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FOREWORD BY HEAD OF DEPARTMENT OF PHYSICS

Assalamua'laikum warahmatullahi wabarakatuh and greetings..

Welcome to the Undergraduate Project Symposium 2015.
Firstly, I would like to express my heartiest congratulations to the final-year students of the Physics Department whom have successfully completed their Undergraduate projects. To the academic staffs who gave their full dedication in assisting, supervising and guiding the students, I would like to congratulate them for their endless efforts. I would also like to thank all the supporting staffs for their technical assistances provided to the students during the execution of their respective projects.
Within approximately one year of doing these projects, I am sure a lot of experiences and knowledge have been gained by the students. These projects should train the students to stand on their feet, find the right information as well as assert them to be positive and proactive. All these skills can be integrated and applied in their respective future careers.
Finally, I would like to congratulate and thank the Committee of Undergraduate Project, Department of Physics who have worked hard to ensure the success of this Symposium.

Wassalam.

SELAMAT BERSIMPOSIUM!

Prof. Madya Dr Wan Muhamad Saridan Wan Hassan
Ketua Jabatan Fizik, Fakulti Sains,

Universiti Teknologi Malaysia.

FOREWORD BY CHAIRPERSON UNDERGRADUATE PROJECT
PHYSICS DEPARTMENT

Assalamu'alaikum w.b.t and greetings,

In the name of Allah, the Beneficent, the Merciful. God willing, the committee of the Undergraduate Project, Department of Physics, Faculty of Science, is able to plan and conduct the relevant activities until its peak, which is the Undergraduate Project Symposium. I congratulate all the members of the committee for their full cooperation and commitment to ensure the success of this program.

To all the Final-year students of Physics Department, we thank you for your efforts and smart works that have been shown throughout these projects. Hopefully, the patience, perseverance and experiences in order to overcome all these problems will foster a strong sense of identity to prepare for a more challenging career environment later.

Congratulations and well done also to the dedicated supervisors who never tired of scouting and guiding and caring for the students in order to be able to complete their projects successfully. Not forgetting the supporting staffs who have made a significant technical assistance and guidance needed by students in the course of their projects.

Finally, wishing everyone, have a pleasant day!

Thank you,

Mr. Muhammad Zaki Yaacob

Undergraduate Project Physics Department Committee Members

Chairperson : Mr. Muhammad Zaki Yaacob
Secretary : Mdm. Masleeyati Yusop
Dr. Wan Nurulhuda Wan Shamsuri (Assistant)
Mdm Fadzilah Lasim (Assistant)

Members : Material Physics
- Dr. Rosnita Muhammad
- Dr. Ezza Syuhada Sazali
- Mr. Nor Azman Abu Bakar

: Intrumentation Physics
- Mr. Abdul Rashid Abdul Rahman
- Mdm. Siti Sarah Safaei
- Mdm. Azlina Amir

: Health Physics
- Dr. Izyan Hazwani Hashim
- Dr. Koh Meng Hock
- Mdm. Sarah Sulaiman

: Laser & Applied Optic Physics
- Dr. Nor Ain Husein
- Dr. Nabilah Kasim
- Mdm. Tan Sew Chu

Technical:
- Mr. Zaki Selan
- Mr. Bakhtiar Mat Sari

OPENING CEREMONY OF UNDERGRADUATE PROJECT (UGP) SYMPOSIUM
PHYSICS DEPARTMENT, FACULTY OF SCIENCE, UTM
Semester 2, Session 2015/2016

VENUE: PHYSICS MEETING ROOM (C21-318)

DATE: 31May 2016 (Tuesday)

Time (a.m)	**Program**
10^{10}	Arrival of External Evaluators, Lecturers and Students
10^{20}	Welcoming address by UGP Chairperson
10^{25}	Recital of du'a
10^{30}	Speech by Head of Physics Department, Assoc.Prof. Dr Wan Muhamad Saridan bin Wan Hassan
10^{40}	Presentation of tokens of appreciationto External Evaluators
10^{50}	End of opening ceremony

LIST OF EVALUATIORS OF UNDERGRADUATE PROJECT SYMPOSIUM
DEPARTMENT OF PHYSICS, FACULTY OF SCIENCE
SEMESTER 2 SESSION 2015/2016

1. MATERIAL PHYSICS

VENUE: PHYSICS MEETING ROOM (C21-318)

DATE: 31 May 2016 (Tuesday)

(L) - Leader

Session 1: 8.30am – 10.10am	Session 2: 11.00am – 1.00pm	Session 3: 2.30pm – 5.00pm
Chairperson : Dr. Ezza Syuhada Sazali	Chairperson : En.. Muhammad Nor Muhamad	Chairperson : Dr. Rosnita Muhammad
Evaluators: Prof. Dr.Rosli Hussin (L) Assoc. Prof. Dr. Zuhairi Ibrahim Mr. Abd Rashid Abd Rahman	Evaluators: Prof. Dr. Md Rahim Sahar(L) Assoc. Prof. DrKarim Deraman Dr. Ezza Syuhada Sazali	Evaluators: Prof. DrSamsudi Sakrani (L) Dr. Wan Nurulhuda Wan Shamsuri Mdm. Masleeyati Yusop

VENUE: PHYSICS MEETING ROOM (C21-318)

DATE: 1 June 2016 (Wednesday)

Session 4: 8.30am – 10.10am	Session 5: 11.00am – 1.00pm	Session 6: 2.30pm – 5.00pm
Chairperson : Dr. Ezza Syuhada Sazali	Chairperson : Mdm. Masleeyati Yusop	Chairperson : Assoc. Prof. Dr. Zuhairi Ibrahim
Evaluators: Prof. Dr. Zulkafli Othaman (L) Dr. Rosnita Muhammad Mr. Abd Rashid Abd Rahman	Evaluators: Assoc. Prof. Dr. Sib Krishna Ghoshal(L) Dr. Wan Nurulhuda Wan Shamsuri Mr.. Muhammad Nor Muhamad	Evaluators: Prof. Dr. Md Rahim Sahar(L) Dr Rashid Ahmed Dr Ramli Arifin

2. LASER & APPLIED OPTICS

VENUE: PHYSICS INSTRUMENTATION TEACHING LABORATORY 3 (C20-307)

DATE: 31May 2016 (Tuesday)

(L) - Leader

Session 1: 8.30am – 10.30am	Session 2: 11.00am – 1.00pm	Session 3: 2.30pm – 5.00pm
Chairperson : Dr. Nor Ain Husein	Chairperson : Dr Nabilah Kasim	Chairperson : Dr. Suzairi Daud
Evaluators: Dr. Raja Kamarulzaman(L) Dr..Muhammad. Arif Jalil Dr. Mahdi Bahadoran	Evaluators: Prof.Dr. Noriah Bidin (L) Dr. Muhammad Safwan Dr. Kashif Tufail	Evaluators: P.M Dr. Yusof Munajat (L) Dr. Nor Ain Husein Dr Nabilah Kasim

3. HEALTH PHYSICS

VENUE: PHYSICS INSTRUMENTATION TEACHING LABORATORY 1(C20- 302)

DATE: 31May2016 (Tuesday)

(L) - Leader

Session 1: 9.00a.m – 10.00a.m	Session 2: 11.00a.m – 12.20p.m	Session 3: 2.30p.m – 3.50p.m
Chairperson : Dr Nor Ezzaty Ahmad	Chairperson : Dr Izyan Hazwani Hashim	Chairperson : Dr Koh Meng Hock
Evaluators: Dr Izyan Hazwani Hashim(L) Dr Muhammad Alam Saeed	Evaluators: Dr Koh Meng Hock (L) Dr Nor Ezzaty Ahmad	Evaluators: PM Dr Wan M Saridan (L) Dr Muhammad Alam Saeed

4. PHYSICS INSTRUMENTATION

VENUE: PHYSICS INSTRUMENTATION TEACHING LABORATORY 4 (C21-310-01)

DATE: 31May 2016 (Tuesday)

(L) - Leader

Session 1: 8.30am – 10.05am	Session 2: 11.00am – 1.00pm	Session 3: 2.30pm – 5.00pm
Chairperson : Hj Mohd Khalid Kasmin	Chairperson : En. Muhammad Zaki Hj Yaacob	Chairperson : Dr. Amirudin Shaari
Evaluators: Assoc. Prof. Dr. Hazri Bakhtiar (L) Dr. Amiruddin Shaari Dr. Abd Rahman Tamuri	Evaluators: Dr. Abd Khamim Ismail (L) Dr. Roslinda Zainal Dr. Yap Yung Szen	Evaluators: Assoc. Prof. Dr. Md Supar Rohani (L) Dr. Yap Yung Szen Hj Mohd Khalid Kasmin

1. MATERIAL PHYSICS

(LIST OF PRESENTERS AND ABSTRACTS)

VENUE :Physics Meeting Room (C21-318)
DATE :31May2016 (Tuesday)
Chairperson session 1 : Dr. Ezza Syuhada Sazali
Time : 08:30 am– 10:10am

1. The Optical Absorption of Samarium Doped Magnesium Zinc Lithium Tellurite Glass
   Maizatul Akmal Binti Rani & Prof. Dr. Md Rahim Sahar

2. Thermal Conductivity and Thermal Stability of Tellurite Glass
   Norashidah Binti Mohd Hanafiah & Prof. Dr. Md Rahim Sahar

3. Physical and Infra-Red Spectroscopy of Samarium Doped Lithium-Magnesium-Zinc-Tellurite Glass
   Nurajira Binti Roslan & Prof. Dr. Md Rahim Sahar

4. Zinc Oxide Films Prepared by Modified Sol Gel Technique
   Nur E'zzati Nabilah Syaqilah Binti Abdul Hamid & Prof. Dr. Samsudi Sakrani

5. Structure and Optical Properties of Zinc Oxide Nanowires Prepared Using Hydrothermal Method
   Nurul Alina Afifi Binti Norizan & Prof Dr. Samsudi Sakrani

ABSTRACTS

THE OPTICAL ABSORPTION OF SAMARIUM DOPED MAGNESIUM ZINC LITHIUM TELLURITE GLASS

Maizatul Akmal Binti Rani and Prof. Dr. Md Rahim Sahar

A series of glass based on $(71\text{-}x)TeO_2$-20ZnO-8MgO-xLi_2O- $1Sm_2O_3$ with $0 \leq x \leq 20$ (mol %) has successfully been prepared using melt quench technique. The amorphousity of the glass sample has been characterized by using the X-ray Diffraction (XRD). It is clearly seen that, there is no sharp peak that confirm the amouphous nature of the glass. The optical absorption has been determined using UV-Vis Spectroscopy in the range of 300 – 800nm. The energy band gap, E_g is found to be in the range of (2.03 – 2.85) eV whereas the Urbach Energy is found to be around (0.27– 0.87) eV. Meanwhile, the refractive index is range from 2.44 –2.73. It is discussed that as the Li_2 content increased, the band gap energy decreases, the Urbach energy is increases and the refractive index increases.

