %), C (95.77%), and Pb (0.26%). Meanwhile, there are few metals were detected on the conventional electrode surface. On the cathode surface, it's mainly sticking by Al (94.62%), Zn (1.19%), Mn (0.73%), Fe (2.81%) and Cu (0.64%), while on the anode contain with O (12.08%), AI (87.63%) and Zn (0.29%). According to this experiment, it was found that integrated carbon-aluminium electrodes have a great potential to accumulate more heavy metal species from polluted water compare to the conventional aluminium electrode. Here, heavy metal accumulation process obviously very significant on the cathode surface.

P30B

Evaluation of Potential Site For Mineral Processing Plant Using Surface Moisture-Density Gauge

<u>Muhamad Noor Izwan Ishak</u>, Susan Maria Sipaun, Ismail Mustapha, Engku Mohd Fahmi Engku Chik, Nurliyana Abdullah, Airwan Affandi Mahmood

Plant Assessment Technology Group, Industrial Technology Division, Malaysian Nuclear Agency, 43000, Kajang, Selangor , Malaysia. noorizwan@nuclearmalaysia.gov.my

ABSTRACT

Nuclear moisture-density gauge is a type of instrument for measuring density and moisture of the material in a relatively thin zone beneath a surface of the material by using low activity of neutron and gamma radiation source. Density and moisture content data of the compacted layers are needed to determine the degree of compaction of soils, aggregate, concrete, asphalt or other materials used in civil engineering works. A Gamma radiation source is mounted inside gauge housing with the elongate source rod extending vertically through and mounted for vertical sliding movement to various depth positions. Direct transmission gamma radiation technique is used to obtain the count reading for the number of photons emitted before it is converted into density reading by microprocessor. This paper presents the inspection technique and results for the measurement of soil moisture and density carried out at potential site for mineral processing plant, Malaysian Nuclear Agency. The experiment is carried to ensure the compaction of ground is suitable for the plant construction. From the calculation, the percentages of soil wet density compaction (%WD Compact) are within acceptable limits with respect to the standard compacted wet soil density measured in the laboratory.

P31B

Study on Detection Geometry and Detector Shielding for Portable PGNAA System using PHITS

<u>Hanafi Ithnin¹</u>, Norliana Mohd Lip², Izyan Qistina Abd Rashid³, Lahsen@Norman Shah Dahing¹

¹Malaysian Nuclear Agency, 43000, Kajang, Selangor, Malaysia.
²Faculty of Computer and Mathematical Science, Universiti Teknologi Mara.
³Department of Nuclear Science, Universiti Kebangsaan Malaysia.
hanafi_i@nuclearmalaysia.gov.my

ABSTRACT

Prompt Gamma-ray Neutron Activation Analysis (PGNAA) measurements require efficient detectors for gamma-ray detection. Apart from experimental studies, the Monte Carlo (MC) method has become one of the most popular tools in detector studies. The absolute efficiency for a 2 × 2 inch cylindrical Sodium Iodide (NaI) detector has been modeled and validated by using the PHITS software and compared with previous studies in literature. In the present work, the applicability of PHITS code for optimization of portable PGNAA system has been tested by using the validated NaI detector. The detection geometry is optimized by moving the detector along the sample to find the highest intensity of the prompt gamma generated from the sample. Shielding material for the validated NaI detector is also studied to find the best option for the PGNAA system setup. The result shows the optimum distance for detector is on the surface of the sample and around 15 cm from the source. The results specify that this process can be followed to determine the best setup for PGNAA system for a different sample size and detector type. It can be concluded that data from PHITS code is a strong tool not only for efficiency studies but also for optimization of PGNAA system.

P32B

Monitoring Underground Water Leakage Pattern by Ground Penetrating Radar (GPR) Using 800 MHz Antenna Frequency

Tengku Sarah binti Tengku Amran¹, Mohamad Pauzi Ismail¹, Mohamad Ridzuan Ahmad¹, Mohamad Syafiq Mohd Amin¹, Mohd Azmi Ismail¹, Suhairy Sani¹, Noor Azreen Masenwat¹ and Nabilah Syuhada Mad Basri²

 ¹Material Structure Integrity group (NDT-MSI), Industrial Technology Division, Malaysian Nuclear Agency, 43000 Kajang, Selangor, Malaysia.
 ²The Faculty of Science, Technology and Human Development, Universiti Tun Hussein Onn Malaysia (UTHM), 86400 Parit Raja, Batu Pahat, Johor, Malaysia. sarah@nm.gov.my

ABSTRACT

Water is the most treasure natural resources, however, a huge quantities of water losses during its distribution, leads to water leakage problem. The leaks then waste money and create more economic loss, to treat and fix the pipe damage. Researchers and engineers have put tremendous attempts and effort, to solve water leaking problem especially in water leakage of buried pipeline. An advanced technology of ground penetrating radar (GPR) has been established as one of the non-destructive testing (NDT) methods to detect utilities for the underground water pipe leaking. This paper is focus on the ability of GPR in water utility field, on detection of water leaks in the underground pipeline distribution. A series of laboratory experiments were carried out, using 800 MHz antenna, where the performance of GPR, on detecting underground pipeline and locating water leakage was investigated and validated. A prototype to recreate water leaking system was constructed using a 4 inch PVC pipe. Different diameter of holes, 1/4 inch, 1/2 inch, and 3/4 inch, were drilled into the pipe to simulate the water leaking. The PVC pipe was buried at depth of 60 cm into the testbed that was filled with dry sand. 15 litres of water was injected into the PVC pipe, then, the water leakage pattern in term of radargram data was gathered. The effectiveness of the GPR in locating the depth of underground water leakage was ascertained, after the results were collected and verified.

P33B Residential exposure from Extremely Low Frequency Electromagnetic Field (ELF EMF) Radiation

Shamesh Raj Parthasarathy, Roha Tukimin

Radiation Health and Safety Division, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia. shamesh@nuclearmalaysia.gov.my

ABSTRACT

Impending health effects associated to Electromagnetic Fields (EMF) in the Extremely Low Frequency (ELF) range associated with the electrical power systems, electronic and electrical devices have been the emphasis of extensive scientific research. ELF EMF have received considerable attention as a potential threat to the safety and health of people living in the vicinity of high voltage transmission lines, electric distribution substations, power stations and even in close proximity to electronics and electrical household appliances. The paper highlights the study on the ELF EMF safety assessment performed at residences comprising of an owner-occupied house, a completed vacant house and an under construction condominium. The objectives of this study are to determine the ELF EMF radiation exposure level from the high voltage transmission lines, electric distribution substation, power station and electrical household appliances in the residences, and to assess the potential exposure received by the occupants at the assessed locations. The results were logged in the electric and magnetic field strength with the units of volt per meter (V/m) and mGauss (mG) respectively. The instrument setup and measurement protocols during the assessment were adopted from standard measurement method and procedures stipulated under the Institute of Electrical and Electronics Engineers (IEEE) Standard. The results were compared with the standards recommended in the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines.

P34B

Metaheuristic Approach In Multilayer Radiation Shielding Optimization

Muhammad Arif Bin Sazali

Department Energy Engineering, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia. marif69@liveutm.onmicrosoft.com

ABSTRACT

Metaheuristics are high-level algorithmic concepts that can be used to develop heuristic optimization algorithms. One of their applications is to find optimal or near optimal solutions to combinatorial optimization problems (COPs) such as scheduling, vehicle routing, and timetabling. Combinatorial optimization deals with finding optimal combinations or permutations in a given set of problem components when exhaustive search is not feasible. A radiation shield made of several layers of different materials can be regarded as a COP. The time taken to optimize the shield may be too high when several parameters are involved such as the number of materials, the thickness of layers, and the arrangement of materials. Metaheuristics can be applied to reduce the optimization time, trading guaranteed optimal solutions for near-optimal solutions in comparably short amount of time. In this paper, we present a review on the suitability of using metaheuristics in multilayer shielding design, specifically the genetic algorithm and ant colony optimization algorithm.

SESSION 9C

MATERIALS AND SUSTAINABILITY 3

P30C

Phase Formation and Microstructure of Gamma Irradiated Bi-2223 Superconductor

Natasha Alieya Adnan¹, <u>Nasri A. Hamid¹</u>, Zaahidah 'Atiqah Mohiju¹ and Yusof Abdullah²

¹Nuclear Engineering and Energy Group, College of Engineering, Universiti Tenaga Nasional, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia. ²Materials Technology Group, Industrial Technology Division, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia. Nasri@uniten.edu.my

ABSTRACT

The effect of gamma irradiation on phase formation and microstructure of high-temperature Bi-2223 phase superconductor ceramics has been investigated. The bulk samples were palletized with 7 tons of pressure using the hydraulic press machine and underwent prolonged sintering at 840°C. The samples were irradiated with gamma irradiation with a dose of 50 kGy at room temperature. Structure characterization using X-ray diffraction (XRD) showed that the patterns for all the samples comprised of well-defined peaks all of which could be indexed on the basis of a Bi-2223 phase structure. However, for irradiated sample, it showed a decrease in the peak intensity that indicates reduction in the composition and purity of the Bi-2223 superconducting phase. The effect of gamma irradiation on surface morphology and its composites was investigated by scanning electron microscope (SEM) and it showed randomly oriented grain boundaries with poorly connected inter-grains. Since microstructure is associated with materials' strength, it can be concluded that the strength of the Bi-2223 superconductor is reduced significantly when subjected to gamma irradiation.
P31C

Nanoindentation Hardness of Gamma Irradiated Sn-Ag-Cu Lead-Free Solder

<u>Wilfred Paulus</u>^{1, 2}, Irman Abdul Rahman², Azman Jalar², Norinsan Kamil Othman², Roslina Ismail²,Wan Yusmawati Wan Yusoff³ and Maria Abu Bakar²

¹Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia. ²Universiti Kebangsaan Malaysia, Bangi, 43600 Kajang, Selangor, Malaysia. ³Universiti Pertahanan Nasional Malaysia, Kem Sg. Besi, 57000 Kuala Lumpur, Malaysia. wilfred@nuclearmalaysia.gov.my

ABSTRACT

Sn-Aq-Cu solder becomes as a desired environmental friendly and cost effective joint material in most present microelectronic packaging. Nevertheless the effect of ionizing radiation on the reliability related mechanical hardness of solder joint in radioactive environment is not well established. In this study a lead-free 99.0Sn0.3Ag0.7Cu wt.% (SAC) solder joint was developed and subjected to various doses of gamma radiation. Hardness of the joint was then determined using nanoindentation technique. The results show a relationship between hardness values of indentations and the increment of radiation dose. Highest mean hardness, 0.2290 ± 0.0270 GPa was calculated on solder joint which was exposed to 5 Gray dose of gamma radiation. This value indicates possible radiation hardening effect on irradiated solder. The hardness gradually decreased to 0.1933 ± 0.0210 GPa and 0.1631 ± 0.0173 GPa when exposed to doses 50 and 500 gray respectively. These values are also lower than the hardness of as -received sample which was calculated as 0.2084 ± 0.0.3633 GPa indicating possible radiation damage. These findings show possible mechanical property evolution in the SAC solder joint when exposed to ionizing radiation such as gamma ray.