THERMAL CONDUCTIVITY AND THERMAL STABILITY OF TELLURITE GLASS

Norashidah binti Mohd Hanafiah and Prof. Dr. Md. Rahim Sahar

A series of glass based on (0.71-x)TeO2 - (x)Li_2O - (0.2)ZnO - (0.08)Mg - (0.01) Sm_2O_3 where x = 0, 0.05, 0.10, 0.15, 0.20 mol% is prepared by melt quenching technique. An X-ray diffraction method (XRD) method is used to characterize the structure of the glass. It is observed that all glasses are amorphous in nature. The thermal conductivity, κ and thermal convection, *h*is determined by Lee Disc's method. It is observed that the thermal conductivity achieve its maximum value at 5 mol % Li_2O and slightly decrease with the increase of Li_2O content (0-20 mol %). It is also found that the convection coefficient, *h* is the same for all the composition. The thermal stability of tellurite glass is investigated by differential thermal analysis (DTA). All thermal parameters including glass transition temperature, T_g, crystallization temperature, T_c and melting temperature, Tm are obtained. Thermal stability, S and glass forming tendency, H_r are also determined. It is observed that the thermal stability and forming tendency increases as the Li_2O content increase. This indicates that the tellurite glass is a promising candidate for glass fabrication and has potential applications for optical devices.

PHYSICAL AND INFRA-RED SPECTROSCOPY OF SAMARIUM DOPED LITHIUM-MAGNESIUM-ZINC-TELLURITE GLASS

Nurajira Bt Roslan and Prof. Dr. Md. Rahim Sahar

Glasses with composition of (71-x)TeO_2-20ZnO-8MgO-xLi_2O-1Sm_2O_3 where 0≤x≤20 mol% are prepared using the melt quenching technique. X-ray diffraction (XRD) method is used to confirm the amorphous nature while the physical parameters in terms of density (ρ) and molar volume (V_m) are measured and calculated. The Fourier Transform Infrared (FTIR) spectroscopy is manipulated to observe the structural modification of TeO_4 trigonal bipyramidal (tbp) unit and the variation of the absorption due to O-H stretching vibration as the Li_2O concentration is increased. The absence of sharp peak in the XRD pattern indicates that the glass is amorphous. Meanwhile, it is observed that both density and molar volume decrease as the Li_2O concentration is increased. From the FTIR spectra, it is found that TeO_4 tbp unit is located at 683-706 cm^{-1} while TeO_{3+1} polyhedral and/or TeO3ctrigonal pyramidal (tp) unit is located at 770-775 cm^{-1}. However, the TeO_4 tbp peak is found to be shifted to a higher wavenumber as the concentration of Li_2O is increased. Besides, the spectrum also indicates an increase in relative absorption area of O-H stretching for up to 10 mol% of Li_2O. The relative area decreases as the content of Li_2O is increased.

ZINC OXIDE FILMS PREPARED BY MODIFIED SOL GEL TECHNIQUE

Nur E'zzati Nabilah Syaqilah Bt Abdul Hamid and Prof. Dr. Samsudi Sakrani

Zinc Oxide (ZnO) is a wide band gap semiconducting oxide with many potential applications due to its excellent properties. In this study, thin films with composition of zinc acetate diydrate, n-propyl alcohol and diethanolamine (DEA) were prepared using modified sol gel dip coating technique. ZnO thin filmswere deposited on glass substrate with four different thicknesses of 2 layers, 4 layers, 6 layers and 8 layers at fixed temperature of 450 °C for 1 hour.The influences of different thickness of ZnO thin films in terms of structural and optical properties were characterized using Field Emission Scanning Electron Microscope (FESEM), Atomic Force Microscopy (AFM), X-ray Diffraction (XRD), Photoluminescence Spectroscopy (PL) and UV-Vis Spectrometer. It is observed that FESEM result exhibited spherically shapes that are closely packed together among particles. The AFM results displays grain size of ZnO thin films with the range from 55.27 - 109.30 nm. Meanwhile,XRD analyses assigned (002) peak becomes more dominant peaks, indicates the ZnO thin films prefer to grow along c-axis orientation and formation of good crystallinity. Two peaks were observed in PL spectra which appear in visible region at400 - 500 nm. UV-Vis spectrareveal the transmittance between 420 – 800 nm is found to decrease with the increases in the thickness. Energy band gaps wereobtained from the extrapolation graph with the range from 3.19 - 3.22 eV.The result were found to be comparable with those obtain by other researchers.

STRUCTURAL AND OPTICAL PROPERTIES OF ZINC OXIDE NANOWIRES PREPARED USING HYDROTHERMAL METHOD

Nurul Alina Afifi Binti Norizan nnd Prof. Dr. Samsudi Sakrani

Hexagonal zinc oxide (ZnO) nanowires were synthesized on glass substrate using a hydrothermal method with different thicknesses and concentrations of zinc oxide (ZnO) precursor solution at a fixed temperature of 70 °C. The pre-seeded layer was produced by sol-gel dip coating method with zinc acetate dihydrate in ethanol and diethanolamine (DEA). Different concentrations of zinc acetate dihydrate, 0.3 M, 0.5 M and 0.6 M were prepared. Thicknesses of ZnO films were altered by dipping the glass substrates for 5 times and 8 times in each sol concentration. The structural properties were characterized using X-ray diffraction (XRD) and field emission scanning electron microscopic (FE-SEM). XRD spectra revealed that the ZnO nanowires are polycrystalline with wurtzite structures that are formed randomly on the glass substrates. FE-SEM images showed that ZnO nanowires have hexagonal unit cell and the average diameter and average length of 27.39 nm and 773.76 nm respectively. The

optical properties of ZnO nanowires were determined using photoluminescence (PL) and UV-Vis spectra. The PL revealed fairly strong UV emission at 300 nm and relatively weak visible emission (between 412 – 480 nm) which implied that the ZnO nanowires have good optical properties with less impurities and structural defects. The UV-Vis spectra have transmittance of 10 % to 30 % and the energy band gaps were found to be in the range of 2.97 eV to 3.22 eV. The results were found to be comparable with those obtained by other researchers.

Chairperson session 2 : Mr. Muhammad Nor Muhamad
T ime : 11:00am – 1:00pm

1. The Structure and Luminescence Properties of Copper Sulfophosphate Glass Doped with Europium
   Naemah Binti Omar & Prof. Dr. Rosli Hussin

2. The Structure and Luminscence Properties of Zinc Sodium Sulfophosphate Glasses Doped With Er_2O_3
   Marsyuhada Binti Mamat @ Mohamad & Prof. Dr. Rosli Hussin

3. The Structure and Luminescence Properties of Zinc Magnesium Sulfophosphate Glasses Doped with Samarium (III) Oxide
   Shahirah Binti Deraman & Prof. Dr. Rosli Hussin

4. Preparation and Characterization of Cobalt-Substituted Manganese Ferrite Nanoparticle
   Nurulhuda Binti Azman&Prof. Dr. Zulkafli Bin Othaman

5. Effect of Mg-Al Substitution on the Structural and Morphological Properties of Co Ferrites
   Wan Muhammad Izuddin Bin Wan Nawi & Prof. Dr. Zulkafli Othaman

ABSTRACTS

THE STRUCTURE AND LUMINESCENCE PROPERTIES OF COPPER SULFOPHOSPHATE GLASS DOPED WITH EUROPIUM

Naemah Bt Omar and Prof. Dr. Rosli Hussin

Structural investigation of (70-x-y) P_2O_5-xCuSO$_4$-30Li_2O-$y$$Eu_2O_3$ glass systems with $5 \leq x \leq 30$ mol% and $0 \leq y \leq 0.8$ mol% have been prepared by melt quenching technique. The sample were characterized by Fourier Transform Infrared spectroscopy (FTIR) and Photoluminescence spectroscopy (PL). The structural and luminescence properties of the prepared Eu_2O_3doped copper sulfophosphate glasses were studied and compared with reported results. FTIR spectra revealed the vibrational modes in the prepared glass. Increase in the concentration of Eu_2O_3 resulted in gradual depolymerization of the phosphate chains and $EuPO_4$ crystalline phase was form. The infrared spectrum of these glass sample showed the deformation mode of P-O bond, stretching vibrations of bridging oxygens, asymmetric stretching modes of P-O-P linkages, PO_2 symmetric stretching modes and the stretching mode of P=O double bonds in the branching group. The luminescence properties of the glass sample were measured based on the analysis of emission spectra. Luminescence spectra of these glasses at the excitation wavelength of 396 nm shows transitions of $^5D_1$ to $^7F_1$ (519 nm), $^5D_1$ to $^7F_2$ (540 nm), $^5D_1$ to $^7F_3$ (548 nm), $^5D_0$ to $^7F_4$ (562 nm) and $^5D_0$ to $^7F_5$ (649 nm).

THE STRUCTURE AND LUMINSCENCE PROPERTIES OF ZINC SODIUM SULFOPHOSPHATE GLASSES DOPED WITH Er_2O_3

Marsyuhada Bt Mamat @ Mohamad and Prof. Dr. Rosli Hussin

A study of luminescence and glass structure had been done to a glass system. Erbium-doped zinc sodium sulfophosphate glasses with composition (55-x)P_2O_5-10Na_2SO_4-35ZnO-$x$$Er_2O_3$ are prepared (x = 0, 0.5, 1.0, 1.5, 2.0 mol%) using melt quenching technique. The structural was measured using Ultraviolet Visible Spectroscopy and Fourier transformed infrared (FTIR) spectroscopy and the Photoluminescence (PL) Spectroscopy was used to measure the luminescence properties. The colour of the glass changed from light yellow to deep pink due to the introduction of Er^{3+} ions. The UV-Vis absorption spectra exhibits six prominent peak centered at 380, 490, 520,650, 800 and 982 nm ascribed to the transition in erbium ion from ground state to the excited states $^4G_{11/2}$, $^4F_{7/2,}$ $^2H_{11/2,}$ $^4F_{9/2,}$ $^4I_{9/2}$ and $^4I_{11/2}$ respectively. The mode vibrations observed in this glass system are asymmetry stretching (PO_2) at 1260cm^{-1}, symmetric stretching mode (P-O-P) at 892cm^{-1}, asymmetric stretching mode (P-O-P) at 747cm^{-1} and deformation modes of PO_4^{3-} at 535cm^{-1}. The luminescence properties of the doped sample were measured based on analysis of emission spectra. Result showed that the emission band of Er^{3+} are 606nm and 634nm due to the transition of $^4S_{3/2}\rightarrow$ $^4I_{15/2}$ and $^4F_{9/2}\rightarrow$$^4I_{15/2}$.

THE STRUCTURE AND LUMINESCENCE PROPERTIES OF ZINC MAGNESIUM SULFOPHOSPHATE GLASSES DOPED WITH SAMARIUM (III) OXIDE

Shahirah Binti Deraman and Prof. Dr. Rosli Hussin

A series of Zinc magnesium sulfophosphate glasses doped with Samarium (III) oxide with composition (60-x) P_2O_5 -30$MgSO_4$-10ZnO-xSm_2O_3 are prepared (x = 0, 0.5, 1.0, 1.5, 2.0 mole %) using melt quenching technique. P_2O_5 -$MgSO_4$-ZnO-Sm^{3+} glasses optically active with rare earth ion with 4f electronic configuration of Sm^{3+}.The structure of these materials has been studied by ultraviolet –visible spectroscopy meanwhile the structural information via vibration modes was provided by Fourier Transform Infrared spectroscopy. The luminescence were also observed by photoluminescence spectroscopy. The result shows absorption spectra consist five absorption peak at 320, 400, 480, 820, and 950nm corresponding to the transition from the ground state $^6H_{5/2}$ to various excited energy level. The modes of vibration from infrared spectroscopy in this sulfophosphte glass system have two dominant absorption bands in the frequency range of 550-760 cm^{-1}. The absorption spectra were obtained at around 554cm^{-1} can be ascribed to deformation modes of $PO_4^{3-}$and 753cm^{-1} was referred to asymmetric stretching

mode of P-O- P linkages. The luminescence properties of the doped sample were measured based on analysis of emission spectra. Result showed that the emission band of Sm^{3+} are 555 and 579 nm due to the transition of $^4G_{5/2} \rightarrow {}^6H_{5/2}$ and $^4G_{5/2} \rightarrow {}^4H_{7/2}$respectively.

PREPARATION AND CHARACTERIZATION OF COBALT-SUBSTITUTED MANGANESE FERRITE NANOPARTICLE

Nurulhuda Binti Azman and Prof. Dr. Zulkafli Bin Othaman

Ferrites is a ceramic ferromagnetic materials that have been considered as highly important electronic materials for more than half a century. Recent studies showed it contribution and application in electronics, automobile and computer are limitless and keep growing as the day passing by due to their extraordinary properties of electrical, magnetic and optical. The effect of different synthesize temperature on the structure and morphology properties of Cobalt substituted Manganese Ferrites was investigated in this study. Cobalt substituted Manganese Ferrites with composition of $Co_{1-x}\ Mn_x\ Fe_{2-x}\ Al_x\ O_4$ where x are (0.0, 0.4, 0.8) were prepared using co-precipitation method at three different synthesize temperature 600°C, 750°C and 900°C. X-ray diffraction (XRD) technique is used to confirm the identification crystalline structures of samples. The Fourier Transform Infrared (FTIR) spectroscopy is manipulated to observe the functional groups structural. The nanocrystalline structure and grain distribution were recognized by Field Emission Scanning Electron Microscope (FESEM). The crystallite size of 19-26 nm is procured using Scherer's Formula and as the synthesize temperature increase, the size of the particle also experience the increment. The fragment showed a supreme amount which is 26 nm for the sample synthesize at 900°C. FT-IR studies indicate that the spinal phase formation which are tetrahedral and octahedral takes place at higher synthesize temperature. The homogenous grain distribution of cubic shape with gain in size as accretion in synthesize temperature were revealed by FE-SEM.

EFFECT OF Mg-Al SUBSTITUTION ON THE STRUCTURAL AND MORPHOLOGICAL PROPERTIES OF Co FERRITES

Wan Muhammad Izuddin B. Wan Nawi and Prof. Dr. Zulkafli Othaman

Ferrite magnetic materials have wide applications in various technological fields. They are used in applications such as electronic, automobile, computers and in new emerging fields due to their remarkable electrical, magnetic and optical and other properties. The structural, magnetic and electrical properties of ferrites are depending on several factors such as the method of preparation, stoichiometry, substitution of cations and annealing temperature. In this study, the effect of Magnesium-Aluminium substitution on the structural and morphological properties of Cobalt ferrites in different temperature was investigated. Magnesium-Aluminium substitute in Cobalt ferrites with the general formula $Co_{1-x}Mg_xFe_{2-x}Al_xO_4$ (x = 0.0, 0.4 and 0.8) were prepared by co-precipitation method and the samples were annealed at temperature of 600°C, 750°C and 900°C. The formation of nano-particles with different composition, microstructure and sizes were confirmed by X-ray diffraction (XRD), FT-IR and FESEM. The XRD acquired shows pure phase of Magnesium-Aluminium substitute in Cobalt ferrites. The crystallite size of 14 – 25 nm is obtained using Scherer's formula and the crystallinity of the samples increases with increasing annealing temperature. The lattice parameter showed a minimum value for the sample heated at 900 °C. It has been observed that the grain size increases as annealed temperature increases and it is maximum (25nm) for the powder annealed at 900°C. FT-IR studies indicate that the spinel phase formation takes place at higher annealing temperature. The absorption bands shifted to lower values for the annealed samples. Grain size distribution for the samples is investigated by FE-SEM which displayed homogeneous grains of cubic shape with increased in grain size along with the increasing of annealing temperature.

Chairperson session 3 : Dr. Rosnita Muhammad
Time : 2.30pm – 5.00pm

1. Surface Morphology and Photoluminiscence Properties of Zinc Oxide Thin Films Prepared By Dip Coating Method with Different Number of Layer of Coating
   Hasinah Binti Alias & Assoc. Prof. Dr Karim Deraman

2. Effect of Withdrawal Speed on Structural, Photoluminescene and Optical Properties of Zinc Oxide Thin Film by Dip Coating Method
   Khairulanwar Bin Abu Shah & Prof Madya Dr Karim Deraman

3. Optical Properties and Surface Morphology of Zinc Oxide Thin Films Synthesized by Sol Gel Dip Coating Method with Different Annealing of Temperature
   Muhammad Akmal Bin Mohd Minhat & Prof Madya Dr Karim Deraman

4. Physical and Optical Properties of Neodymium Doped Tellurite Glass
   Loh Chun Seng & Assoc. Prof. Dr. Sib Krishna Ghoshal

ABSTRACTS

SURFACE MORPHOLOGY AND PHOTOLUMINISCENCE PROPERTIES OF ZINC OXIDE THIN FILMS PREPARED BY DIP COATING METHOD WITH DIFFERENT NUMBER OF LAYER OF COATING

Hasinah binti Alias andAssoc. Prof. Dr. Karim Deraman

In this research, zinc oxide, ZnO thin films with different thickness were prepared by sol-gel dip coating method on glass substrates. The precursor solution used were zinc acetate dehydrate (Zn(CH3COO)2.2H2O) and 2-propanol (C_3H_8O). Diethanolamine (DEA) was used as a stabilizer to produce a clear solution that was aging for 24 hours. Dip coating was repeated several times to produce different thickness of films from 1 to 9 layers at constant withdrawal speed, 0.9cm/min. After each successive coating, the films were preheated at 170^{o}C for 15 minutes. Then the films were annealed at 500^{o}C for 1 hour to get a better surface structure. The surface morphology and photoluminescence properties of these films were studied by using atomic force microscopic (AFM) and photoluminescence (PL). The thickness of films was in the range of 150 nm to 370 nm, measured by using ellipsometer. While the refractive index of films were in the range of 2.3 to 2.7. With the increase of film thickness, the surface roughness and grain sizes were increased from 2.44 to 51.02 nm and 71.32 to 430 nm respectively. Photoluminiscence spectra showed that the peak emission were varies in the wavelength of 383.75 to 388.22 nm.

EFFECT OF WITHDRAWAL SPEED ON STRUCTURAL, PHOTOLUMINESCENE AND OPTICAL PROPERTIES OF ZINC OXIDE THIN FILM BY DIP COATING METHOD

Khairulanwar Bin Abu Shah and Assoc. Prof. Dr. Karim Deraman

Zinc oxide (ZnO) thin films were prepared by using sol-gel technique. To prepare zinc solution, zinc acetate dehydrated was used as starting material and dissolve in 2- propanol. Diethanolamine was used in this solution as a stabilizer. Then the solution was stirred at 60^{o}C for one hour and keep at room temperature for one night. The ZnO thin films were deposited on glass substrate by using dip coating method. Various withdrawal speed is used in the deposition of ZnO thin films from the range of 40 mm/s – 90 mm/s for five layers each speed. After each layer of coating the films were preheated at 200^{o} C for 15 minutes.The deposited films were annealed at 550^{o}C for one hour to remove impurities and to form oxide layers. The effects of withdrawal speed on ZnO thin films on morphology and optical properties has been investigated using atomic force microscopy (AFM), photoluminescence spectroscopy and UV-Vis spectroscopy. The grain size of the thin film increases with an increasing withdrawal speed. The average grain size of ZnO thin films for four different speed is increasing from 120nm to 135nm. All the thin films shows optical transmittance in the visible region about 60 ~80%. The photoluminescence spectra shows that the peak emission of all films were varies in the wavelength of 378.92nm to 383.32nm.

OPTICAL PROPERTIES AND SURFACE MORPHOLOGY OF ZINC OXIDE THIN FILMS SYNTHESIZED BY SOL GEL DIP COATING METHOD WITH DIFFERENT ANNEALING OF TEMPERATURE

Muhammad Akmal bin Mohd Minhat and Assoc. Prof. Dr. Karim Deraman

The Zinc Oxide thin films with different annealing temperature from 300^{0}c to 500^{0}c are prepared by using sol gel dip coating method .The sol gel solution is prepared by using chemical mixtures which is diethanolamine (DEA) ,ethanol ,and zinc acetate .Five samples of zinc oxide thin film with different temperatures were achieved to determine their surface morphology and optical properties .The surface morphology of the samples are investigated by Atomic Force Microscopy (AFM). The roughness of ZnO thin films samples with different temperature samples were obtained in the range 3.15 nm to 7.30 nm . The optical properties of ZnO thin films were analysis by using Photoluminescence Spectroscopy (PL) and UV-VIS Spectroscopy .Meanwhile ,the emission behaviour is detected by photoluminescence spectroscopy .The emission spectra shows the strong peak in the UV range at 330nm and

relatively with peak at 380nm . The emission of spectra was dominated at 375 nm and the peak intensity of the luminescence were found increased at temperature 300^0c until 400^0c then ,at temperature 450^0c decrease to 500 ^{0}c . The energy bandgap of the ZnO was determined using UV-VIS Spectrometer and it was found that the energy band gap of the ZnO is between 3.20 eV and 3.24 eV. The results were found to be comparable with those obtained by other journals.

PHYSICAL AND OPTICAL PROPERTIES OF NEODYMIUM DOPED TELLURITE GLASS

Loh Chun Seng and Assoc.Prof. Dr. Sib Krishna Ghoshal

Tellurite glass has emerged to be a vital photonics material due to its high refractive index, wide transmission range, low phonon energy and good corrosion resistance. Its optical property is enhanced by doping rare earths (RE) while neodymium (Nd) has been frequently doped for lasing purpose attributed to its sharp emissions and good solubility. However, self-quenching due to Nd3+-Nd3+ interaction oppresses the lasing efficiency. In fact, the physical and optical properties of glass doped with relatively higher RE concentration (2–4 mol %) are yet far from being understood. In this study, a series of (70-x)TeO2–30ZnO–xNd2O3 (x=0.0, 2.0, 2.4, 2.8, 3.2, 3.6, 4.0) glasses is synthesised using melt-quenching technique. XRD analysis confirms the amorphous nature of the samples. UV-Vis spectroscopy reveals 9 absorption peaks in the visible range at where 584 nm is dominating. The UV absorption edge is further analyzed to calculate band gap energy, Urbach energy, refractive index and polarizability. Conversions of TeO_3 and TeO_{3+1} to TeO_4 units are deduced from the increasing indirect band gap energy and decreasing refractive index with RE addition. The increasing polarizability may be contributed by the lower field intensity of Nd ions than that of Te. Photoluminescence spectroscopy exhibits 4 peaks of visible light correspond to the transitions to the $^4I_{9/2}$ ground state from $^2D_{5/2}$ (422 nm), $^2P_{1/2}$ (443 nm), $^2G_{9/2}$ (485 nm) and $^4G_{7/2}$ (543 nm). From most of the peaks, optimum luminescence intensity is determined to be at 2.80 mol % Nd_2O_3 concentration. Self-quenching happens at the onward concentration until a recovery is demonstrated at 4.00 mol%. FTIR spectroscopy confirms the existences of bridging oxygen (BO) and non-bridging oxygen (NBO) in the glasses. Glass transition (T_g), crystallization (T_x) and melting temperature (T_m) are affirmed to be in the range of 350-366 °C, 420-434 °C and 878-881 °C respectively using DTA.