P32C

Influence Of Electron Beam Irradiation on Optical Properties Of TiO₂ Particles

Cik Rohaida Che Hak^a, Siti Salwa Zainal Abidin^b, Nur Ubaidah Saidin^c, Siti Aishah Ahmad Fuzi^d, And Yusof Abdullah^e

Materials Technology Group, Industrial Technology Division, Malaysian Nuclear Agency, Bangi 43000 Kajang, Selangor, Malaysia. ^arohaida@nuclearmalaysia.gov.my, ^bsitisalwa_za@nuclearmalaysia.gov.my, ^cubaidah@nuclearmalaysia.gov.my, ^daishahfuzi@nuclearmalaysia.gov.my, ^eyusofabd@nuclearmalaysia.gov.my,

ABSTRACT

The electron beam (e-beam) irradiation techniques introducing small intrinsic defects in a sample in a meticulous manner that lead to regrowth and crystallization of materials. Studies related to e-beam irradiation effects on TiO₂ have emerged in the recent years as an important area of research to improve the optical absorption performance of TiO₂ nanoparticles (NPs) as a semiconductor. In this study, the influence of electron irradiation on the optical absorption properties of TiO_2 particles was investigated. The dose dependent effects of e-beam irradiation were studied by means of optical absorption measurement using Uv-Vis spectrometer and photoluminescence. To demonstrate the quantum size effects. TiO₂ NPs were dispersed in aqueous medium containing stabilizing agent and the UV absorption spectra and photoemission spectra were recorded. Results showed a slight shift of the absorption peak to the shorter wavelength region, indicating the quantum size effects attributed by size reduction of the TiO₂ NPs resulting from the e-beam irradiation. There was a small blueshift and broadening for Photoluminescence (PL) spectra of the irradiated samples with increasing dose rate suggesting surface band bending with surface structural modifications for the irradiated TiO₂ NPs. The spectra intensities of irradiated samples are higher relative to non-irradiated due to defects and particle size variation caused by e-beam irradiation. Also, the intensity increases with dose rate, attributed to the recombination of self-trapped excitons, which is a combined effect of defect centers generated by oxygen vacancies and increased absorption over the UV and visible range.

P33C

Preliminary Study of Tin Slag Concrete Mixture Formulation

Mohd Jamil Hashim¹, <u>Ishak Mansor</u>², Mohamad Pauzi Ismail², Suhairy Sani², Azhar Azmi², Shaharudin Sayuti², MohdZaidi Ibrahim³, Abul Adli Anuar² and Abdul Adha Abdul Rahim¹

¹Agency Nuclear Malaysia: Engineering Division, ²Industry Technology Division, ³Waste Technology & Environment, Malaysian Nuclear Agency, Bangi 43000 Kajang, Selangor, Malaysia. ishak_mansor@nuclearmalaysia.gov.my

ABSTRACT

The study focuses on practices to facilitate tin smelting industry to reduce radioactive waste product (Tin Slag) by diluting its radioactivity to a safe level and turning it to a safer infrastructural building product. In the process the concrete mix which include Portland cement, sand, tin slag, water and plasticizer are used to produce interlocking brick pavements, piles and other infrastructural products. The mixing method follows DOE (UK) standard method of mixing targeted at in selected compressive strength suitable for its function and durability. A batching machine is used in the mixing and six test cube are produced for the test. The testing equipment used are a compressional machine, ultrasonic measurement and a Geiger Muller counter to evaluate of the concrete mix. The result obtained indicated the radioactivity of tin slag in the mixing process has reduced to background level that is $0.5 \,\mu$ Sv/h while the strength and workability of the concrete has not been severely affected. In conclusion the concrete mix with tin slag has shown the potential it can be turned into a safe beneficial infrastructural product with good strength.

P34C

Characterization of XRF and Direct Gamma-Rays Measurement Techniques for TRIGA Mark III Fresh Fuel Rod Research Reactor

M.Mujaini^{1(a)}, N.A.Hamid¹, A.A.Muhamed¹,¹H.Taha

¹College of Engineering, Universiti Tenaga Nasional, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia. madihah@uniten.edu.my

ABSTRACT

Identification and characterization of uranium bearing materials experimentally investigated using direct measurement of gamma rays from ²³⁵U in combination with the x-ray fluorescence (XRF) technique. Measurement of gamma rays conducted by using high purity germanium (HPGe) detector or cadmium telluride (CdTe) detector while a ⁵⁷Co radioisotope-excited XRF spectrometer using CdTe detector is used for elemental analysis. The proposed technique tested with TRIGA Mark III Fresh fuel rod with 20% ²³⁵U. As prediction, the prominent energy at 185.7 keV shows the highest peak area from the decay of ²³⁵U that indicate the enrichment meter for the sample and the existence of ²³⁵U in the sample. The characterization using both techniques achieved the practical objective of the application of reasonable time measurement with good resolution of spectrum.

25 SEPTEMBER 2017 (MONDAY)

SESSION 3A

WIN MALAYSIA 1

P06A Nanotheranostics in Nuclear Medicine

Siti Najila Mohd Janib

Medical Technology Division, Malaysian Nuclear Agency Bangi, 43000 Kajang, Selangor, Malaysia. najila@nuclearmalaysia.gov.my

ABSTRACT

Nanotheranostics is a relatively new field that combines the advantages of diagnosis and treatment via a single nanoscale carrier. By using nanoscale constructs to noninvasively study and detect various molecular markers of diseases, it can allow for much earlier diagnosis and treatment, and better prognosis that will eventually lead to personalized medicine. Nanoparticulate-based carriers are particularly suited for tailoring patient specific therapy in two different ways, namely through targeted delivery of therapeutics and as molecular imaging agents. These carriers can simultaneously monitor drug distribution, evaluate therapeutic efficacy noninvasively and in real time. Multiple nanocarriers are under investigation as theranostic agents for packaging, transport and delivery of imaging and therapeutic agents. Polymer-based nanomaterials have emerged as promising carriers of drugs and imaging agents. Co-inclusion of therapeutic and imaging agents, into these carriers are advantageous because they increase solubility of hydrophobic agents, may enhance permeability across physiological barriers, alter drug biodistribution, increase local bioavailability and reduce side effects.

P07A

Enhancing Women's Participation in and Contribution to The Nuclear Industry

Sheriffah Noor Khamseah Al-Idid binti Dato' Syed Ahmad Idid

Malaysian Nuclear Agency Bangi, 43000 Kajang, Selangor, Malaysia.

ABSTRACT

The nuclear industry, traditionally a male-dominated industry is witnessing an increase in the number of women entering this field. Recently global surveys and studies had reported that women make up approximately 20% of workforce in the nuclear industry. As a case in point as of 2010, women represented only 22.4 % of all professional staff at the International Atomic Energy Agency (IAEA) and more recently Dr Hasna Al Blooshi, President ENEC Women in Nuclear had announced during the 24th Women in Nuclear Global Conference held in Abu Dhabi that women make up 20 % of the UAE's nuclear workforce .However there are several countries whose nuclear workforce comprise more than 20%, including Malaysia. Thus more efforts are necessary to not only increase this global average but equally important is developing strategies and plans to increase the number of women in decision making roles in this sector. This paper will outline international best practices of selected countries to achieve this goal and objective.

P08A

Potential Impact of Andrassy Bentonite Microbial Diversity In The Long-Term Performance of A Deep Nuclear Waste Repository

<u>Mohd Yuhyi Mohd Tadza¹, Muhammad Afiq Mohd Tadza², Ramakrishna Bag³, Noor Sheena Herayani Harith</u>

 ¹Faculty of Civil Engineering & Earth Resources, Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia.
 ²Faculty of Science & Industrial Technology, Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia.
 ³Department of Civil Engineering & Environmental Engineering, Indian Institute of Technology Patna, Bihta, Patna 801106 (Bihar), India.
 ⁴Faculty of Engineering, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah Malaysia.

yuhyi@academia.my

ABSTRACT

Copper and steel canning and bentonite buffer are normally forseen as the primary containment component of a deep nuclear waste repository. Distribution of microbes in subsurface environments have been found to be extensive and directly or indirectly may exert influence on waste canister corrosion and the mobility of radionuclides. The understanding of clays and microbial interaction with radionuclides will be useful in predicting the microbial impacts on the performance of the waste repositories. The present work characterizes the culture-dependent microbial diversity of Andrassy bentonite recovered from Tawau clay deposits. The evaluation of microbial populations shows the presence of a high number of cultivable microbes (e.g. Staphylococcus, Micrococcus, Achromobacter, Bacillus, Paecilomyces, Trichoderma, and Fusarium). Additionally, a pigmented yeast strain Rhodotorula mucilaginosa was also recovered from the formation. Both Bacillus and Rhodotorula mucilaginosa have high tolerance towards U radiation and toxicity. The presence of Rhodotorula mucilaginosa in Andrassy bentonite might be able to change the speciation of radionuclides (e.g. uranium) in a future deep repository. However concern over the presence of Fe (III) reduction microbes such as Bacillus also found in the formation could lead to corrosion of copper steel canister and affect the overall performance of the containment system.

P09A

Investigation of Au-198 as radiotracer in Laboratory Porous Media Using Gamma Camera: A Preliminary

<u>Noraishah Othman¹</u>, Wan Hamirul², E.M. Fahmi¹, M. Amirul Syafiq¹, Meor A.K. ¹, M. Rabaie¹, Nurliyana A. ¹

¹Plant Assessment Technology, Industrial Technology Division, Malaysian Nuclear Agency, 43000, Kajang, Selangor, Malaysia. ²Medical Technology Division, Malaysian Nuclear Agency, 43000, Kajang, Selangor, Malaysia. noraishah@nm.gov.my

ABSTRACT

Preliminary experiment has been carried out using irradiated Au-198 as radiotracer inside the laboratory porous media (PM). Au-108 is gamma emitter isotope with half-life of 2.7days and energy of 0.41 MeV (99%). The porous media consists of fine sandstone with certain grain sizes, lubricant as the mimic of original oil in plant (OOIP) or trapped oil and a layer of cement on top of the rig as the bed rock. Gamma camera is arranged next to the porous media in order to capture the movement of radiotracer which has been set to 1minute per frame. Initially, the gold wire which has isotope of Au-197 was irradiated inside the rotary rack of research reactor to produce Au-198 at Nuclear Malaysia which has energy of 750kW with neutron flux of 5 x 10^2 n/cm²/s. Au-198 which is in liquid form is injected inside the porous media will be monitored and recorded by the gamma camera. The objective is to check the compatibility of Au-198 as the radiotracer inside the porous media as well as to determine the suitable parameters for this application.

P10A

Automatic Sample Changer Control Software for Automation of Neutron Activation Analysis Process in Malaysian Nuclear Agency

Nolida Yussup¹, Nur Aira Abd Rahman¹, Maslina Mohd Ibrahim¹, Mukhlis Mokhtar¹, Nazaratul Ashifa Abdullah Salim², Syirrazie Che Soh@Shaari¹, Azraf Azman¹, Lojius Lombigit¹

¹Technical Support Division, Malaysian Nuclear Agency, 43000 Kajang, Selangor, Malaysia. ²Division of Waste and Environmental Technology, Malaysian Nuclear Agency, 43000 Kajang, Selangor, Malaysia.

ABSTRACT

Most of the procedures in Neutron Activation Analysis (NAA) process that has been established in Malaysian Nuclear Agency (Nuclear Malaysia) since 1980s are performed manually. These manual procedures carried out by the NAA laboratory personnel are time consuming and inefficient especially for sample counting and measurement process. The sample needs to be changed and the measurement software needs to be setup for every one hour counting time. Both of these procedures are performed manually for every sample. Hence, an automatic sample changer system (ASC) that consists of hardware and software is developed to automate sample counting process for up to 30 samples consecutively. This paper describes the ASC control software for NAA process which is designed and developed to control the ASC hardware and call GammaVision software for sample measurement. The software is developed by using National Instrument LabVIEW development package.

P11A

Gsm Module For Wireless Radiation Monitoring System Via Sms

Nur Aira Abd Rahman¹, Lojius Lombigit¹, Nor Arymaswati Abdullah¹, Zainudin Jaafar¹, Glam Hadzir Patai Mohamad¹, and Noor Hisyam Ibrahim²

¹Malaysian Nuclear Agency, 43000, Bangi, Selangor, Malaysia. ²Rocksolid Simplified Solution PLT, 43000, Kajang, Selangor, Malaysia. nur_aira@nuclearmalaysia.gov.my

ABSTRACT

A customized Global System for Mobile communication (GSM) module is designed for wireless radiation monitoring through Short Messaging Service (SMS). This module is able to receive serial data from radiation monitoring devices such as survey meter or area monitor and transmit the data as text SMS to a host server. It provides two way communication for data transmission, status query, and configuration setup. The module hardware consists of GSM module, voltage level shifter, SIM circuit, and Atmega328P microcontroller. Microcontroller provides control for sending, receiving and AT command processing to GSM module. The firmware is responsible to handle task related to communication between device and host server. It process all incoming SMS, extract, and store new configuration from Host, transmits alert/notification SMS when the radiation data reach/exceed threshold value, and transmits SMS data at every fixed interval according to configuration. Integration of this module with radiation survey/monitoring device will create mobile and wireless radiation monitoring system with prompt emergency alert at high-level radiation.

P12A

Experience in the Recertification of Reactor Operator for RTP

Julia Abdul Karim, Nurhayati Ramli, Zaredah Hashim

Malaysian Nuclear Agency, 43000, Bangi, Selangor, Malaysia. Julia@nuclearmalaysia.gov.my

ABSTRACT

PUSPATI TRIGA Reactor (RTP) was licensed and regulated by the AELB on the voluntarily basis. This mean, in response to the operation of the licensed research reactor, it also requires the operator to be licensed. Ever since it has been in an operation, the RTP has trained almost 30 personnel to be an Operator. Nevertheless, movement of the staff due to many reasons such as retirement, staff transferred, opportunity in other sectors in resultant of deficient number of Licensed Reactor Operator at the reactor. Inherent to the operating organization of a research reactor facility, it requires a program for training, retraining and qualification to ensure the safe operation at all time. Up to now RTP has two licensed Reactor Operator at the RTP shall prepared to response to the nuclear workforce and staffing requirement. A specific program has been to develop to train Reactor Personnel to obtain Reactor Operator Licensed is underway. This paper discussed about the challenges faced in the Reactor Operator Training Program for RTP

P13A

Limitations and Challenges Towards an Effective Business Continuity Management in NUKLEAR MALAYSIA

Amy Hamijah binti Ab. Hamid

Malaysian Nuclear Agency (Nuklear Malaysia), Ministry of Science, Technology and Innovation (MOSTI), Bangi, 43000 Kajang, Selangor, Malaysia. amyhamijah@nm.gov.my, amyhamijah@gmail.com

ABSTRACT

Nuklear Malaysia utmost concern towards radiological and nuclear safety and security preparedness in its operational facility management, which is bonded by Act 304, Directive 20, International Atomic Energy Agency (IAEA) guidelines and many others. Besides that, since 2012 the Malaysian government initialized Business Continuity Management System under the supervision of Malaysian Administrative Modernization and Management Planning Unit referring to MAMPU.BPICT.700-4/2/11 (3), ISO 22301:2012 and Business Continuity Good Practice Guidelines 2013 documentations. This standard is prior to a resilient management program indicates organizational capabilities to prevent any accident from occurring and spreading its impact, which includes recovery action to post-accident situation towards a normal operational and managerial state. Unfortunately, there is a lacking of certified Business Continuity Management standard among the public sector agencies compare to local private sectors. Subsequently, Nuklear Malaysia had been selected as one of the pioneering agencies to be certified accordingly. Therefore, this paper significantly recognized Nuklear Malaysia efforts in order to plan, analyse, design, implement, review and validate the establishment of this standard recently. The project is implemented using a case study approach in order to complete these required certification activities. As the result. this paper proposed benchmarking the selected literature reviews against the Nuklear Malaysia experience in order to determine best practice in implementing and managing Business Continuity apparently. It is concluded, that resilience Business Continuity Management program need to be incorporated with agency's capabilities to ensure our mitigation capacities to survive any unexpected event and overcome future challenges could be fulfilled subsequently.

26 SEPTEMBER 2017 (TUESDAY)

SESSION 6A

WIN MALAYSIA 2

P20A

The Role of Woman in Nuclear- Attracting Public Participation in Regulatory Decision Making Process

A.M Jais and N. Hassan

Nuclear Power Regulatory Coordination Unit, Malaysia Nuclear Power Corporation, Prime Minister's Department.

ABSTRACT

The fundamental objective of the Nuclear Regulatory authority is to ensure an adequate level of protection of the public and the environment against any possible harmful effect of ionising radiation that could result from the use of nuclear energy and radiation sources. The nuclear regulatory authority strives to ensure that all its regulatory decisions are technically sound, consistent and timely. The nuclear regulator is also committed to ensure its regulatory decisions are transparent, have a clear basis in laws and regulations, and are fair to all parties. The nuclear regulator, considering itself as being accountable to the public, especially when it involves a regulatory decision, is open to public scrutiny. Therefore, the public has the right to be informed on the procedures and the results of the nuclear regulatory activities and to participate in the nuclear regulatory decision-making process performed by the nuclear regulatory authority. Since, Fukushima nuclear incident it has sparked interest among the public, especially when it comes to dissemination of information The public thinks that the dissemination of in regulatory decision making process. information was slowly released to the public. This had contributed to distrust and losing their confidence to the nuclear regulatory authority. As now all information are at the tip of our finger, regardless whether the information are accurate or not, the public still relies on it. Thus makes the public participation particularly in regulatory decision- making process is very important. Therefore, the nuclear regulator considers the public participation as one of the key regulatory tools widely used to improve transparency, efficiency and effectiveness of nuclear regulatory process. As for that, they should play a more vital role to attract public participation, with the aim of improving the quality of the regulatory decisions make. This paper will discuss and focus on the above issues and explore the role taken by woman and its challenges.

Disclaimer: The ideas and concepts contained herein this paper is solely the articulation of the said authors and do not necessarily reflect the positions of the organizations and institutions that employ all of them.

P21A Radiopharmaceuticals For Assessment Of Tumor Perfusion

Ng Yen

Medical Technology Division, Malaysian Nuclear Agency, Bangi 43000 Kajang, Selangor, Malaysia. yen@nuclearmalaysia.gov.my

ABSTRACT

The ability to measure tumor perfusion non-invasively with Positron Emission Tomography (PET) may be important to visualize, underline, and evaluate early changes in physiology functions of tumors. This approach offers both the ability to remarkably reduce cost and time spent for clinical trials of new anticancer agents and to make earlier assessment of tumor response, which will benefit the patient with more specific therapeutic regimens. Currently, H₂¹⁵O PET is the 'gold standard' for non-invasive quantification of tumor blood perfusion. However, due to its short half-life, a costly on-site cyclotron is required. Thus, the development of generator-produced short-lived PET radionuclide has become increasingly important because these generators can be distributed from a central cyclotron to a remote PET center. This paper will present the newly developed Copper-62-labeled radiotracers for regional tumor perfusion evaluation in clinical PET imaging.

P22A

Development of Protocol Treatment Using Gamma Irradiation For MD2 Pineapple In Mintec-Sinagama Plant, Malaysia

<u>Ruzalina Baharin¹</u>, Hafiza Che' Manan², Ahmad Zainuri Dzomir³, Hasan Sham⁴ and Ahsanulkhaliqin Abd Wahab¹

 ¹MINTec-Sinagama, Technical Support Division, Malaysian Nuclear Agency Bangi, 43000 Kajang, Malaysia.
 ²Quarantine Treatment Technology Unit, Plant Biosecurity Division, Department of Agriculture, 43400 Serdang, Malaysia.
 ³Agriculture, Agriculture and Bioscience Division, Malaysian Nuclear Agency Bangi, 43000 Kajang, Malaysia.
 ruzalina@nuclearmalaysia.gov.my

ABSTRACT

Amang or tin tailing is processed into concentrated ores and other economical valuable minerals such as monazite, zircon, xenotime, ilmenite etc. These product minerals could be extracted. Besides that the tailings from these ores may have a significant potential source of radiation exposure to amang plants' workers. This study was conducted to determine the elemental concentration of uranium and thorium in mineral samples collected from five amang tailing factories. The concentration of uranium and thorium was carried out by using INAA relative technique. The analysis results shown that the monazite, xenotime and zircon have high content of uranium and thorium, whereas ilmenite, rutile, pyrite and waste have lower concentration compare with raw materials after tailing process.

P23A

Nuclear Reactor Technology Assessment Study in Malaysia

M. Mazleha1, 2, , A.K. Julia2, and F. Mohamed1

¹Nuclear Science Programme, School of Applied Physics, Faculty of Science and Technology, University Kebangsaan Malaysia, Bangi, 43600 Kajang, Selangor, Malaysia ²Reactor Technology Center, Malaysia Nuclear Agency, MOSTI, Bangi, 43000 Kajang, Selangor, Malaysia

ABSTRACT

Reactor technology assessment (RTA) has been performed to match the requirement for the future nuclear-fueled power generated undertakings in Malaysia. The process of this assessment suggested for the decision making in selecting a nuclear power plant technology which is suitable for Malaysian needs. This study is based on qualitative criteria and systematic approach as recommended by International Atomic Energy Agency (IAEA) publication on nuclear energy series No. NP-T-1.10. Scope and criteria in the selection is limited within common user consideration (CUC) input under five major categories: (1) Infrastructure, site conditions and national capacity building; (2) Nuclear plant technical characteristics and performance; (3) Fuel cycle; (4) Safety features and licensing; and (5) Economic, financing and others Integrated technology assessment method with Kepner-Tregoe expert scoring and multi-attribute utility techniques (MAUT) were used in the evaluation process. Information obtained from the assessment can be used by any technical support organizations, operators, governing organizations, or others from newcomer countries as a guidance in collecting and analyzing the reactor technology assessment with stakeholders' engagement, which will be responsible for the process of selecting a nuclear power plant technology. This study is perhaps one of the first to address classic comprehensive steps in quantifying the selection of a nuclear power plant.

P24A

Neutron Flux Measurement at Radial Piercing Beamport

<u>Julia Abdul Karim</u>, Norfarizan Mohd Said, Muhammad Amirul Izat Mohd Idrus, Julie Andriany Murshidi, Rafhayudi Jamro, Azraf Azman, Lojius Lombigit, Khairiyah Mohd Yazid

Malaysian Nuclear Agency, 43000, Bangi, Selangor, Malaysia. Julia@nuclearmalaysia.gov.my

ABSTRACT

Four beam ports were designed at the PUSPATI TRIGA Reactor (RTP) to cater for different utilization using a constant neutron source from the reactor core. Each beam ports are of a different design and characteristics. In the radial piercing beam port, where a Small Angle Neutron Scattering (SANS) instrument was installed, it offers highest neutron flux for outer core irradiation, yet it has harder spectrum due to more fast neutrons compared to the other beam ports. A neutron flux measurement using foil activation analysis was carried out to obtain the baseline data for the next arrangement of SANS application. In the measurement, the ratio of neutron flux corresponding to the collimator length was analyzed in related with the area of interest in the neutron spectrum.

P25A

Centralized Radiation Monitoring System At Nuclear Malaysia: Development And Progression

<u>Maslina Mohd Ibrahim¹</u>, Nolida Yussup¹, Mohd Fauzi Haris², Raymond Yapp³, NurAira Abdul Rahman¹, Syirrazie Che Soh @ Shaari¹, Nursuliza Samsudin², Faizal Azrin B. Abdul Razalim³, Mohd Dzul Aiman Aslan², Azraf Azman⁴, Harzawardi Hasim¹

¹Instrumentation and Automation Center, Technical Support Division, Malaysian Nuclear Agency.

²Information Technology Center, Technical Support Division, Malaysian Nuclear Agency.
 ³Health Physics Group, Radiation Safety and Health Division, Malaysian Nuclear Agency.
 ⁴Prototype and Development Center, Technical Support Division, Malaysian Nuclear Agency.
 Magency.
 Maslina i@nm.gov.my

ABSTRACT

Centralized radiation monitoring system (CERMS) is a system that enables area radiation level at various locations in Malaysian Nuclear Agency (Nuklear Malaysia) to be monitored centrally by using a web browser. The purpose of the system is to enhance the workplace safety in Nuclear Malaysia. The Area radiation detectors are permanently installed in the crucial location such as supervise and control area. The system utilizes a Local Area Network (LAN) or Ethernet as a communication media for data acquisition of the area radiation levels from radiation detectors. The development of the system involves system configuration, wiring and hardware installation, interface and software development. Apart from that data distribution package in a web form is also developed. This paper discusses the development and progression of the system since it was started in 2005 until now. With the rapid growth of technology, the system had undergone a lot of challenge such as hardware obsolete, system compatibility and many more. The challenge and solution in software development, hardware changing and the improvement of data management is also discussed in detail.