VENUE :Physics Meeting Room (C21-318)
DATE :1June 2016 (Wednesday)
Chairperson session 4 : Dr. Ezza Syuhada Sazali
Time : 08:30am – 10:10am

1. Influence of Erbium Ions Concentration on Structural and Optical Properties of Zinc Tellurite Glass
   Sylviana Jones & Assoc Prof Dr. Sib Krishna Ghoshal

2. Absorption and Emission Features of Europium Doped Zinc Tellurite Glass
   Nur Hafawati Binti Abdullah & Assoc Prof Dr. Sib Krishna Ghoshal

3. The Effect of Pelletizing Time on Hap Ceramics
   Mohammad Dzarul Hafiz Bin Dol Malek & Assoc Prof. Dr. Zuhairi Ibrahim

4. The Structural and Optical Properties of GaAsThin Film for Solar Cell Application
   Nor Hidayah Binti Md Amin & Dr. Wan Nurulhuda Wan Shamsuri

ABSTRACTS

INFLUENCE OF ERBIUM IONS CONCENTRATION ON STRUCTURAL AND OPTICAL PROPERTIES OF ZINC TELLURITE GLASS

Sylviana Jones and Assoc Prof. Dr. Sib Krishna Ghoshal

Rare earth ions doped tellurite glass have been a great deal of interest for diverse industrial applications. Er^{3+} -doped zinc tellurite glasses with molar composition of $(70-x)TeO_2-20ZnO-10ZnCl_2-xEr_2O_3$ where $(0.00 \leq x \leq 0.25)\, mol\%$ are prepared by melt quenching technique. The structural and optical properties of synthesized glasses are investigated and characterized using X-Ray Diffraction (XRD), Differential Thermal Analysis (DTA), Fourier Transformation Infrared (FTIR), UV-Vis-NIR and Photoluminescence spectroscopy. Density and molar volume have been measured and lies within the range of 5.229 to 5.453 gcm^{-3} and 25.9768to 27.0949 cm^3mol^{-1}, respectively. The non-crystalline nature of synthesized samples are shown in the XRD pattern. Thermal stability of samples are overall increases (127.9-137.0 ℃) due to increasing Er^{3+} concentration obtained from DTA results. UV-Vis-NIR spectra was observed at room temperature in the wavelength range of 400-1000 nm displays five absorption bands. The indirect transition of optical band gap (3.02-3.22 eV), Urbach energy (0.13-0.26 eV) and refractive index (2.3404-2.3917) are calculated and revealed to be firmly erbium concentration dependent. Photoluminescence spectra are evaluated at the excitation of 380 nm at room temperature in the wavelength range of 520-650 nm showed emission peaks of

$4_{S_{3/2}}$ transition Results are analysed, explained and compared which developed a good understanding of influence of erbium concentration on zinc tellurite glass.

ABSORPTION AND EMISSION FEATURES OF EUROPIUM DOPED ZINC TELLURITE GLASS

Nur Hafawati Bt Abdullah and Assoc. Prof. Dr. Sib Krishna Ghoshal

Series of europium (Eu^{3+}) doped zinc tellurite glasses of composition (75-x)TeO_2□25ZnO□xEu_2O_3 with (0.0≤x≤ 2.0 mol%) are prepared via melt quenching method. Synthesized glasses are characterized using X-Ray Diffraction (XRD), Differential Thermal Analyzer (DTA), Fourier Transform Infrared (FTIR) Spectroscopy, UV-Vis-NIR, and Photoluminescence (PL) spectroscopy. The XRD pattern confirmed the amorphous nature of samples. The density is found to be increase in the range of 5.3466 to 5.4610 g/cm^3. The molar volume increase from 26.1944 to 26.3797 cm^3/mol^{-1} but decreases to 26.3500 cm^3/mol^{-1}. The refractive index (2.3651 to 2.3895), the molar refraction (15.8459 to 16.0970 cm^3mol^{-1}) and polarizability (6.2818 ×10^{-24} to 6.3814 ×10^{-24} cm^3) are found to be increase. All glasses posses good thermal stability where ΔT > 100 °C.The glass forming tendency, Hruby parameter increase from 0.28 to 0.35. FTIR spectral analysis explore the presence of linkage bond of Te-O-Te, O-H, H-O-H and TeO_{3tp} at range 4000 – 400 cm^{-1}. UV-VIS-NIR spectra displayed four absorption bands centered at 462, 533, 580 and 635 nm corresponding to the transition from the ground to the excited states $^7F_0$→$^5D_2$, $^7F_0$→ $5D_1$, $^7F_0$→$^5D_0$, $^7F_1$→$^5D_0$ respectively. Direct and indirect band gap energy are found decreasing where the values are 3.426 to 3.336 eV and 3.122 to 3.028 eV respectively. Urbach energy is increasing from 0.404 to 0.850 eV. Emission spectra under the excitation of 393 nm showed emissions peaks due to the transition for $^5D_2$→$^7F_0$, $^5D_2$→$^7F_1$, $^5D_1$→$^7F_0$, $^5D_1$→$^7F_1$, $^5D_1$→$^7F_2$, $^5D_0$→$^7F_1$, $^5D_0$→$^7F_2$, $^5D_0$→$^7F_3$, $^5D_0$→$^7F_4$ were found to be around 468nm, 483nm, 509nm, 535nm, 554nm, 586nm, 613nm, 650nm and 698nm respectively. Results are analyzed, explained, and compared.

THE EFFECT OF PELLETIZING TIME ON HAp CERAMICS

Mohammad Dzarul Hafiz Bin Dol Malek and
Assoc. Prof. Dr Zuhairi Ibrahim

Calcium Phosphate ceramics, $Ca_{10}(PO_4)_6(OH)_2$ or Hydroxyapatite, HAp in powder were prepared using the dry pressing method at difference palletizing time at 2 minutes, 4 minutes, 6 minutes, 8 minutes and 10 minutes to produce a round shape ceramic at different times. HAp ceramics had been sintered for an hour in temperature of 800^{o}C. The strength of HAp ceramics was evaluated and had been tested by measuring its Young's Modulus, density, number of Vickers' Pyramid or hardness and porosity. The results showed an increase in Young's Modulus (1226-1282)MPa, density (2.36-2.41) gcm^{-3} and Vickers' Pyramid number (10.2-13.5)Hv whilst decreased on porosity (8.13-3.35)% with increasing palletizing time. As such, the palletizing time plays an important role in strengthening the HAp ceramics.

THE STRUCTURAL AND OPTICAL PROPERTIES OF GaAs THIN FILM FOR SOLAR CELL APPLICATION

Nor Hidayah Binti Md Amin and Dr Wan NurulhudaBinti Wan Shamsuri

The purpose of this research is to investigate the structural and optical properties of gallium arsenide thin films which is prepared using RF magnetron sputtering. The samples have been deposited on the glass substrates using a high purity GaAs target at 2.7 x 10^{-2}Torr and power of 50 W at different time of deposition. The different time of samples deposition is between 2, 4, 6 , 8 and 10 minutes. Five samples of undopedgallium arsenide thin filmswere achieved to determine their structure and optical properties. The optical properties of the samples wereinvestigated using UV-Vis Spectrophotometer 3101-PC. The absorption and transmittance were obtained in the range of 200 nm to 1000 nm. From the absorption investigations, the optical band gap(E_g) were determined to be in the range 1.63 eV to 1.70 eV (direct energy band gap). The transmittance has more than 50% in the wavelength range of 250 nm to 500 nm. Meanwhile, the structural of GaAs thin film was studied using Atomic Force Microscopy(AFM) where the highest value of surface roughness was 7.86 nm.

Chairperson session 5 : Mdm Masleeyati Yusop
Time : 11:00am – 1:00pm

1. Effects of Lithium Chloride on Phosphate Oxychloride Glass
   Dayang Nur'irma Farahain & Dr Ramli Arifin

2. Structure and Electrical Properties of Yttria-Stabilized Zirconia Thin Film Grown Using Radio Frequency Magnetron Sputtering
   Syarifah Aloyah Binti Syed Husin & Dr. Rosnita Muhammad

3. Computational Study of Barium Titanate, $BaTiO_3$ Properties
   Mohd Afzol Bin Ramle & Dr. Rashid Ahmed

4. Fabrication and Characterization of Zinc Antimony Sulfide (ZAS) Thin Films
   Nor Afifah Nashuha Binti Azmi & Dr Rashid Ahmed

ABSTRACTS

EFFECTS OF LITHIUM CHLORIDE ON PHOSPHATE OXYCHLORIDE GLASS

Dayang Nur' Irma Farahain and Dr. Ramli Ariffin

Phosphate glasses in a system of magnesium lithium phosphate were synthesised. The glass samples in a nominal composition of (80-x) P_2O_5–10MgO–10Li_2O–xLiCl where x = 0, 5, 10, 15, 20 mol % were prepared by means of the conventional melt-quenching technique. The effect of lithium chloride content on the structural properties of glass samples in the system of P_2O_5–MgO–Li_2O–LiCl has been established using the Fourier Transform Infrared (FTIR) spectra. Whilst physical properties; density and molar volume of the glass samples have also been measured as supportive data for the study. Results obtained from this study indicated that increasing of glass/network modifier LiCl content (mol fraction) in the phosphate glasses increase the density progressively at the same time decreasing the molar volume. The observed changes in the FTIR spectra of the glass samples were associated to the role of phosphate oxide, P_2O_5 as glass/network former. Both variation of frequencies and intensity of the infrared bands have been actualised all the compositions for phosphate group frequencies' characteristic which includes P=O-P stretching modes, P-O-P stretching and bending modes and P-O bending mode and etc. Furthermore, the intensity and wavenumbers of the infrared bands around 1635 cm^{-1} and 3450 cm^{-1}, associated to P-O-H bond or water. The changes observed in these infrared bands validated the role of water as an additional glass modifier. The local structure, analysed by the FTIR absorption spectroscopy can be concluded to be almost myopic to the content of lithium.

STRUCTURE AND ELECTRICAL PROPERTIES OF YTTRIA-STABILIZED ZIRCONIA THIN FILM GROWN USING RADIO FREQUENCY MAGNETRON SPUTTERING

Syarifah Aloyah Binti Syed Husin and Dr. Rosnita Binti Muhammad

Solid oxide fuel cells (SOFC) is an efficient device for converting chemical energy into electrical energy. Yttria Stabilised Zirchonia (YSZ) material is one of the most important materials as electrolyte in SOFC applications. In this study, YSZ thin film has been prepared using Radio Frequency Magnetron Sputtering. Glass substrate was used as a substrate for the YSZ thin film deposition. Samples were prepared by two different growth parameters which are deposition time and RF power. The samples was then annealed at 400^{o}C for one hour. The YSZ thin film were characterized using FESEM, EDX, AFM and XRD. The electrical properties of YSZ material were characterized using CAFM. From the structural measurement, FESEM images shown that the thickness of thin film increased with the growth time from 15 to 60 minutes. AFM morphology shows that with the annealing at 400^{o}C, grain size of the YSZ materials decreased with the increasing of growth time with the increasing of density. The measured grain size was 267, 172 and 101 nm for the growth time of 15, 30 and 60 minutes respectively. The XRD results shows that some of the significant peak of YSZ obtained such as [111] and [002] at 2θ at 30^{o} and 36^{o}. YSZ thin film composition was determined using the EDX. The conductivity of YSZ thin film shows that the effect of electron tunneling occurs between CAFM tip and YSZ thin film with a graph in the form of forward bias at the positive voltage supply.