P26A

Radiometric glucose uptake assay to measure anti-diabetic potential of *Ficus deltoidea*

Zainah Adam and Shafii Khamis

Medical Technology Division, Malaysian Nuclear Agency, Bangi 43000 Kajang, Selangor, Malaysia.

ABSTRACT

Diabetes mellitus is a metabolic disease characterized by persistent hyperglycemia resulting from defect of insulin secretion and insulin action. Currently, diabetes mellitus is treated with oral antidiabetic drug such as sulphonylureas, biguanides, thiazolidinediones, alphaglucosidase inhibitor and etc. Each drug possesses unique and specific anti-diabetic mechanism. For examples metformin from biguanides group possesses anti-diabetic activity through enhancement of glucose uptake into muscle and adipocytes cells. This glucose uptake activity can be measured using radiolabelled glucose analog (2-deoxy-[³H]-glucose) as glucose tracer. Many antidiabetic plants have been evaluated for its glucose uptake activity using this method. One of which is Ficus deltoidea, a common medicinal plant used in Malaysia. This plant is locally known as Mas cotek and it has been used in folk medicine to reduce high blood glucose. Glucose uptake activity of *Ficus deltoidea* into muscle and adipocytes cells were determined using 2-deoxy-[³H]-glucose at concentration of 1 µCi/ml. The cells were incubated with Ficus deltoidea either alone or combination with insulin (glucose uptake mediator). Radioactivity incorporated into the cells was measured using Liquid Scintillation Counter after the addition of scintillation cocktail. Ficus deltoidea was shown to enhance basal and insulin mediated glucose uptake into muscle and adipocytes cells. This enhancement was up to 1.8-fold and 2.0-fold in muscle and adipocytes cells, respectively when compared to control. Ficus deltoidea also showed insulin-mimetic and insulin-sensitizing activity during enhancing glucose uptake into such cells. This study had shown the Ficus deltoidea possess anti-diabetic activity and has the potential to be developed as new oral antidiabetic agent for the treatment of diabetes mellitus.

P27A

Optimizing the Efficiency of a Dielectric Barrier Discharge Reactor for Removal of Nitric Oxides in Gas Phase

S.A. Hashim¹, C.S. Wong² and M.R. Abas³

 ¹Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia
 ²Plasma Technology Research Centre, Physics Department, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia
 ³ Chemistry Department, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia

ABSTRACT

A dielectric barrier discharge (DBD) reactor was built and used to remove nitric oxides in gas phase. In the preliminary work, it was found that the DBD reactor can used for direct processing of contaminated air stream. It was observed that if the applied energy is sufficiently high, reduction can overcome the oxidation process. The other characteristics that can affect the efficiency of the reactor are the processing flow rate, number of DBD tubes used and how the tubes are connected. The composition of the feed gas also plays important role. To improve the efficiency, more tubes were added and configured in combination of serial and parallel connections to achieve the best result. The reactor was found to be most efficient when using 6 tubes configured to have 2 sets of 3 tubes in series connected in parallel. The maximum flow rate that can be treated is 5 scfh. When operated with the optimum input voltage of 32 kV, the reactor can remove up to 80% nitric oxide in the reduction mode. This means that the energy is sufficiently high to sustain the reduction mode and prevent further oxidation.

iNuSTEC2017,UNITEN, Putrajaya Campus, Selangor, Malaysia. 25 - 27 SEPTEMBER 2017

ABSTRACTS FOR POSTERS

No.	Title and authors
	Dose Linearity of Al ₂ O ₃ Dosimeter at High Energy Photons and Electrons Mohd Fahmi Mohd Yusof, Nabil Aiman Joohari, Reduan Abdullah, Ahmad Bazlie Abd Kadir, Norriza Mohd Isa
PP01.	Abstract. The linearity of Al ₂ O ₃ OSL dosimeters were evaluated for dosimetry works in clinical photons and electrons. The measurements were made at depth of maximum dose Zmax and reference depth Zref according to IAEA TRS 398:2000 codes of practice at 6 and 10 MV photons and 6 and 9 MeV electrons. The measured dose were compared to thermoluminescence dosimeters (TLD) and ionization chamber commonly used for dosimetry works for highe enrgy photons and electrons. The results showed that the measured dose in OSL dosimeters were in good agreement to TLD and ionization chamber in both photons and electrons. A reproducibility test also showed good consistency of readings by the OSL at similar energies. The overall results had indicated the suitability of OSL dosimeters for dosimetry works involving high energy photons and electrons in radiotherapy.
PP02.	Mass attenuation coefficients of several bio-adhesive based palm oil particleboards at 16.59-25.26 keV photon energies. <u>Umiatul Asma Abdu Mustapa</u> , Mohd Fahmi Mohd Yusof, Mohd Zahri Abd Aziz, Rokiah Hashim, Puteri Nor Khatijah Abd Hamid
	Abstract. Particleboards made of palm oil with addition of polylactic acid (PLA), starch, and fish oil were fabricated with target density of 1.0 g/cm ³ . The mass attenuation coefficients of te particleboards were measured using X-ray fluorescence (XRF) configuration in conjunction with niobium, molybdenum, palladium and tin metal plates that provided K _{a1} photon energies between 16.59 and 25.26 keV. The results were compared to the calculated value of water using XCOM. The results showed that all particleboards having mass attenuation coefficients near to the value of water. The method of fabrication did not give significant different to the mass attenuation coefficients of the particleboards. The results had indicated the potential of bio-adhesive based palm oil particleboards to be developed as phantoms for low enegy photons.
	Stakeholder Engagement Programme For Promoting The Comprehensive Nuclear- Test-Ban Treaty (CTBT) In Malaysia Faisal Izwan bin Abdul Rashid
PP03.	Abstract. In order to keep abreast on issues related to CTBT in Malaysia, Malaysian Nuclear Agency (Nuklear Malaysia), as the CTBT National Authority in Malaysia, has collaborated with local partners to implement various stakeholder engagement programme. This paper aims at highlighting Malaysia's approach in promoting CTBT through stakeholder engagement programme targeted at multilevel stakeholders, both local and international. Such programme includes participation in the international fora, inter-agency meeting, awareness seminar, training course to CTBT authorized users using CTBTO e-learning modules, technical visit to IMS station, promoting civil and scientific application of International Monitoring System (IMS) data and International Data Centre (IDC) products using Virtual Data Exploitation Center (vDEC), inviting youth groups to participate in the CTBTO Youth Group ,and publication of CTBT-related topics in various conferences. This approach has successfully fortify Malaysia's commitments at the international level, enhanced national awareness of global multilateral framework, increased stakeholders awareness and their roles related to CTBT, as well as building domestic capacity on CTBT matters. In conclusion, stakeholder engagement is an effective tool in promoting and enhanced stakeholders understanding on CTBT.

	Continuous engagement with relevant stakeholders will enable effective dissemination and smooth implementation of CTBT related matters that will eventually support towards global universalization of CTBT.
PP04.	 Level-I Probabilistic Safety Assessment Development at Puspati TRIGA Research Reactor M. Mazleha, P.T. Phongsakorn, A. Hassan, I. Kuzmina, M.B. Fedrick, R. Zulfadli and F. Mohamed Abstract. This paper attempts to present the work and results in developing Level-1 probabilistic safety assessment (PSA) at Malaysian Puspati TRIGA research reactor (RTP). RiskSpectrum software was used in evaluating the occurrence frequency of different types of core damage states which may potentially arised in RTP. Small event trees and large fault trees (SELF) approach were applied in modelling the responses of safety systems to various initiating events and systems / components failures. Using both plant-specific and generic data, with conservative assumptions, the probability of an accident leading to severe core damage from internal initiating events was estimated to be 1.01E-04 per year of reactor operation. The largest contribution to the probability for the core to damage is made by accident initiated by large loss of coolant accident which also indentifed as a single point failure incidents from minimal cut sets. Sensitivity analysis indicated that human errors are one of the dominant contributors to both accidents with major and minor core degradation.
PP05.	 Study on degradation of mechanical properties of wood due to water absorption using a neutron radiography <u>Redza Rabani Md Rosli</u> <u>Abdul Aziz Mohamed</u> Rafhayudi Jamro, Khairiah Bt. Yazid @ Khalid, faridah mohamad idris. Abstract. The moisture content of wood is attached straightforwardly to the relative humidity of the encompassing air. The higher the relative humidity, the higher the moisture content of the wood. Period. In case you're introducing wood that is as of late been transported, or introduced on a vocation, it may take a short time for the material to achieve its equilibrium moisture content with the air as it were, for the wood to oblige to the humidity level for the atmosphere around the wood: the wood may tackle more moisture or it might dry out. This work highlights the study on the effects of water uptake into the wood after soaked for certain period of time by using the Neutron Radiography method. X-ray radiography was also applied for a comparison.
PP06.	Comparative Study Between Single Core Model and Detail Core Model of CFD Modeling on Reactor Core Cooling Behavior Rosli Darmawan Abstract. Nuclear power industry is facing uncertainties since the occurrence of the unfortunate accident at Fukushima Daiichi Nuclear Power Plant. The issue of nuclear power plant safety becomes the major hindrance in the planning of nuclear power program for new build countries. Thus, the understanding of the behavior of reactor system is very important to ensure the continuous development and improvement on reactor safety. Throughout the development of nuclear reactor technology, investigation and analysis on reactor safety have gone through several phases. In the early days, analytical and experimental methods were employed. For the last four decades 1D system level codes were widely used. The continuous development of nuclear reactor technology has brought about more complex system and processes of nuclear reactor operation. More detailed dimensional simulation codes are needed to assess these new reactors. Recently, 2D and 3D system level codes such as CFD are being explored. This paper discusses a comparative study on two different approaches of CFD modeling on reactor core cooling behavior.

PP07.	 Bent Perfect Crystal (BPC) As The Monochromator In High Focusing Neutron Diffractometer Hishamuddin Husain, Zaifol Samsu, Muhammad Rawi Mohamed Zin, Faridah Mohd Idris, Kok Kuan Ying and Abdul Aziz Mohamed Abstract. Neutron Diffraction requires high resolution of Neutrons. When high resolution of neutrons is required, the neutron fluxes on the sample position must be with the highest possible fluxes. There are two type of monochromators which are commonly used i.e the conventional mosaic crystal with soller collimator and Bent perfect crystal (BPC). This paper will introduce the use of BPC monochromator in Neutron Diffraction (ND) and its advantages.
	Study On Internal Integrity of Mock-Up Nuclear Fuel Pins Using Neutron and X-Ray Radiography Aman Ullah Ashraf, <u>Abdul Aziz Mohamed</u> , Rafhayudi Jamro, Khairiah Bt. Yazid@Khalid, Faridah Mohamad Idris
PP08.	Abstract. In nuclear reactor, the importance on monitoring the fuel pins integrity is very important and compulsory. Radiography offers a practical Non Destructive Testing approach in providing the information on the conditions of fuel pins. Most of the flaws are formed during the in-service of the fuel pins where the pins exposed to high level of radiation and temperature regimes. These flaws include fuel pellet cracking, misalignment, pellet bubbling and spacers' burn out. Since the using of actual in-service fuel pins are required safety procedures, the mock-up test pins are fabricated and simulated flaws are introduced in them. The test fuels are then examined its internal condition by using neutron and x-ray radiography techniques. This work reports on the radiographic finding of the test fuel pins.
	Analysis of Malaysian Long-Term Energy and Electricity Demand Projection 2014- 2030 Using the End-Use Methodology Muhammed Zulfakar Bin Zolkaffly
PP09.	Abstract. Malaysia is moving toward becoming a developed and high income nation by year 2020. In this connection, reliable energy production is identified as one of the critical driver to attain that vision. This paper aims at presenting an analysis of the possible future long-term development of Malaysian energy and electricity demand covering the period 2014–2030. The analysis was conducted using the International Atomic Energy Agency's Model for Analysis of Energy Demand (MAED), which relies upon the end-use approach. Starting from the base year of 2014, final energy consumption distributed by energy forms and consumption sectors, the future energy and electricity demand has been projected. A few different scenarios reflecting the possible future demographic, socioeconomic and technological development of the country were also simulated. These scenarios are constructed to cover a plausible range, in which future evolution factors affecting energy demand are expected to lie. Overall, the energy demand is expected to increase as the country socio-economic become more developed.
	Research Reactor Current Status and the Way Forward in Malaysia M.K.A. Mustafa, N. Ramli, J. Abdul Karim, M.F. Abdul Farid, M.R. Mohamed Zain
PP010.	Abstract. PUSPATI TRIGA Reactor (RTP) have been operated since 1982. After more than two decades RTP operations, there is no foreseeable intention to shut down the facility in the immediate future. Many efforts have been invested in phases to keep RTP in excellent condition for continuous safe operation such as the refurbishment and modernization projects that has been performed in phases over the years. However, the low neutron flux at RTP posed certain limitation to advanced research in Malaysia. In addition, RTP are now experiencing ageing problems. Thus, initiatives study on; possibility of upgrading RTP power from 1MW to 2MW or 3MW and desktop study for

	new research reactor project has been conducted towards fulfillment the national needs in the irradiation services and radioisotopes productions in the future. This paper provides information regarding the research reactor current status and activities in Malaysia and its way forward.
PP011.	 Particle's Energy Measurement Using a Calorimeter Faridah Mohamad Idris, Wan Ahmad Tajuddin Wan Abdullah, Zainol Abidin Ibrahim, Fathimal Elias, Nurul Hidayah Mohamed Noor, Mohamed Javad Soleimani, Atiqah Mohamad Jainal Abstract. In a particle detector, electromagnetic calorimeters (ECAL) provides a good tool to measure the energy of particles through the detector. The energy depostied in ECAL, coupled with its momentum, is used to calculate the mass of the particle produced in the detector during the bight energy of functions.
	electromagnetic calorimeter is produced by design to measure the energy of a particle hitting it, aided with a scintillator and sometimes using a wavelength shifter, before consequently being transmitted into the photomultiplier tube (PMT) as electrical signals.
	Neutron Shielding Behavior of Thermoplastic Natural Rubber/Boron Carbide Composite
PP012.	Abstract. Many shielding materials have been designed against the harm of different types of radiation to the human body. Today, polymer-based lightweight composites have been chosen by the radiation protection industry. In the present study, thermoplastic natural rubber (TPNR) composites with different weight percent of boron carbide (B ₄ C) filler (0% to 30%) were fabricated as neutron shielding through melt blending method. Neutron attenuation properties of thermoplastic natural rubber/boron carbide composite have been investigated. The macroscopic cross-section (Σ), relaxation lengths (λ) and half value layer (HVL) of the composites have been calculated and the transmission curves have been plotted. The obtained results show that Σ , λ and HVL strongly depends on the B ₄ C content. Addition of B ₄ C fillers into TPNR matrix enhanced the macroscopic cross-section (HVL) of the composites and decreased the relaxation lengths (λ) and half value layer (HVL) of the composites into TPNR matrix enhanced the macroscopic cross-section of the composites and decreased the relaxation lengths (λ) and half value layer (HVL) of the composites into TPNR matrix enhanced the macroscopic cross-section of the composites and decreased the relaxation lengths (λ) and half value layer (HVL) of the composites. The transmission curves exhibit that the transmission factor of the composites decreases with increasing shielding thickness.
	Neutron Optic Simulation for Small Angle Neutron Scattering Instrument (SANS) using McSTAS. Norfarizan Mohd Said, Julie Andrianny, Azraf Azman, Rafhayudi Jamro, Khair'iah Yazid, Lojius Lombigit, Mohd Khairulezwan Abdul Manan, Hafizal Yazid and Muhammad Rawi
PP013.	Mohamed Zin Abstract. Ray tracing have become an essential tool for simulating the performance of neutron instruments. The program McStas is the open-source software based on a ray- tracing method that has been successfully applied in neutron guide design in neutron diffraction and scattering. In this paper, a neutron optic model and simulations for Small Angle Neutron Scattering instrument (SANS) instrument are developed and performed using McStas. SANS employs one of the two radial channels for thermal neutron beams available at TRIGA PUSPATI Reactor (RTP). The simulation results representing the neutron baseline characteristics are aimed to be used as a basis for subsequent attempts to improve the instruments performance and experimental setting.
PP014.	Radioactive Release During Nuclear Accidents in Chernobyl and Fukushima Sulaiman, S.N.A., Mohamed, F., Ab Rahim, A.N.

	Abstract. Nuclear accidents occurred in Chernobyl and Fukushima have initiated many research interests to understand the cause and mechanism of radioactive release within reactor compound and to the environment. Common types of radionuclide release are the fission products from the irradiated fuel rod itself. In the case of nuclear accident, the focus of monitoring will be mostly on the release of noble gases, I-131 and Cs-137. As these are the only accidents have been rated within International Nuclear Events Scale (INES) Level 7, the radioactive release to the environment was one of the critical insights to be monitored. It was estimated that the release of radioactive material to the atmosphere due to Fukushima accident was approximately 10% of the Chernobyl accident. By referring to the previous reports using computational code systems to model the release rate, the release of I-131 and Cs-137 will be analysed and discussed for both accidents. Other factors affecting the radioactive release for Fukushima and Chernobyl accidents such as the current reactor technology and safety measures are also compared for discussion.
	Moderators For Intense Cold Neutron Beams in Materials Research Using Low Flux Research Reactor RTP Abdul Aziz Mohamed, Nasri A. Hamid, Azraf Azman, Megat Harun Al Rashid Megat
PP015.	Ahmad , Zakaria Dris and Syafiq Ramli Abstract. Whether created by fission, fusion, spallation, or (p,xn) knockout reactions, the initial energies of free neutrons (\geq a few MeV) are not generally useful for materials science until they are moderated down to energies at which they become sensitive to the length scales and energies characteristic of condensed matter. The earliest neutron sources for scattering were thermal, and the moderator was that of the reactor core itself. Later, designs for additional, specialized moderators dedicated to the production of cold (T < 293 K, E < 25 meV) and ultracold neutrons (T ~ 3.5 mK, E ~ 300 neV) were developed. Cold neutrons offer many advantages for materials research: their energies are often better suited for many techniques, such as small angle neutron scattering (SANS), reflectrometry, quasielastic and some inelastic spectroscopy, as well as prompt gamma neutron activation analysis. A second advantage is that the energy distribution of neutrons leaving a colder moderator is tighter than that of a thermal moderator, which can result in a more intense neutron source for scattering. And a third advantage is that they can be transported over long distances with minimum losses in neutron sources are very expensive to build, and gains in intensity required for research purposes are cheaper to achieve by optimizing the components from the reactor core, or accelerator target, onwards towards the instruments than by building a new, or upgrading an existing, primary source. This demonstrates the importance of the moderator to such facilities. A good moderator should have three nuclear properties which are have large scattering cross section, small absorption cross section, and large energy per collision [2]. This presentation will highlight activities on investigating the neutron moderators under TRIGA neutron beams characteristics and environment.
	Gamma irradiation induced method for preparation of Gd2O2S:Eu3+ phosphors: The effect of dose towards luminescent properties Sapizah Rahim, Muhammad Hassyakirin Hasim, Muhammad Taqiyuddin Mawardi Ayob, Shahrul Izwan Ahmad, Irman Abdul Rahmana, Shahidan Radiman
PP016.	Abstract. A novel gamma irradiation induced synthesis method of Gd ₂ O ₂ S:Eu ³⁺ phosphor was investigated in the presence of cetyl trimethylammonium bromide (CTAB). The effect of irradiation doses (50-150kGy) on structural and morphology analysis as well as luminescence properties was characterized by XRD, FESEM, EDX and PL spectra. The results show that gamma radiation is potentially induced formation of Gd ₂ O ₂ S:Eu ³⁺ phosphor from radiation reduction and/or precipitation of insoluble compounds as the hexagonal structure was formed without any impurities as shown in X ray diffraction pattern. FESEM observations revealed that the obtained Gd ₂ O ₂ S:Eu ³⁺ phosphors

	possess sphere structure with diameters about 60nm as well as have good homogeneities. PL spectroscopy reveals that the strongest red emission peaks is located at 617nm under 325nm light excitation, which corresponds to ${}^5D_0 \rightarrow {}^7F_2$ transition Eu $^{3+}$ ions. An optimized doses for excellent luminescent was observed at 100 kGy. The results suggest that the Gd ₂ O ₂ S:Eu $^{3+}$ phosphor may have a beneficial approach in field of imaging device.
PP017.	The Extraction Of Thorium Hydroxide in Hydrochloric acid by using Di (2- Ethylhexyl) Phosphoric acid in Kerosene Ahmad Hayaton Jamely Mohd Salehuddin
PP018.	 Measurement of Backscatter Factors for Kilovoltage X-ray Beam using Ionization Chamber and Gafchromic Film XR-QA2 Nor Shazleen Ab Shukor, Nurul Hazwani Mohd Asri, Syed Mohd Fahmi Syed Jaafar, Muhammad Syazwan Rosnan, Norida Ahmad & Siti Aishah Abd Aziz Abstract. Backscatter factor (BSF) is an important parameter in the determination of the surface dose for kilovoltage X-ray beams. The purpose of this study was to measure the BSF for kilovoltage diagnostic X-ray machine and compared the measured BSF values from Gafchromic XR-QA2 film with the ionization chamber. Besides that, various parameters that affected the contribution of BSF such as tube voltage (kVp) and field sizes also been studied. The effective energies (keV) were measured to define the monoenergetic beam of photons that has the same ability as the spectrum of photons. For the study setup, ionization chamber was exposed by a range of tube voltage (70-115kVp) at positioned in air for no-scatter condition and at the surface of the solid water phantom with varies field sizes. Film study was done by substituted the ionization chamber with Gafchromic XR-QA2 films with the size of 5 x 5 cm² with the same measurement setup. The BSF values were obtain using the formula BSF_{air} (Q) = (Kair,Q)w
	⁷ (Kair,Q) _{air} . From the results, as the higher tube voltage and bigger field sizes applied; the BSF values increase due to the contribution of scatter inside the area. The results were in a good agreement with TRS 457 with deviation is less than 12%. From results in film study, BSF values from film measurement were lower than IC with the average percentage different 16.98%. At the small field size, less effective energy produced and the amount of photons scattered back to surface is lower. From this study, demonstrated that Gafchromic XR-QA2 film was not suitable for small field size because less effective energy passes through the collimator and probability of photons to scatter back to surface is lower than bigger field sizes.
	Study on the Public Perception on Nuclear Power from Diverse Education Background in Malaysia <u>Anas Muhamad Pauzi</u> , Juniza Md Saad, Asyraf Arif Abu Bakar, Syafiq Ramli, Abdul Hannan Damahuri
PP019.	Abstract. Malaysian government's aim to include nuclear energy for electricity generation has triggered various reactions from all especially the public. The objective of this study is to have a better understanding on the knowledge, sources of information of nuclear power and sources of energy chosen by Malaysian in 20 years' time. Besides that, we want to examine the level of acceptance and perception of Malaysian towards nuclear energy and we want to identify the correlation between public perceptions with the acceptance towards nuclear power in Malaysia, and also to study the differences between perception and acceptance of nuclear power with gender and educational level. For this research methodology, the research questions are given orally or through paper-pencil and also social networking site such as Facebook or through electronic media application such as WhatsApp and Google docs. The data were analysed using a SPSS version 22.0 (Statistical Package for the Social Sciences). Results showed that more than 50% of the respondents have the knowledge of nuclear energy and 82.9 % respondents chose solar energy, 76.4 % chose hydro power and 52.2 % chose nuclear energy for three sources