COMPUTATIONAL STUDY OF BARIUM TITANATE, $BaTiO_2$PROPERTIES

Mohamad Afizol Bin Ramle and Dr. Rashid Ahmed

The study of Barium Titanate, $BaTiO_2$structure commonly investigate by experimental but in this research, the computational study applied. Investigation on the electronic structure of Barium Titanate (BT), band structure and density of state (DOS) of paraelectric BT in the cubic phase using the full potential-linearized augmented plane wave (FP-LAPW) method in WIEN2k package software.WIEN2k package calculation based on the density functional theory. The electronic band structure were calculated and simulate based on this theory. This study discussed on the simulate and modelling the electronic structure of BT. Determine the thermoelectric and ferroelectric properties of BT. One fundamental model of the BT with the changing of the electronic structure was created. The changing of the electronic structure were based on the adjusted cubic unit cell of BT. The band structure, total density of states (DOS),

and electronic density in paraelectric cubic crystal BT determined based on the generalized gradient approximation (GGA) from the graph plotted by the FP-LAPW analysis on the WIEN2k package. The calculation were done within the density functional theory with GGA for solving the Kohn-Sham equation. The band gap were calculated by using this GGA approximation is below than experimental result. Full potentials-linearized augmented plane wave (FP-LAPW) method used the improved approach to calculate the precious result.

FABRICATION AND CHARACTERIZATION OF ZINC ANTIMONY SULFIDE (ZAS) THIN FILMS

Nor Afifah Nashuha Binti Azmi and Dr. Rashid Ahmed

Zinc antimony sulfide thin films were prepared on glass substrate by using thermal vaporization technique. Zinc antimony sulfide thin films is a ternary compound, has wide gap and direct transition semiconductor. Zinc powder and antimony sulfide powder have been deposited on a substrate by using the molybdenum as a boat. The thin films were annealed in argon gas at various substrate temperature range of 150 – 300˚C. The characterization of the thin films properties of four samples were performed by means of UV-Visible Spectroscopy. Optical properties of the thin films were characterized by measuring absorbance and transmittance in the range of wavelength 200 – 1000 nm by subtracting the glass substrate as a reference. The films were found to exhibit high transmittance (25 - 50%). The absorbance of the thin films was found to be high in the ultra violet region with peak around 310 nm. The band gap was found to be high also. It was observed that the energy gap increase with the increase in the annealing temperature. The films were also characterized by investigating optical microscopy. Atomic-force microscopy or AFM is a scanning probe microscopy to measure the topography and other surface properties. It was observed that the surface roughness of the thin films were different from each other. The value of root mean square for roughness was found to be high around 4 nm – 9 nm.

Chairperson session 6 : Assoc. Prof. Dr. Zuhairi Ibrahim
Time : 2.30pm – 5.00pm

1. Effect of Alumina Particle Size on Hardness and Physical Properties of Alumina Copper Composite
   Nurul Najwa Binti Ahmad Jusoh & Mdm. Masleeyati Yusop

2. Effect of Plastic Deformation on Curie Temperature of Gadolinium Using Pc Interfaced Resistivity System
   Masilah Binti Tumeran & Mr. Abd Rashid Abd Rahman

3. Determination of Surface Roughness and Topography of Different Types of Salts Using AFM Analysis
   Muhammad Naqib Bin Mohd Rashdi &En. Muhammad Nor Muhamad

4. Structural and Optical Properties of Dysprosium Doped Tellurite Glass
   Rezki Sabrina Binti Masse & Assoc Prof Dr Sib Krishna Ghoshal

ABSTRACTS

EFFECT OF ALUMINA PARTICLE SIZE ON HARDNESS AND PHYSICAL PROPERTIES OF ALUMINA COPPER COMPOSITE

Nurul Najwa Bt Ahmad Jusoh and Mdm. Masleeyati Bt Yusop

Ceramic matrix composite (CMC) is a composite that has excellent physical and mechanical properties as well as its unique ability. In this study Al_2O_3-10 wt. % Cu composite with different alumina particle size (50μm, 100μm, and 125μ) were investigated on its properties. This composite were successfully produced by dry pressing method with constant pressure at 199MPa. All the three samples were sintered at constant temperature of 1200°C for 2 hours. Physical properties and hardness of these samples were observed as the particle sizes of alumina were varied. The hardness of the composite was measured by the Vickers test whereas the density and the porosity of composite were measured by using analytical balance. The result shows the density of composite increased from 2.489gcm^{-3} to 2.783gcm^{-3} with the increased of alumina particle size. As the particle size increased, the porosity of ceramic metal composite decreased from 67.09% to 56.10%. This is due to the void space between the particles are not compacted together and it leads to an increase of total porosity. Other than that, the bond between composite particles also increases when the smaller alumina particles were sintered. Besides, hardness of the ceramic matrix composite also decreased as the increase of particle size which are from 52.4 HV to 42.77 HV. It shows that particle size of alumina had significant effects to the mechanical and physical properties of Al_2O_3-Cu composite.

EFFECT OF PLASTIC DEFORMATION ON CURIE TEMPERATURE OF GADOLINIUM USING PC INTERFACED RESISTIVITY SYSTEM

Masilah Binti Tumeran andMr. Abd Rashid Abd Rahman

A study had been conducted on a Gadolinium (Gd), to see the effect of plastic deformation on its curie temperature using PC interfaced resistivity system – the transition between its ferromagnetic and paramagnetic phases. The dimension of the sample used was 1.8mm wide by 25mm long and 0.28mm thick. The sample was subjected to plastic deformation upon it by bending process. A set of rollers were designed and built for the purpose of bending the strip back and forth in order to introduce plastic deformation by a controlled amount. The amount of plastic deformation was determined by the Young's Modulus of the sample measured by the bending method. Observation from the change in the slope of its resistivity curve as a function of temperature gives the information of the transition between the paramagnetic and ferromagnetic stage of the sample. The resistivity was determined by using four point probe technique. In order to hold the sample during the resistivity measurement, a contact type Copper-Beryllium point was design and built. Cryostat was developed by using a stainless steel flask. While maintaining electrical and thermal insulation, the temperature was able to maintain by placing the sample on a copper block with a massive thermal mass. Coolants used were liquid Nitrogen and ice, and a pair of 1 W carbon resistors was used which has been fixed at the bottom of the copper block to raise the temperature. The interfacing concept was applied to get the accurate and faster result than before.

DETERMINATION OF SURFACE ROUGHNESS AND TOPOGRAPHY OF DIFFERENT TYPES OF SALTS USING AFM ANALYSIS

Muhammad Naqib Bin Mohd Rashdi andMr. Mohammad Noor Muhamad

The aim of this study is to determine surface roughness and topography of different types of salts. Salt that been used in the study are mountain salt and common. The mountain salt is separated into two different type of salt. First sample of each salt was polished using sand paper that attach to rotary platform with adjustable revolution per minute. After finish polishing, the samples were rinse with water to remove the unwanted remaining and wipe dry then stored inside container with silica gel. Second sample of each salt was polished using sand paper using hand. The sample were brushed with brush to remove the remaining then stored inside container with silica gel. Topography of each sample was examined by SPA300HV Atomic Force Microscope. Sample's surface has been scanned in non-contact mode with OMCL-AC200TS-C3 tip. Measured topography data were processed by Gwyddion V2.45

software. Average roughness and maximum peak-to-valley distance were compared among the same type of salt. First sample of mountain salts have lower average roughness compare to second sample while opposite result in common salt. Average maximum peak-to-valley distance also have similar pattern between first and second sample. Method to polish the salt and finishing touch do influence the average values of roughness and maximum peak-to-valley distance.

STRUCTURAL AND OPTICAL PROPERTIES OF DYSPROSIUM DOPED TELLURITE GLASS

Rezki Sabrina Bt Masse and Assoc Prof. Dr. Sib Krishna Goshal

Series of dysprosium (Dy^{3+}) doped zinc tellurite glasses of molar composition (75–x) TeO_2-25ZnO-xDy_2O_3 where $0.0 \leq x \leq 1.0$ mol% are prepared using melt quenching technique. For these synthesized glasses Differential Thermal Analysis (DTA), X-Ray Diffraction (XRD), Fourier Transform Infrared (FTIR), UV-Vis-NIR, and Photoluminescence (PL) spectroscopy were carried out. The thermal parameters are characterized using DTA. The influence varying concentrations of Dy^{3+} on the physical and optical features of the samples is determined. The XRD pattern confirmed the amorphous nature of the glass while the structural properties of Dy^{3+} have been studied through FTIR spectra. The calculated glass density is increased from 5.352 to 5.479 gcm^{-3} attributes to addition of Dy^{3+} ions. The molar volume (2.803 to 2.738 cm^3) is found to decrease due to the formation of the number of non-bridging oxygen (NBO). UV-VIS absorption spectra revealed six peaks and subsequently used to determine the energy band gap and Urbach energy. The refractive index (2.425-2.581), the molar refraction (21.603-23.299 cm^3) and polarizability (8.564×10-24 to 9.236×10-24 cm^3) are obtained due to alteration of dysprosium contents. The luminescence spectra exhibit three emission peaks at 459, 483 and 573nm corresponding to $^4I_{15/2} \rightarrow {}^6H_{15/2}$ (violet), $^4F_{9/2} \rightarrow {}^6H_{15/2}$ (blue) and $^4F_{9/2} \rightarrow {}^6H_{13/2}$ (yellow) transitions respectively. Results corresponding to the compositional changes were analyzed, explained and compared with previous studies. Careful characterization for physical and optical properties are capable to provide useful ideas for the development of dysprosium doped zinc tellurite glass based devices.