	that will be used in 20 years' time. Meanwhile, about 48 % of the respondents feel that they are not given enough information about nuclear power and 43 % think that social media is the most preferable medium to spread information about nuclear energy. A part of from that, it can be seen that 93.6 % still have negative perception about nuclear power and 65 % still rejecting this government's plan to implement NPP in Malaysia. From analysis using SPSS 22 we can see that negative perception will give a negative acceptance in term of support towards the use of nuclear energy in power generation in Malaysia. We can also conclude that the higher the level of education of Malaysian, the more negative the perception of Malaysian in accepting nuclear energy as source of power in Malaysia. Therefore in shaping a positive acceptance of NPP in Malaysia, the authorities need to educate the people with the knowledge of nuclear in order to overcome the negative perception towards nuclear power.
	Large Scale Synthesis of Tellurium Nanostructures via Galvanic Displacement of Metals K. Y. Kok, T. F. Choo and N. U. Saidin
PP020.	Abstract. Tellurium (Te) is an attractive semiconductor material having wide applications in various functional devices such as sensors, radiation dosimeters, optical storage materials, thermoelectric or piezoelectric generators. In this work, large scale production of tellurium (Te) nanostructures have been successfully carried out in aqueous solutions containing TeO ₂ and NaOH, by galvanic displacement reactions on Zn and Al foils served as the sacrificial materials. By adjusting the TeO ₂ and NaOH concentrations, etching temperature and etching time, Te nanostructures could be precisely tuned to form various nanostructures ranging from one-dimensional needles or rod-like structures to more complex hierarchical structures. Our microscopy examination have showed that both the diameter and length of the Te nanostructures increased as the etching temperature and etching time increased. This galvanic displacement process is cost-effective and it requires no template or surfactant for the synthesis of the nanostructures.
	Design And Development of PC-Based Ultrasonic Goniometer System For Study Materials Surface Properties by Surface Wave Ultrasound Suhairy Sani, Mohamad Pauzi Ismail, Shukri Mohd, Noor Azreen Masenwat, Tengku Sarah Tengku Amran, Mohamad Syafiq Mohd Amin and Mohamad Ridzuan Ahmad
PP021.	Abstract. This paper explained the design and development of a portable PC-based Ultrasonic goniometer system for study materials surface properties by surface wave ultrasound. The system is using an ultrasonic pulse-receiver card model attached to computer notebook as a signal display. A new specific software package (GoNIO) was developed to control the operation of the scanner, displaying the data and analysis for characterization of the material. The cube sample were used and cut into small size of about 10mm x 20mm x 30mm so that it can be fitted into goniometer specimen holder and immersed in a liquid during measurement. The sample attached to goniometry were rotated from incident angle of 0° to 90° and the amplitudes reflected signal were recorded at every one degree of rotation. Immersion transducers were used for generating and receiving ultrasound through this sample. From this measurement, longitudinal, shear and surface Rayleigh waves in the samples can be determined. Some result of measurement are explained and discussed.
	Ultrasonic inspection of fake gold jewelry <u>Mohamad Pauzi Ismail</u> , Suhairy Sani, Mohd. Harun and Norlaili Binti Omar
PP022.	Abstract. Hollow jewelry made from combination of gold and other material was found in the market. At the outside it is made of gold and the inside layer is made of other material. X-ray fluorescent method cannot detect the inside material that was covered by gold. This

	Kajian Hubungkait Faktor Pembentukan Prestasi (PSF) Kebarangkalian Kesilapan Manusia (HEP) dan Prevalen Stress Dikalangan Operator Reaktor TRIGA PUSPATI Ahmad Nabil Bin Ab Rahim, Faizal Mohamed, Mohd Fairus Abdul Farid, Mohd Fazli Zakaria, Alfred Sangau Ligam, Nurhayati Binti Ramli
PP023.	Abstrak. Faktor manusia ini boleh dipengaruhi oleh prevalen stess yang diukur menggunakan Skala Kemurungan, Kebimbangan dan Stres, (DASS). Secara keseluruhan di kalangan responden mengatakan faktor utama tertinggi punca prevalen stress adalah disebabkan keadaan kerja yang perlu berurusan dengan suasana cemas dan memerlukan pengendali membuat keputusan kritikal secara tiba-tiba. Perkaitan diantara prevalen stress dan Faktor Pembentukan Prestasi (PSF) untuk HEP tindakan menunjukkan terdapat perkaitan yang positif daripada Korrelasi Pearson bagi PSF Tatacara, PSF Kecergasan dan PFS Proses Kerja dengan nilai .740, .763 dan .826 dengan paras signifikan masing-masing .036, .028 dan .012. Korelasi yang positif dengan nilai signifikan yang baik ini dapat diperhatikan di antara tahap prevalen stres dengan faktor pembentukan prestasi manusia berkaitan kecergasan, proses kerja dan tatacara. Semakin tinggi tahap stres responden semakin tinggi pemilihan skor untuk skala faktor pembentukan prestasi tersebut. Ini disebabkan tahap stres yang semakin tinggi menyebabkan kesihatan fizikal semakin bertambah stres. Semakin tinggi nilai faktor pembentukan prestasi ini akan menyebabkan semakin tinggi kebarangkalian kesilapan manusia berlaku. Justeru pemantauan tahap stress dikalangan pengendali RTP adalah penting bagi menjamin keselamatan RTP.
PP024.	Characterization of Ion-Exchange Resins from TRIGA Reactor <u>Hasniyati Md Razi</u> , Na'im Syauqi Hamzah, Zaredah Hashim, Tonny Anak Lanyau, Phongsakorn Prak Tom, Siti Aishah Ahmad Fuzi, Suhaimi Kassim.
	Abstract. RTP utilizes commercially available nuclear grade ion-exchange resin for the demineralizer unit. Since the resin is supplied by the company, only little knowledge on the characteristics of the resin, adsorption mechanisms and its behavior with reactor operation is available. The characterization of raw resin will involve both physical and mechanical properties evaluation. FTIR will be used to scrutinize the chemical composition of the resin, FESEM/EDX will be used to examine the morphology and elements present on the surface of the resin while BET will be used to study the porosity, surface area and volumetric space.
	Analysis of Water Volume Changes and Temperature Measurement Location Effect to the Accuracy of RTP Power Calibration <u>Tonny Lanyau</u> , Na'im Syauqi Hamzah, Abi Muttaqin Jalal Bayar, Alfred Sanggau Ligam, Phongsakorn A/L Prak Tom, Julia Abdul Karim, Mohammad Suhaimi Kassim.
PP025.	Abstract. Power calibration is one of the important aspect for safe operation of the reactor. In RTP, the calorimetric method has been applied in reactor power calibration. This method involves measurement of water temperature in the RTP tank. Water volume and location of the temperature measurement play an important role to the accuracy of the measurement. In this study, the analysis of water volume changes and thermocouple location effect to the power calibration accuracy has been done. The changes of the water volume is controlled by the variation of water level in reactor tank. The water level is measured by the ultrasonic measurement device. Temperature measurement has been done by thermocouple placed at three different locations. The accuracy of the temperature measurement has been determined and discussed in this paper.

	Safety requirements in the management of NORM residues: Phosphogypsum Case A.Ettoufi and <u>E.H Sayouty</u> .
PP026.	Abstract. NORM residue is a material that remains from a process and comprises or is contaminated by naturally occurring radioactive material, it can be in solid or liquid form. Its management is important, as accumulating residues can have a potential radiological impact on workers, members of the public, and the environment. This paper calls into question the radiological impact of the phosphogypsum, the important role of safety requirements in the management of NORM residues. We will also highlight the international efforts to minimize the impact of phosphogypsum. In this context, we shed new light at the engagement of the Kingdom of Morocco in this area, through the new 142-12 law related to nuclear and radiological safety and security, and finally we will revisit the adequacy of the Moroccan safety requirements with the IAEA safety standards in the management of NORM residues.
	Selective Separation and Production of High-Purity Thorium Oxide From Malaysian Monazite
	Che Nor Aniza Che Zainul Bahri ¹ , Aznan Fazli Ismail ^{2,3*} , Wadee'ah Mutahir Al-Areqi ¹ , Mohd Izzat Fahmi Mohd Ruf ¹ , Amran Ab. Majid ^{2,3}
PP027.	Abstract. Monazite is known to contain a high concentration of thorium along with other rare-earth elements. Rare earth elements (REEs) are essential in high and advanced technology industries, whereas thorium (Th) considered as future nuclear fuel. This research aimed to extract and produce a high purity of thorium oxide (ThO ₂) from Malaysian monazite. Th and REEs were extracted through acid digestion followed by a selective precipitation technique. The purification of ThO ₂ was performed through solvent extraction technique using 30% of tributyl phosphate (TBP) in kerosene to produce thorium nitrate (Th (NO ₃) ₄). The Th(NO ₃) ₄ was converted to ThO ₂ through calcination process. The formation of ThO ₂ was validated using X-ray diffraction (XRD), while the purity of ThO ₂ was examined using inductively coupled plasma mass spectrometry (ICP-MS). The finding indicates that selectively precipitation at the pH 1.62 – 1.69 was able to extract about $60.4 \pm 3.8\%$ of Th (NO ₃) ₄ . Further treatment through calcination process at 1000 °C has successfully produced high-purity of ThO ₂ at 98.2%
	Uranium Extraction From Seawater: Prospects, Benefits And Risks For Malaysia Aznan Fazli Ismail*
PP028.	Abstract. The projection of the well-known, easily obtainable sources of uranium are capable of supporting nuclear energy through the end of the century. The easiest, economical efforts to this day for providing uranium for nuclear energy has been through conventional mining. However, the current projection of the of uranium sources indicates that global nuclear industry only can be supported through the end of the century under the once-through fuel cycle. As alternative extraction technologies improve, the mode of obtaining uranium through seawater extraction may soon become feasible against conventional mining techniques. This paper seeks to address the prospects, benefits, and risks of the seawater uranium extraction for Malaysia with regards to this rapidly improving technology at hand. It also raises some environmental issues that need attention in place of policy development towards technology.

	Natural Radioactivity Levels and The Associated Radiological Risk of Selected Building Materials in Malaysia Shittu Abdullahi, Aznan Fazli Ismail, Supian Samat & Muhamad Samudi Yasir
PP029.	Abstract. The presence of natural radioactivity in building materials resulted in external and internal radiation exposure to the dwellers. The evaluation of radiological hazard in building materials is imperative due to the concern about radiological impact to dwellers. Thus, this study aimed to determine the concentration of natural radionuclides (226Ra, 232Th and 40K) and the associated radiological hazard from building materials (Portland cements, bricks, and sands) using gamma spectrometry system. The results showed that the mean activity concentrations of 226Ra, 232Th, and 40K in the investigated building materials were 53.8 ± 1.5 Bq kg-1, 74.8 ± 1.4 Bq kg-1 and 649.22 ± 13.6 Bq kg-1 respectively. Radium equivalent activity (Raeq), external and internal hazard indexes (Hex and Hin), annual effective dose (E) and Excess lifetime cancer risk (ELCR) were evaluated for potentials radiological hazard. The analysis indicated that bricks contribute the highest radiological hazard to dwellers compared with the other investigated building materials. However, the determined Raeq, Hex and Hin for the investigated building materials were found to be lower than the recommended limit.
	Characterization of XRF and Direct Gamma-Rays Measurement Techniques by CdTe and HPGe Detector for Natural Uranium Series <u>M.Mujaini</u> , N.A.Hamid, R.Ramli, N.Chankow
PP030.	Abstract.Uranium ore can be detect due to various gamma-ray energies emitted from uranium daughters particularly from 238U daughters such as 214Bi, 214Pb and 226Ra. After uranium extracted from uranium ore, only low energy gamma rays emitted from 235U detected if the detector placed in close contact to the specimen. In this research, identification and characterization of uranium bearing materials iexperimentally investigated using direct measurement of gamma rays from 235U in combination with the x-ray fluorescence (XRF) technique. Measurement of gamma rays conducted by using high purity germanium (HPGe) detector or cadmium telluride (CdTe) detector while a 57Co radioisotope-excited XRF spectrometer using CdTe detector is used for elemental analysis. The proposed technique tested with various natural uranium bearing specimens with metallic uranium, standard uranium oxide, yellow cake and uranium ore (euxenite). As prediction, the prominent energy at 185.7 keV shows the highest peak area from the decay of 235U which indicate the enrichment meter for the sample and the existence of 235U in the sample
	Review on the Irradiation Effect Towards Water Filtration Elements Asyraf Arif Abu Bakar, Anas Muhamad Pauzi, M.Mujaini, Abdul Aziz Mohamed, Faridah Mohamad Idris
PP031.	Abstract . Gamma and neutron irradiation effect on material had been studied intensively since the application of nuclear as a source of power. It was proven that there are strong correlation between neutron fluence and physical and mechanical damage of materials. The paper is part of the project to study the use of neutron and gamma irradiation to increase the effectiveness of simple water filtration element which are mostly sands and paper or pulp. Studies on irradiation effect on these element are compiled and analyze its changes from atomic structure to physical properties. On the atomic level, the change in atomic structure are relatively similar to the effect of irradiation on any solid, but with slight difference due to different in material composition and grain structure. Change in mechanical properties might be less prominent but the change in grain size and its ability to filter water may be different. List of publication on previous experiments conducted on irradiating filtering element are compiled to provide basic idea on the parameters needed to provide significant changes. As a conclusion, the paper provides a preliminary correlation between the fluence and energy level of irradiation with the physical effects towards these filtration element, hence will be used to analyze events leads to change in filtering effectiveness upon irradiation