2. LASER & APPLIED OPTICS

(LIST OF PRESENTERS AND ABSTRACTS)

VENUE :Physics Instrumentation Teaching Laboratory 3 (C20-307)
DATE :31May 2016 (Tuesday)
Chairperson session 1 :
Time : 08:30 am– 10:30am

1. The Effect of Transverse Magnetic Field on Growth of Carbon Nanotubes by Arc Discharge Technique
   Nurul Shahirah Binti Mohamad & Prof.Dr.Jalil Bin Ali

2. Laser Cleaning
   Nursyahida Binti Jamalludin & Prof. Dr. Noriah Binti Bidin

3. Electrical Conductivity of Honey
   Faten Nurhanani binti Abdul Razak & Dr.Ganesan A/L Krishnan

4. Characteristics Performance of Erbium Doped Fiber Laser
   Siti Fatihah Binti Selamat & Prof Madya Dr Yusuf Munajat

5. LIBS for Elemental Composition Determination In Potato Skin From Different Variance
   Low Jia Hooi & Prof Madya Dr. Yusof Bin Munajat

ABSTRACTS

THE EFFECT OF TRANSVERSE MAGNETIC FIELD ON GROWTH OF CARBON NANOTUBES BY ARC DISCHARGE TECHNIQUE

Nurul Shahirah Binti Mohamad and Prof.Dr.Jalil Bin Ali

Unique properties of carbon nanotubes (CNTs) make them potential material for differenttechnological applications in field of engineering, medicine, material science and electronics.In present study, the effect of external transverse magnetic fields on growth of carbon nanotubes by arc discharge technique is investigated. Carbon nanotubes are grown in presence of external magnetic fields0mT, 5mT, 10mT, 15mT, 20mT and 25mT.The arc discharge is produced between two graphite in hydrogen environment at low pressure 10 mbar with applied DC voltage 12 V and arc current 70 A. The samples of CNTs synthesized at different magnetic fields are characterized using field emission scanning electron microscopy (FESEM) and X-ray diffraction (XRD).FESEM analysis reveals that the diameter of CNTs increases from 10 nm to 25 nm with increase in strength of applied magnetic fields. Besides that, XRD analysis of CNTs prepared under different magnetic fields show peak shift of (002) plan towards lower angle to 25.09°. By comparison with the sharp reflection peak (002) of graphite at 26.66°, it indicatespresence of CNTs structure with large quantity and smaller diameter.FESEM and XRD analyses of synthesized CNTs showthat the increase in the external transverse magnetic fields significantly increases the growth of CNTs and also increases the size of diameter.

LASER CLEANING

Nursyahida Binti Jamalludin and Prof. Dr. Noriah Binti Bidin

The projects aim was to develop a laser ablation clean system as the alternative way to clean contaminated layer ratherthan using chemical substances. Nd:YAG solid state laser at wavelength of 1064 nm was acted as gain medium of laser with Q-switch technique that produced pulse laser. Chromium (Cr) was been chosen as the sample which being covered with molding compound contained carbon (C) as main elements of the compound. Scanning electron microscope with energy dispersive X-ray spectroscopy analysis (SEM/EDX) was used to analyze the samples before and after laser cleaning. The results shows that the percentage mass for carbon decreased after cleaning and the existence of oxide layer due to passivation. Cleaning efficiency for all samples shows 140 kJ was the most efficient in cleaning with efficiency at 89.5% whereas 80kJ shows the least effective with 82% only. Based on the results, it shows that cleaning can be done by using laser which has advantage where laser cleaning system is environmental friendly which do not produce any waste product.

ELECTRICAL CONDUCTIVITY OF HONEY

Faten Nurhanani binti Abdul Razak and Dr.Ganesan A/L Krishnan

Honey exhibits varying degrees of electrical conductivity due to variation in electrolyte content.Manufacturers do not usually publish or measures the electrical conductivity of honey.In this study, the electrical conductivity of different types of honey was determined via Wenner method. The Wenner method system was developed and the four-electrode plates were arranged with inner plate of 0.51cm apart.Direct current voltage was supplied to the outer plates and a current was induced between inner plates. The induced current and potential differences across inner plates were measured by ammeter and voltmeter respectively. The system was verified by using a standard solution with conductivity of 1413μS/cm. The conductivity of the solution measured by the system was 1413.75μS/cm with the percentage error of 0.05%. The conductivity of sample Cis109.75μS/cmis the highest among three samples. Sample A show the lowest electrical conductivity which is 1.403μS/cm, while the conductivity of sample B is 40.91μS/cm.This indicates that the content of mineral substance in sample C is higher than other samples.Sample C also has the darkest hue compared to other samples while sample A has the lightest hue. Qualitatively, honey with darkest hue has higher mineral content and therefore higher electrical conductivity.

CHARACTERISTICS PERFORMANCE OF ERBIUM DOPED FIBER LASER

Siti Fatihah Binti Selamat and Assoc.Prof. Dr. Yusuf Munajat

In area of research in telecommunication, signal with 1550 nm wavelength is the most desirable wavelength for transmitting data because its attenuation and loss in glass fiber are much lesser with wavelength at this region. Previous research has found that erbium doped fiber produce output wavelength that is close to 1550 nm. In this work an erbium doped fiber laser was studied to achieve the effect of output power in varying input current. A semiconductor laser diode was used to pump 980nm to a ring configuration EDFL. Wavelength division multiplex of 980/1550 nm was used to converge two different wavelengths from pump source, 980 nm and output coupler, 1550 nm into one channel. A 50/50 split ratio output coupler was used to split 1550 nm wavelength into two portions for measurement purpose and to resonate light of the fiber laser. After light passes through the EDF, two peaks were discovered due to lasing of 1550 nm wavelength and from laser diode 980 nm. Experimental result shows with input power of 0.114 μW (from 70 mA input current) produced the threshold output wavelength for EDFL which was 1562.4 nm. Input current was varied up until 450 mA with its output power 1.507 μW. The results for output spectrum were filtered using Gaussian Kernel Density filter to observe the changes in bandwidth (Full width at half maximum, FWHM) for both wavelengths at 975.193 nm and 1562.41 nm. As increasing input current, the bandwidth for 975.193 nm does not change and stays for 117.947 nm. For wavelength 1562.41 nm at threshold point, its bandwidth was 355.85 nm and increases as input current increases. This is due to the gain medium of EDF where wavelength at approximately close to 1550nm where lasing occurs.

LIBS FOR ELEMENTAL COMPOSITION DETERMINATION IN POTATO SKIN FROM DIFFERENT VARIANCE

Low Jia Hooi and Assoc.Prof. Dr. Yusof Bin Munajat

Potato is a cheap and enrich source of carbohydrate which require elemental composition determination. In this research, laser-induced breakdown spectroscopy (LIBS) technique was used for elemental analysis of potato skin. Four commercially available potatoes originated from Malaysia, Thailand, Australia and United State were selected as samples. An ungated LIBS system was constructed using Q-switch Nd:YAG pulsed laser as the excitation source and an atomic emission detection system consist of optical fibre, spectrometer and computer. The elements in potato skin detected in this work are sodium, magnesium,

aluminium, calcium, titanium, iron, hydrogen and carbon. The result of this research shows that the elemental composition of the potatoes skins from different countries is the same. However, the intensity of each peak of the elements in the potatoes skins from different countries is different. Qualitative potato differentiation was done by analyzing the intensity ratios of atomic emission lines. Six different ratio combinations among the monitored elements were investigated and only the ratio of Ca II to Mg I present in each potato skin, can be taken as a promising reference point to differentiate between the potatoes from Malaysia, Thailand, Australia and United State.

Chairperson session 2 : Dr Nabilah Kasim
Time : 11:00 am– 1:00am

1. Non-thermal Plasma Technology In Wire Cleaning
   Muhamad Naqiuddin Bin Razali & Dr. Raja Kamarulzaman Bin Raja Ibrahim

2. Performance of Non-thermal Plasma in Deposition of Thin Film onto Fibre Optic
   Mohamad Eqbal Hamdy Bin Kamarun & Dr Raja Kamarulzaman Bin Raja Ibrahim

3. Comparison of Several Characteristics of Single Mode Step-Index (SMSI), Multimode Step-Index (MMSI), and Multimode Graded-Index (MMGI) Fiber for Optical Communication System
   Nur Amira Aqila Binti Zaini & Dr Muhammad Arif Bin Jalil

4 Dielectric Barrier Discharge Plasma Reactor Temperature Profiling Using Fiber Bragg Grating Sensors
   Muhamad Khaidir Bin Mohd Zamri & Dr Nor Ain Husein

ABSTRACTS

NON-THERMAL PLASMA TECHNOLOGY IN WIRE CLEANING

Muhamad Naqiuddin Bin Razali and Dr. Raja Kamarulzaman Bin Raja Ibrahim

In this works,bare wires that contaminated with dust and has oxide layer has been successfully cleaned using Non-Thermal Plasma method.The cleaning process was carried out under different conditions; type of gases at varies of flow rate and voltage. Helium, nitrogen, and air were used to generate plasma where plasma operated at flow rates in the range of 20 – 140 mL/min while voltage set up in the range of 1 – 7 kV.The performances of wires undergo plasma cleaningwere examined ~~by~~ using Olympus SZX9 Stereozoom Microscope. It was found that nitrogen plasma has the best cleaning performance at voltage of 2.05 kV and flow rate of 60 mL/min.

PERFORMANCE OF NON-THERMAL PLASMA IN DEPOSITION OF THIN FILM ONTO FIBRE OPTIC

Mohamad Eqbal Hamdy Bin Kamarun and Dr. Raja Kamarulzaman Bin Raja Ibrahi*m*

The aim of the research is to achieve a uniform cylindrical coating by applying the non-thermal plasma technique to achieve that consistent cylindrical coating with precise uniformity. A fibre is exposed in the plasma reactor so the non-thermal plasma were performed to aid the coating process onto the fibre and Tetraethyl Orthosilicate (TEOS) solution is used to obtain a gold coating. It was found that the gold coating, which, when performed properly, has form a non-thermal plasma that can act on the fibre in all direction, resulting a precise uniform coating. Research limitation. However, the plasma performance differ by different variable. The best choice of variable need to being investigate to achieve the best coating. The coating part are subjected to thermal and electrical resistance, so this may affect the coating process. For future work, we can try using other coating materials, stable yttria can be used as the best coating material with optimum thermal resistance. This paper fulfils the identified information and offers practical help to the industrial firms working with coatings and also to the academicians working on wear of materials.

COMPARISON OF SEVERAL CHARACTERISTICS OF SINGLE MODE STEP-INDEX (SMSI), MULTIMODE STEP-INDEX (MMSI), AND MULTIMODE GRADED-INDEX (MMGI) FIBER FOR OPTICAL COMMUNICATION SYSTEM

Nur Amira Aqila Binti Zaini and Dr. Muhammad Arif Bin Jalil

Optical fiber is a medium that made by silica or plastic, and widely used in transmitting information over longer distance especially in communication system. There are three types of fiber optic used in this project which are single mode step-index (SMSI), multimode step-index (MMSI), and multimode graded-index (MMGI) in optical communication system. There are three objectives in this project in order to get the suitable optical fibers in the communication system. First objectiveis to simulate the result by using Excel and Origin software. The data and the formulaof fiber optics will be key in through Excel software while the graph will be analyzed by using Origin software. The second objective is to compare the different types of fiber optics in communication system by comparingthe several of their characteristics such as numerical aperture (NA), acceptance angle (θa), solid acceptance angle (Ω) and propagation constant (β).The performance of all types fiber optics are analyzed from the result using the standard communication wavelength of 1550 nm. The core diameter for SMSI, MMSI, and MMGI are 9, 200 and 50 μmrespectively while the cladding diameter for SMSI and MMGI is 125 μm and 240

μm for MMSI. This diameter also been analyzed by using the standard value for optical communication system. Then, the comparison between SMSI, MMSI and MMGI will be made to choose the more suitable for optical communication system based on their characteristics. From the results, MMSI and MMGI give best performance compared to SMSI. After that, the third objectiveis to make the comparison between MMSI and MMGI in term of intermodal dispersion to compare the efficiencies of fiber optics. MMGI give the better result in terms of efficiencies for communication system compared to MMSI.

DIELECTRIC BARRIER DISCHARGE PLASMA REACTOR TEMPERATURE PROFILING USING FIBER BRAGG GRATING SENSORS

Muhamad Khaidir Bin Mohd Zamri and Dr.Nor Ain Husein

The purpose of this study is to investigate the sensing performance in monitoring temperature of dielectric barrier discharge (DBD) plasma reactor operating at atmospheric pressure using fiber Bragg grating (FBG). The FBG was made from germanium doped fiber were embedded inside the DBD reactor to monitor the temperature inside the reactor. The FBG has single grating series with the Bragg wavelength, λ_B of 1550 ± 0.2 nm, Grating's length of 3 mm, Bandwidth at 3 dB of less than 0.7 nm.Three types of plasma was generated using different gasses; nitrogen (N_2), Helium (He) and air in the reactor at gas flow rate in the range of 20 – 140 mL/min and applied voltage in the range of 1 – 8 kV.The FBG was recorded to have a response time up to 0.2 seconds/°C. The sensitivity of the FBG temperature sensor used in this study is estimated at 2.683 pm/°C.

Chairperson Session 3 : Dr. Suzairi Daud
Time : 2.30 pm– 5.00 pm

1. Diagnosis of Calcium Lines by Laser-Induced Plasma Spectroscopy
Nordini Najwa Zakaria & Dr. Muhammad Safwan Bin Abd. Aziz

2. Characterization of CarbonIon in Arc Discharge Plasma
Natasya Binti Zainal Abidin & Dr. Suzairi Bin Daud

3. Optimization of Optical Transfer Function of Microring Resonator Using Genetic Algorithm
Mohammad Farizuddin Bin Salebi & Dr Mahdi Bahadoran

4. Synthesis of Graphene by arc Discharge Technique
Farah Shahirah Binti Norazmi & Dr. Kashif Tufail Chaudhary

ABSTRACTS

DIAGNOSIS OF CALCIUM LINES BY LASER-INDUCED PLASMA SPECTROSCOPY

Nordini Najwa Zakaria and Dr. Muhammad Safwan Bin Abd. Aziz

Plasma is a rich source of radiations that carry information about the species inside plasma which is directly associated with surface of the target sample. Its nature is dynamic and complex that is not fully understood. Conditions inside LIP vary temporally and spatially. Core of plasma is the hottest region while it gradually cools down along the radius. Cooler species reside in the outer region of plasma that can absorb the radiations coming out from the inner regions. This phenomenon is called as self-absorption which results in detection of lesser radiations outside the plasma than originally emitted from inner regions of the plasma. It causes erroneous measurements. The prominence of self-absorption varies with plasma conditions which are strongly dependent upon experimental parameters. In this study, we have explored the self-absorption in Ca I and Ca II emission lines as a function of laser energy. Self-absorption is estimated through intensity ratio of emission lines. Laboratory prepared samples with careful account of elemental concentrations were utilized in this study. Results have shown the dominance of self-absorption when higher laser energies were used to ablate the sample. Self-absorption effect is more strongly observed in resonant lines which, in general, gradually decreased as laser energies were decreased.

CHARACTERIZATION OF CARBON ION IN ARC DISCHARGE PLASMA

Natasya Binti Zainal Abidin and Dr. Suzairi Bin Daud

The objective of this study is to determine the energy of carbon ion in different environment and pressures. The purposes of determination the energy of carbon ion is to get better knowledge regarding on the fabrication of different type of carbon nanostructures. Carbon nanostructures become more useful due to their unique carbon elements. They can form ball-shaped, fullerenes and cylindrical nanotubes. The energy of carbon ion can be obtained by measuring the ion track sizes on the CR-39 target. Solid state nuclear track detector (SSNTD) was used to track the charged nuclear particles, such as alpha particles or fission fragments. In this study, arc discharge plasma generated by graphite electrode were chosen to produce carbon nanostructures and the CR-39 were exposed to energetic carbon ion under different environment and pressures. The energetic carbon ion was etched by 6.25 M of NaOH solution for 8 hours. The temperature was maintained at (72±1)°C to ensure the etching process going smoothly. The ion tracks was observed under optical microscope and the diameter of ion track were measured. The energy was determined from the diameter obtained by using the related formula. From the data taken and graph plotted, the diameter of carbon ion in air at 10^{-1} mbar pressure is 18.29 μm and 15.07 μm for hydrogen. The energy of carbon ion is influenced by the diameter ion track. Energy of carbon ion in air was higher than hydrogen. The energy of carbon ion under 10^{-1} mbar pressure for air and hydrogen were measured to be 54858846.15 keV and 16641324.04keV respectively. The energy of carbon ion under 10^{2} mbar pressure for air and hydrogen were measured to be169931.7 keV and215228.3747 keV respectively. It is conclude that, higher energy of carbon ion is measured at lower pressure.

OPTIMIZATION OF OPTICAL TRANSFER FUNCTION OF MICRORING RESONATOR USING GENETIC ALGORITHM

Mohammad Farizuddin Bin Salebi and Dr. Mahdi Bahadoran

In optical communication, a sharp carrier signal is required for the purpose of conveying information. Microring resonators have been introduced as suitable tools to generate low cost and a qualitative sharp carrier signals. In fabrication process of microring resonator, some optical coefficients such as couplings coefficient and coupling loss are crucial and sensitive factors to achieve high quality carrier signals. In this work, the Mason rule together with signal flow graph method are used to calculate the optical transfer function (OTF) of some microring

resonating systems like add-drop resonator and flower shape layout. Genetic algorithms (GAs) is known as an effective optimization method based on principles of natural selection and genetics. The GA has been used in widespread scientific areas especially solving of quantum mechanical problems, designing tools and engineering optimization problems. As an objective of this work, the GA is used to optimise the OTF based on determining optical parameters including coupling ring resonator and coupling loss coefficient. Our approach include finding optimise parametric values to minimise full width at half maximum (FWHM) and maximise out of band rejection ratio (OBRR). For the value of g_1, g_2, k_1 and $k_2$in the first generation the FWHM and OBRR are 10nm and 5dB while using GA for optimizing minimum FWHM and maximum OBRR within five generation in Table 4.4.The simulated result for add-drop resonator by Matlab software show that increasing the generations contributes to achieve the optimum critical values for coupling coefficients and losses.

SYNTHESIS OF GRAPHENE BY ARC DISCHARGE TECHNIQUE

Farah Shahirah Binti Norazmi and Dr. Kashif Tufail Chaudhary

Synthesis of carbon nanotubes (CNTs) and graphene by arc discharge technique are conducted in controlled hydrogen environment. The arc discharge is carried out between two graphite electrodesin hydrogen environment at ambient pressures 10^{-3}mbar, 10^{-1}mbar, 10^{0}mbar, 10^{1}mbar and 10^{3}mbar. Hydrogen is used as a buffer gas on the growth of CNTs and graphene. The samples of CNTs and graphene are prepared in different conditions andcharacterized using Field Emission Electron Microscopy (FESEM), X-Ray Diffraction (XRD) and Raman Spectroscopy.FESEM images of CNTs and graphene gives a clear picture of the tubes morphology with their bundle organization and naturally wavy fused nanosheets type morphology. The results of XRD exhibits the structural properties of CNTs and graphene which indicates the strongest (002) plane of diffraction peak corresponds to a d-spacing of 3.46Å and implying the number of layers in nanostructures.Lastly, Raman Spectroscopy describes the high intensity of G-line and G*-line which confirms the presence of CNTs and graphene in the prepared samples. The highest growth of CNTs and graphene are observed at 10^{1} mbar while above that ambient pressures, the CNTs and graphene are less growth.

3. HEALTH PHYSICS

(ABSTRACTS)

VENUE :Physics Instrumentation Teaching Laboratory 1 (C20-302)
DATE :31May 2016 (Tuesday)
Chairperson session 1 : Dr Nor Ezzaty Ahmad
Time : 08:30 am– 9:30am

1. Radiological And Nuclear Emergency Plan Universiti Teknologi Malaysia
   Siti Hajar Binti Suliman &Assoc. Prof. Dr. Suhairul Hashim

2. Radiation Dose Of Betatron X-Ray
   Noraina Hanim Binti Jusoh &Assoc. Prof. Dr. Wan Muhamad Saridan Wan Hasan

3. Band-Head Energy Spectra Of Well-Deformed Odd-Mass Nuclei Within Quasi-Particle Approach
   Siti Nor Afsan Binti Abdul Rahman & Dr. Koh Meng Hock

ABSTRACTS

RADIOLOGICAL AND NUCLEAR EMERGENCY PLAN UNIVERSITI TEKNOLOGI MALAYSIA

Siti Hajar Suliman and Assoc. Prof. Dr. Suhairul Hashim

Aspects of radiation safety is a priority when handling hazardous radioactive materials. In this study, Universiti Teknologi Malaysia (UTM) as the holder of a license under the Atomic Energy Licensing Act 1984 (Act 304) shall provide Radiological and Nuclear Emergency Plan (RNEP). The objective of the plan is to ensure the preparedness programme during radiological emergencies and provide protection to workers, students, the public, property and the environment against the use of radioactive materials in UTM. In addition, this plan was developed so that an appropriate and fast response can be taken to reduce the effects, reduce the level of radiation hazards and the costs involved at a rate as low as possible. Based on the regular audit inspection Atomic Energy Licensing Board (AELB), UTM should carry out the disposal of radioactive material with the help of the Malaysian Nuclear Agency, after obtaining the approval of the disposal from AELB to keep records of radioactive updated as well. Among the material identified for disposal are two units of neutron source ^{238}Pu-Be and 141 units of sealed radioactive materials. Radiation hazard risk assessments have been carried out to identify and quantify any potential hazards that affect the safety and health at UTM. The risk is the probability multiplied by the seriousness that involves a scale of 0 to 3, where 3 is indicating high. The hazards that have been assessed including the incidents caused by natural disasters, technological, human and hazardous materials. In conclusion, this study has helped on UTM license renewal of radioactive material after the AELB satisfied with the disposal of radioactive materials

RADIATION DOSE OF BETATRON X-RAY

Noraina Hanim binti Jusoh and Assoc. Prof. Dr. Wan Muhamad Saridan Wan Hassan

Betatron is a type of particle accelerator and the particles accelerated are electrons. Since betatron is able to produce high-energy electrons, it can also produce narrow beam of photon and the radiation produced by the betatron is x-ray. This investigation aims to calculate the radiation dose of the x-ray at certain points in the room when a betatron of 6 MeV was used. The radiation dose was calculated by conducting a simulation using Monte Carlo N-Particle Transport Code (MCNPX). This simulation is important as it provides an alternative in calculating radiation dose of the radiation without needing to go on a fieldwork. In this research, there were 6 points of interest chosen in determining the radiation dose in a room at Billion Prima Sdn. Bhd. Three of the points were in the air with the standard density of 1.29x10-3 g/cm^3 while the other 2 were the points on the concrete wall with a density of 2.35 g/cm^3 and the last one was the cadmium tungstate (CdWO4) surface of the detector having the density of 7.9 g/cm^3. The room dimension was declared in the coding of the MCNPX where basically, the shape of the room is a cuboid and made up of concrete wall. The radiation dose outside of the room was not calculated as the concrete wall of room is assumed made of appropriate thickness for safety features guided by As Low As Reasonably Achievable (ALARA) principle. The radiation dose on each of the 6 points obtained from the simulation was different as the distance of the points from the betatron are different. Other than that, the factor of density of the material also causes the dose on those points varies.