Microstructural Characterization of neutron irradiation Oxide Dispersion Strengthened (ODS) ferritic steel study by Field Emission Scanning Electron Microscopy

Yusof Abdullah, Farha Mizana Shamsudin, Shahidan Radiman Nasri A. Hamid and Cik Rohaida Che Hak

PP032. *Abstract.* ODS ferritic steel were prepared by mechanically alloying, hot isostatic pressed and sintering at 1100 °C. Irradiation was carried out with neutron flux of 1.3 x1016 n/cm2s1 in TRIGA PUSPATI research reactor. FESEM results show that after irradiation of 1.3 x 1016 n/cm2s1 neutron flux, the sample indicates the excellent response towards irradiation effects. Beside a little of neutron induced swelling and dissolution precipitation, other impact of neutron is the improvement of the stability due to nanoparticles of Y2O3 Yttria phase cover up the voids formation on the steel matrix.

ORGANIZING COMMITTEE

Patrons:

Prof. Dato' Ir. Dr. Kamal Nasharuddin Mustapha, Vice Chancellor Universiti Tenaga Nasional (UNITEN).

Advisors:

Prof. Dr. Izham Bin Zainal Abidin, Dean, College of Engineering, Universiti Tenaga Nasional Prof. Dr. Nahrul Khair Alang Md Rashid (Universiti Teknologi Malaysia), Advisor, Malaysian Nuclear Society. Assoc. Prof. Abdul Aziz Mohamed (UNITEN); Head, Nuclear Engineering and Energy Group.

Chairman:

Assoc. Prof. Dr. Nasri A Hamid (UNITEN) Head, Nuclear Engineering and Energy Group

Co-Chairman:

Dr Faridah Mohamad Idris (MNS/ Nuklear Malaysia).

Deputy Chairman:

Dr Mohd Syukri Yahya (UNITEN).

Secretary:

Anas Muhamad Paizi (UNITEN). Azraf Azman (MNS).

Treasurer:

Dr Julie Andrianny (MNS Treasurer). Finance Department (UNITEN).

Committee Members:

UNITEN

- 1. Assoc. Prof. Dr. Nasri Bin A. Hamid
- 2. AP Dr Siti Fadzlili Abdullah
- 3. Dr Hassan Mohamed
- 4. Dr Juniza Md Saad
- 5. Rogemah Ramli
- 6. Madihah Mujaini
- 7. Hj Zainudin Yahya
- 8. Marketing and Corporate Communication (MCC) Department

MALAYSIA NUCLEAR SOCIETY

- 1. Dr Muhamad Rawi Mohd Zin
- 2. Nazaratul Ashifa Bt. Abdullah Salim
- 3. Mohd Rizal B. Mamat @ Ibrahim
- 4. Anwar B. Abdul Rahman
- 5. Dr. Hafizal Yazid
- 6. Azraf Bin Azman

7. Shalina Bt. Sheik Muhamad

INTERNATIONAL ADVISORY COMMITTEE

- 1. Prof. Emiretus Dr. Noramly Muslim, Western Australia University, Australia.
- 2. Prof. Emiretus Dr. Misaki Saito, Tokyo Institute of Technology, Japan.
- 3. Prof. II Hwang Soon, Seoul National University, Republic of Korea.
- 4. Dr. Mohd. Ashhar B. Hj. Khalid, Director General, Malaysian Nuclear Agency, Malaysia.
- 5. Mr. Hamrah bin Mohd Ali, Director General, Atomic Energy Licensing Board (AELB) of Malaysia, Malaysia.
- 6. Mr. Masahiro Hamamoto, Hitachi-GE Nuclear Energy, Ltd., Japan.
- 7. Prof. Dr. Sung-Min Choi, President AONSA, Korea Advanced Institute of Science and Technology, Korea.
- 8. CEO, Malaysia Nuclear Power Corporation (MNPC), Malaysia.
- 9. Prof. Dr. El Hassan SAYOUTY, Université Hassan II de Casablanca, Morroco.
- 10. Assoc. Prof. Dr. Mokhtar Awang, Universiti Teknologi PETRONAS, ASME Malaysia Section (Chair), Malaysia.
- 11. Prof. Dr. Hesheng Chen, Inst. High Energy Physics, Beijing, China.
- 12. Professor Dr. Hsiung Chou, President Taiwan Neutron Science Society, National Sun Yat-sen University, Taiwan.
- 13. Assoc. Prof. Dr. Chris Ling, The University of Sydney, Australia.
- 14. Dr. Edy Giri Rachman Putra, National Nuclear Energy Agency of Indonesia (BATAN), Indonesia.
- 15. Prof. Dr. Rolando Granada, Comisión Nacional de Energía Atómica, Bariloche, Buenos Aires, Argentina.
- 16. Prof. Dr. R. Mukhopadhyay, Bhabha Atomic Research Centre (BARC), India.
- 17. Professor Dr. Nakahiro YASUDA, University of Fukui, Japan.
- 18. Prof. Dr. Ken Nakajima, Vice-President Atomic Energy Japan Society (AEJS), Kyoto University, Japan.
- 19. Assoc. Prof. Nares Chankow, Chulalongkorn University, Thailand.

NATIONAL ADVISORY COMMITTEE

- 1. Prof. Madya Dr. Izham bin Datuk Zainal Abidin, UNITEN.
- 2. Prof. Dr. Shahrim Ahmad, Universiti Kebangsaan Malaysia
- 3. Assoc. Prof. Dr Faizai b KP Kunchi Mohamed, Universiti Kebangsaan Malaysia
- 4. Assoc. Prof. Dr. Abu Hassan, Universiti Teknologi MARA.
- 5. Prof Dr. Nahrul Khair Bin Alang Md Rashid, Universiti Teknologi Malaysia, Malaysia.
- 6. Prof Dr. Zanariah Abdullah, Universiti Malaya.
- 7. Dr Khaidzir Hamzah, Universiti Teknologi Malaysia.
- 8. Prof Dr. Ahmad Shakri bin Mat Seman, Universiti Tun Hussien Onn Malaysia.
- 9. Prof Dr. Wan Ahmad Tajuddin Wan Abdullah, Universiti Malaya.
- 10. Assoc Prof Dr Samsudin Bani, President of Malaysian Welding and Joining Society, Malaysia.
- 11. Dato² Nik Mohd Fuad Wan Abdullah, Energy Sector, Eden Inc. Bhd., Selangor, Malaysia.
- 12. Ir. Dr. Abu Bakar Hasan, Universiti Sains Islam Malaysia, Negeri Sembilan.
- 13. Prof. Dr. Bachok M.Taib, Universiti Sains Islam Malaysia

WIN MALAYSIA COMMITTEE

Chairperson : Dr. Noor Hasnah Mohamed Khairullah Secretary: Dr. Siti A'iasah Hashim

Technical Committee:

- 1. Dr. Hasni Hasan (Chair)
- 2. Dr. Noor Hasnah Mohamed Khairullah
- 3. Dr. Siti A'iasah Hashim
- 4. Dr. Chantara Thevy Ratnam
- 5. Dr. Zainah Adam
- 6. Rokiah Mohd Sabri

Session Chairperson:

- 1. Suzilawati Muhd Sarowi
- 2. Salmah Moosa

Treasurer : Dr. Susan Maria Sipaun

SCIENTIFIC AND PUBLICATION

- 1. Assoc. Prof. Dr. Abdul Aziz Mohamed (MNS/ UNITEN)
- 2. Dr Hassan b Mohamed (MNS/ UNITEN)
- 3. Dr. Nasri B A Hamid (MNS/ UNITEN)
- 4. Dr. Siti Fazlili bt Abdullah (MNS/ UNITEN)
- 5. Dr. Syukri Yahya (MNS/ UNITEN)
- 6. Dr Juniza Md Saad (MNS/ UNITEN)
- 7. Dr. Faridah Mohamad Idris (MNS/Nucklear Malaysia)
- 8. Dr. Julie Andriani Murshidi (MNS/Nucklear Malaysia)
- 9. Dr. Julia Abdul Karim (MNS/Nucklear Malaysia)
- 10. Dr Hafizal Yazid (MNS/Nucklear Malaysia)
- 11. Dr. Chantara Thevy Ratnam (MNS/Nucklear Malaysia)
- 12. Dr Hishamuddin Hussain (MNS/Nucklear Malaysia)
- 13. Assoc. Prof. Dr. Ahmad Taufek bin Abdul Rahman (UiTM)
- 14. Assoc. Prof. Dr. Mohd Nasri A. Hamid (MNS/UNITEN)
- 15. Dr. Norhasliza Yusof (MNS/Universiiti Malaya)
- 16. Prof. Dr. Hasan Abu Kassim (MNS/Universiiti Malaya)
- 17. Assoc. Prof. Dr. Zaidi Embong (MNS/ UTHM)
- 18. Assoc. Prof. Dr. Faizal b KP Kunchi Mohamed (MNS/UKM)
- 19. Dr Aznan Fazli Ismail (MNS/ UKM)
- 20. Assoc. Prof. Dr. Irman Abdul Rahman (MNS/ UKM)
- 21. Dr. Norsyahidah Mohd. Hidzir (MNS/ UKM)
- 22. Dr. Suhairul Hashim (UTM)
- 23. Dr. Khaidzir Hamzah (UTM)
- 24. Assoc. Prof. Dr. Abu Hasan Husin (UITM)
- 25. Dr. Ir. Abu Bakar Hasan (USIM)

ACKNOWLEDGEMENT

INuSTEC2017 is organized by Malaysian Nuclear Society (MNS) and Universiti Tenaga Nasional (UNITEN)

In Collaboration with

Malaysian Nuclear Agency (Nuclear Malaysia) Universiti Teknologi MARA (UiTM) Universiti Islam Antarabangsa Malaysia (IIUM) Universiti Kebangsaan Malaysia (UKM) Universiti Teknologi Malaysia (UKM) Universiti Malaya (UM) Universiti Sains Islam Malaysia (USIM) Universiti Tun Hussien Onn Malaysia (UTHM)

Supported by

ASME Malaysia Section Malaysian Welding and Joining Society


About Us

The Malaysian Nuclear Society (MNS) is a non-governmental organization aiming at promoting the development and dissemination of information on nuclear science, engineering and technology; providing objective views/ advice on matters relating to nuclear science, technology and its applications. MNS is also a key player in promoting cooperation among members and other organizations of similar objectives.

It was formed as Nuclear Science Society (PersatuanSainsNuklear Malaysia, PESAN) in 1989, operating in the state of Selangor and Wilayah Persekutuan (Kuala Lumpur), Malaysia.

With the expansion of its members to more than seven states in Malaysia in 1994, it was renamed the Malaysian Nuclear Society (MNS).

Currently, MNS enjoys the support of over 2000 members in the government, private, and corporate sectors (as corporate member) and maintains two international linkages with the American Nuclear Society (ANS), the Canadian Nuclear Society (CNS), European Nuclear Society (ENS), Korean Nuclear Society (KNS) and Atomic Energy Society of Japan (AESJ).

OBJECTIVES

Associating nuclear science and technology to the bombs is a common tendency and an almost automatic response when many are asked about nuclear. Very little is known about its other applications. MNS aims at correcting this perception through its objectives, viz:

- To promote the advancement and dissemination of nuclear science and technology and its applications;
- To provide objective views and advice on matters pertaining to nuclear applications ; and
- To promote cooperation among members and other bodies of similar objectives

- Education and Awareness Program forum, discussion, seminar, conferences, and student outreach.
- **Publication of an Annual Magazine** BuletinNuklear Malaysia ("Nuclear Bulletin of Malaysia")
- **Publication of Scientific Journal** Journal SainsNuklear Malaysia (JSNM) or Nuclear Science Journal of Malaysia starting 1999 and from 2003 the journal is known as Journal of Nuclear and Related Technology (JNRT).
- Award to Outstanding University Student At the Nuclear Science Department, UniversitiKebangsaan Malaysia (UKM), UniversitiInstitutTeknologi Malaysia and UniversitiTenagaNasional (UNITEN).
- **Collaboration with international nuclear societies –** American Nuclear society, Canadian Nuclear society, European Nuclear society, Korean Nuclear society, Japan Atomic Energy society, China Atomic Energy society, Asia-Oceana Neutron Scattering Association, Asia-Oceana Forum on Synchrotron Radiation Research, Thailand Nuclear society, Indonesian Nuclear society and Australian Nuclear Association.

[
Advisor / Past President	DR. NAHRUL KHAIR BIN ALANG MD RASHID (INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA)
President	DR. ABDUL AZIZ BIN MOHAMED (UNITEN)
Vice President	DR. FAIZAL BIN K.P. KUNCHI MOHAMMED (UKM)
Secretary	DR. FARIDAH BT MOHAMAD IDRIS (NUCLEAR MALAYSIA)
Deputy Secretary	DR. IRMAN B ABDUL RAHMAN (UKM)
Treasurer	DR JULIE ANDRIANNY BT. MURSHIDI (NUCLEAR MALAYSIA)
Deputy Treasurer	DR NASRI B A HAMID (UNITEN)
Members	AZRAF BIN AZMAN (NUCLEAR MALAYSIA) SHALINA BT. SHEIK MUHAMAD (NUCLEAR MALAYSIA) DR ABU HASSAN HUSIN (UKM) DR JULIA BT. ABDUL KARIM (NUCLEAR MALAYSIA) DR. MUHAMMAD RAWI BIN MOHAMED ZIN (NUCLEAR MALAYSIA) DR MOHD SYUKRI YAHYA (UNITEN)
Auditors	DR. MOHD YUHYI MOHD TADZA (UMP) SAFWAN SHALBI (UTM)

COUNCIL MEMBERS

2017/2019

MNS Chapters

- 1.) RadTech (Radiation Tech)
- 2.) XApp (X-ray App)
- 3.) NuEnergy (Nuclear Energy)
- 4.) Neutron Photon (Neutron- Photon)
- 5.) Student Chapter (UKM, UiTM, UNITEN)
- 6.) Nuclear Engineering Student Society (NESS)
- 7.) Women in Nuclear Malaysia (WiN Malaysia)

8.) Institute of Nuclear Engineers (INE)

Visit us at http://www.nuklearmalaysia.org

IN MEMORY OF



ASSOC. PROF. DR. ZAINI B HAMZAH

(PRESIDENT MNS 2010-2016)

1st February 1955 - 7th October 2016

Zaini Hamzah, born in Negeri Sembilan on February 1st, 1955. He obtained his first degree in Chemistry in year 1978 from Universiti Kebangsaan Malaysia (UKM), Post Graduate Diploma in Chemistry from Keysterton College, North of Wales, Master of Nuclear and Radiation Chemistry and PhD in Radioanalytical Chemistry from the University of Salford, England, United Kingdom in 1983. He was a Research Officer at Malaysian Nuclear Agency before joining Universiti Teknologi MARA, Malaysia as an Associate Professor in 1990. He was the former Assistant of Vice Chancellor (Student Affairs) Universiti Teknologi MARA, and the Head of School of Chemistry and Environment, Faculty of Applied Sciences, Universiti Teknologi MARA till 2016. He was active in doing research in the field of low-level radiation and environmental pollution. He has published and presented more than hundred scientific papers both locally and internationally. He supervised more than twenty post-graduate students doing research in the radiation and environment related fields.

Dr Zaini joined MNS as a member in 1989 with membership number 1/1981 and was active in MNS. He was the president of the Malaysian Nuclear Society (MNS) and also the President of Malaysian Analytical Science Society (ANALIS) until his demised on 7th October 2016. He was also a member of the Malaysian Institute of Chemistry (IKM), Chief Editor of the Journal of Nuclear and Related Technology (JNRT) and Editor of the Malaysian Journal of Analytical Sciences (MJAS). He was the founder and Head of the research group namely Environmental Studies Using Conventional and Nuclear Techniques (ESCAN). He was a member of Technical Committee for Statistical Methods, MISO responsible for adopting ISO for the Malaysian Standard, in SIRIM Berhad since 2003.

...

iNuSTEC2017,UNITEN, Putrajaya Campus, Selangor, Malaysia. 25 - 27 SEPTEMBER 2017

ANNOUNCEMENT

CLOSE MEETING ON NUCLEAR ACADEMY FOR NUCLEAR ACADEMY FOR PEACE AND SUSTAINABLE DEVELOPMENT

MONDAY, 25TH SEPTEMBER 2017 Location: BW-G-R14 2.30PM – 4.30PM

For inquiry contact Dr Abdul Aziz Mohamed (AzizM@uniten.edu.my)

•••

DIALOGUE ON CONTRIBUTION OF WOMEN TOWARD THE NATIONAL NUCLEAR PROGRAMME

WEDNESDAY, 27th SEPTEMBER 2017 Location: BW-1-R04 9.00AM – 13.00PM

For enquiry contact: Dr Siti Aiasah Hashim (aiasah@nuclearmalaysia.gov.my)

. . .

POST CONFERENCE WORKSHOP ON NEUTRONIC SIMULATION

THURSDAY, 28th SEPTEMBER 2017 Location: CFD Lab, BL-Level 1, College of Engineering, UNITEN 9.00AM – 13.00PM

> For Inquiry, contact Dr Hassan b Mohammed (MHassan@uniten.edu.my)



Eko-Teknik Sdn Bhd was established in 1997, and now focusing on supplying high quality products and instruments to various government departments, universities, hospitals, research institutes and other establishments in Malaysia. We are registered with the Ministry of Finance, and the Atomic Energy Licensing Board for sales of radioactive materials in Malaysia.

Our product line covers the areas under nuclear research, nuclear medicine, life sciences, testing equipment, as well as consumables and laboratory equipments. It is our mission to provide reliable and efficient services for total customer satisfaction and assist them towards the advancement of science and technology in the R&D world.





ZL TECHNOLOGIES SDN BHD (587993-P)

56-2, Jalan Bola Tampar 13/14, Seksyen 13 40100 Shah Alam Selangor, Malaysia.

Tel: +603-5510 1359 / 5510 1394 Fax: +603-5523 1490 E-mail : info@zltech.com.my

RELTECH LAB SDN. BHD.

(WHOLLY- OWNED BY RELTECH VENTURE SDN. BHD)

We provide calibration service using Gamma and X-ray source for equipment: Survey Meter

Dosimeter

Lab Address: No.12 , Jalan 6C / 13B, Kompleks Premis Usahawan SME, Taman Perusahaan IKS, Seksyen 16, 43650 Bandar Baru Bangi, Selangor



MORE INFORMATION CONTACT LAB OFFICE: 03-8912 2727 PERSON IN-CHARGE: EN IZZAT 012 3456369





SYAIZA ENGINEERING

Lot No.185H, Jalan Jurutera , Kg. Sri Aman 47150 Puchong,Selangor En.Saadun Zubir : 012-6069286 Pn.Rosmaliza Ismail : 017-2110041 Tel/Fax : 03-80512895

Syarikat kami berpengalaman menyelenggara pelbagai mesin seperti Lathe, Milling, pelbagai kursus-kursus di institut-institut tinggi kemahiran seperti:- MARA, ILP, CIAST, ADTEC dan di syarikat-syarikat swasta. Sejarah berpengalaman dalam pelbagai project kejuruteraan di Agensi NuklearMalaysia seperti:

- 2013 –Pembekalam ,penghantaran ,pemansangan dan pentauliah Satu (1) Set Sistem Pemacu dan landasan bagi pintu Plumbum Untuk Makmal X-ray dibangunan Blok 37 (Blok PTK) Di Agensi Nuklear Malaysia.
- 2014 –Membekal dan penghantar pelbagai saiz Material Stainless Steel Material Stainless Steel, Material Brass ,Material Teflon,Material PE, Material Lead, Material Aluminium,Cooper
- 2015–Pembekalam ,penghantaran ,pemansangan dan pentauliah Satu (1)Set Sistem Pemacu dan landasan bagi pintu Plumbum Untuk Makmal X-ray dibangunan Blok 37 (Blok PTK) Di Agensi Nuklear Malaysia.
- 2015–Pembekalam Membikin, membekal, menghantar, memeriksa, menguji dan mentauliah (1)Set Kompenan Struktur Sel Aktif Mudah Alih untuk Agensi Nuklear Malaysia.
- 2015–Pembekalan, membikin, menghantar, memasang, menguji dan mentauliah Satu (1) Set Pengklolimat neutron untuk Agensi Nuklear Malaysia.
- > 2016–Kerja-Kerja penyelenggraan pelbagai mesin / Hand Truck
- 2016–Pembekalan Membikin, menghantar, memasang, menguji dan mentauliah (1) Set Kabinet Plumbum (Lead Kabinet) untuk Agensi Nuklear Malaysia.



iNuSTEC2017,UNITEN, Putrajaya Campus, Selangor, Malaysia. 25 - 27 SEPTEMBER 2017



*e*XPROJAYA SDN BHD

(Co No. 646207-X)

(Excellent, Professional, Success)

Kami pembekal Bumiputera yang telah beroperasi selama 13 tahun. Tunjang perniagaan kami adalah membekal, menghantar, memasang dan mengujilari peralatan makmal dan membekal bahan kimia di universiti awam dan badan kerajaan. Selain itu, kami juga membuat penyelenggaraan dan baikpulih alat.

PRODUK-PRODUK YANG DITAWARKAN

- Bahan Kimia
- Perkakas Pakai Buang (Disposable Items)
- Bahan Kaca
- Membaikpulih (Repair) Peralatan
- Slides
- Perisian Komputer (Computer Software)
- Peralatan/Kelengkapan Hospital/Makmal
- Model/Anatomi
- Peralatan Untuk Makmal Kultur Tisu

No. 8-1, Jalan Wangsa Setia 3, Taman Wangsa Melawati, 53300 Kuala Lumpur. Tel : 03-4142 9080 Fax : 03- 4142 7310 E-mail : <u>yazidxpro@yahoo.com</u> / <u>yazid3003@gmail.com</u>



Monozukuri — Technology to protect energy and tomorrow

Trees bathe in the warm sunshine while soaking up water. They feed on the precious nutrients, put out buds, extend trunks, spread branches, and put out leaves as they grow slowly but steadily over the time. The flourishing tree produces clean air, clear water and rich harvest soil, furthermore provides many blessing to humankind. The various trees breathing firmly and perpetuating life provide hope for the earth and humankind.

We at Hitachi-GE Nuclear Energy provide wide-ranging support for the nuclear power industry to open up a new horizon for a promising tomorrow of the earth, using highly reliable monozukuri in the integrated Hitachi Group, Nuclear energy produces no carbon dioxide and has a low environmental load while providing a stable supply of electricity to support a comfortable life. Our aim is an abundant, secure, and promising future. based on the theme of a human society that coexists with nature,

Hitachi-GE Nuclear Energy, Ltd. http://www.hitachi-hgne.co.jp/nuclear/index.html

nuclea erg)

reliab