BAND-HEAD ENERGY SPECTRA OF WELL-DEFORMED ODD-MASS NUCLEI WITHIN QUASI-PARTICLE APPROACH

Siti Nor Afsan binti Abdul Rahman and Dr. Koh Meng Hock

The energy spectra of odd-mass heavy nuclei namely ^{235}U and ^{239}Pu have been determined using quasi-particle approach. Calculations were first performed for the neighboring even-even core nuclei (^{234}U, ^{236}U, ^{238}Pu and ^{240}Pu) within the Hartree-Fock-plus-Bardeen-Cooper-Schrieffer (HF+BCS) framework. The effective nucleon-nucleon interaction has been approximated with a Skyrme interaction using the SIII and SkM* parameterizations while the pairing interaction was approximated by a seniority force. Band-head energies of the odd-mass nuclei were then computed from the even-even core solutions. It was found that the results obtained from the quasi-particle approach yields results which are in less good agreement with experimental data, as compared to those obtained from a proper self-consistent blocking calculation taking into account the effect of time-reversal symmetry breaking.

Chairperson session 2 : Dr Izyan Hazwani Hashim
Time : 11.00 a.m– 12.20p.m

1. Performance Measurement Of The Helium-Ethane Gas Mixture In Prototype-Iv Chamber
Mohd Hanafi Bin Ghazali &Dr. Muhammad Alam Saeed

2. Suitability Analysis For The Site Of Nuclear Reactor In Terengganu
Nor Syazwani Binti Daud & Prof. Dr. Ahmad Termizi Ramli

3. Thermoluminescence Dosimetric Properties Of Thulium Doped Optical Fiber By Gamma Irradiations
Noorhalina Binti Ghazali &Dr. Muhammad Alam Saeed

4. Suitability Analysis For Nuclear Reactor Siting In Selangor, Negeri Sembilan And Melaka
Nurul Amira Binti Noorhisham & Prof. Dr. Ahmad Termizi Ramli

ABSTRACTS

PERFORMANCE MEASUREMENT OF THE HELIUM-ETHANE GAS MIXTURE IN PROTOTYPE-IV CHAMBER

Mohd Hanafi bin Ghazali and Dr. Mohammad Alam Saeed

Coherent Muon to Electron Transition (COMET) is an experiment that aims to search for a Charged Lepton Flavour Violation (CLFV) process; muon-to-electron conversion in the presence of nucleus. The process is forbidden in the Standard Model (SM). However, it is predicted to occur in various extension of SM. Using the J-PARC proton beam and the pion capture by a solenoidal field, COMET will have Single Event Sensitivity (SES) 10000 times better than the current limit that is 2.6×10^{-15} SES. The COMET collaboration has started its first phase; COMET Phase-I in 2013 and initial data collection will start in 2017. In this study, the performance of prototype chamber; Prototype-IV, which is a partial copy of the real Cylindrical Drift Chamber (CDC) in COMET Phase-I was tested by using high energy beam with finger scintillator that held in synchrotron radiation facility Spring-8. The drift velocity and spatial resolution of prototype was measured by using Helium-Ethane gas mixture with high voltage of 2300V Threshold 20mV. From the analysis that we have done, it shows that the drift velocity and the spatial resolution is 32900ms^{-1} and 161.2μm respectively. The result will help COMET member to choose gas mixture whether Helium-Methane, Helium-Ethane or Helium-Isobutene is suitable to be filled in the real CDC.

SUITABILITY ANALYSIS FOR THE SITE OF NUCLEAR REACTOR IN TERENGGANU

Norsyazwani Binti Daud and Prof. Dr. Ahmad Termizi Bin Ramli

Electrical energy is the primary energy used in everyday life. Malaysia proposes that nuclear energy as an alternative power generation in the country. The process of selecting a site for the construction of nuclear power reactors is done according to the criteria established by the Atomic Energy Licensing Board, AELB and the International Atomic Energy Agency, IAEA. The study conducted in Terengganu done by limiting the distance of 10 km from the border area of the beach as a candidate site. The selection of a suitable site to build a nuclear power reactor is filtered through the analysis of demographic parameters analysis, geology, seismology, geography and soil structure. This process involves sketching and mapping using software ArcGis and scoring parameters given to each candidate sites at once to get rid of areas that do not meet the prescribed conditions. HotSpot's software is used for analysis of radiological safety by identifying the level of wind speed and direction of wind that would affect the distribution of radioactivity around the site selected. Based on the scoring of each parameter, lived around Kuala Paka, Dungun is potential as the reactor site because it has a population density of 250 people per km^2, stable soil structure and meet the safety requirements that have been set.

THERMOLUMINESCENCE DOSIMETRIC PROPERTIES OF THULIUM DOPED OPTICAL FIBER BY GAMMA IRRADIATIONS

Noorhalina binti Ghazali and Dr. Muhammad Alam Saeed

This work investigates the performance of two commercial optical fibres; Thulium doped and Thulium-Holmium doped fibre optics to be used as ionizing radiation dosimeter sensors compared to TLD-100. Thermoluminescence (TL) properties of these fibres such as dose response, linearity, sensitivity and glow curve have been studied. Thulium and Thulium-Holmium doped fibre optics were the basic material for this study manufactured by CorActive with core diameter 3.0 ± 0.5 μm and 10.0 ± 1.0 μm respectively. The fibres were exposed to 1 Gy to 5 Gy doses under 1.25 MeV gamma radiations, provided by Gammacell 220 Excel available at Applied Physics Study Centre, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, Bangi, Selangor. Results clearly show that the commercially available Thulium doped and Thulium-Holmium doped optical fibres have a linear dose – TL signal relationship. However, TLD-100 has surpassed both commercial optical fibres in terms of response and sensitivity to produce luminescence. Thulium-Holmium doped provides better

sensitivity 30 times higher than Thulium doped fibre optic. This indicates that the addition of Holmium improves the TL characteristics of fibers.

SUITABILITY ANALYSIS FOR NUCLEAR REACTOR SITING IN SELANGOR, NEGERI SEMBILAN AND MELAKA

Nurul Amira Binti Noorhisham and Prof. Dr. Ahmad Termizi Bin Ramli

The use of nuclear energy can be utilized in the generation of electricity to meet the demands and needs of the energy sector in Malaysia. Malaysian government has decided to consider the necessity for the construction of a nuclear power reactor due to this purpose. The selection process of the reactor site must conform the basic needs of nuclear safety recommended by the Atomic Energy Licensing Board (AELB) and the International Atomic Energy Agency (IAEA). There are various parameters that need to be evaluated, therefore this study is designed to propose the steps to identify a suitable candidate site in a clearer and more systematic measure. The selected study area are in Selangor, Negeri Sembilan and Melaka. Scope of this study area was reduced to the region within 10 km of coastline due to the mandatory requirement as suggested in previous studies. The methodology consists of the elimination process and selection of suitable candidates sites based on analysis of the selected main parameters which is the parameter of geology, seismology, demographic and radiological safety. Candidates for the suitable site are determined by a scoring system to each parameter, and involves sketching and mapping using ArcGIS software. High marks are given to the parameters that comply with nuclear safety; and vice versa. To identify the radiological risks at the site, Hotspot software is used to analyze the distribution of radionuclides in the air for that area. This analysis contributes to determine the suitability of potential sites for radiological safety parameters. Due to results of the selection and elimination process based on the scoring system, potential sites which is considered as suitable for construction of the reactor has been obtained at the end of the study.

Chairperson session 3 : Dr Koh Meng Hock
Time : 2.30 p.m– 3.50p.m

1. The Analysis On Thermoluminescence (Tl) Glow Curve Of TLD -100 By Initial Rise And Peak Shape Methods.
   Nur Nafiah Binti Rosdi &Assoc. Prof. Dr. Suhairul Hashim

2. Determination of TL Properties Of TLD -100 Using Two Different TLD Reader
   Aida Norsyafiza Binti Azmi & Dr Izyan Hazwani Hashim

3. Development ff Neutron Statistical Calculator For Muon Neutrino Response
   Siti Syahirah Binti Saroni &Dr Izyan Hazwani Hashim

4. Nuclear Cascade Effect On ^{152}Eu
   Wan Noor Amelia Binti Wan Mohd Rasdi &Dr Izyan Hazwani Hashim

ABSTRACTS

THE ANALYSIS ON THERMOLUMINESCENCE (TL) GLOW CURVE OF TLD-100 BY INITIAL RISE AND PEAK SHAPE METHODS.

Nur Nafiah binti Rosdi and Assoc. Prof. Dr Suhairul Hashim

The dosimeter of TLD-100 was used in chips form as the sample for this study. The samples were exposed to 5Gy of ^{60}Co gamma ray by Gamma Cell Model 220 Excel. The TL measurements was carried out by Harshaw 4500 TLD reader with WINREMS software. The graph of the amount light emitted during the TL process as a function of temperature known as TL glow curves were plotted by using OriginPro 8.5. This study conducted to analyse of each TL glow peaks with different heating rate from 1 °C s^{-1} to 20 °C s^{-1}. The optimum heating rate of TLD-100 was recorded at 20 °C s^{-1} with value of peak temperature, T_M = 239 °C. The kinetic parameters such as an order of kinetic, the activation energy (*E)* and the frequency factors (*s*) of the TL glow peaks were determined by using this two methods. TL kinetic parameters were determine using initial rise (IR) method and peak shape (PS) method. The values of activation energy for initial rise (IR) method and peak shape (PS) method were recorded E = 1.3346 ± 0.0472 eV and E = 1.8613 ± 3.7564 eV respectively and the values of the frequency factor respectively recorded for initial rise (IR) method and peak shape (PS) method were $s = 0.7041 \times 10^{12}\ s^{-1}$ and $s = 2.24 \times 10^{8}\ s^{-1}$. The first kinetic order of TL glow peaks were determined as an asymmetrical shape of TL glow curve.

DETERMINATION OF TL PROPERTIES OF TLD-100 USING TWO DIFFERENT TLD READER

Aida Norsyahafiza binti Azmi and Dr. Izyan Hazwani binti Hashim

This study is to investigate and compares the thermoluminescence glow curve, dose response, linearity and sensitivity of TLD-100 using two different TLD readers. Readings of TL measurements were made using a model Harshaw 3500 and 4500 manual TLD reader with WINREMS. Both of the TLD reader has flowing nitrogen atmosphere. Hot pressed chips of TLD-100 were used as the basic material for this research. Samples were exposed to doses at range from 1.0 Gy to 10.0 Gy of Co-60 gamma ray by Gammacell 220 facility manufactured by Atomic Energy and provided by University Kebangsaan Malaysia. The glow curve are analysed to determine TL properties of the TLD-100 and its sensitivity. The sensitivity of TLD-100 using TLD reader Harshaw 4500 model shows the high sensitivity compared to sensitivity of TLD-100 using TLD reader 3500 which is 533775.708 $nCg^{-1}$and 278442.806 nCg^{-1}. Besides that, the intensity of TL response of TLD-100 using TLD reader 4500 had shown a good linear TL response with the absorb dose for 1250 keV of gamma energy in range of 1.0 – 10.0 Gy absorb dose. From this research, it was found that TLD-100 has good sensitivity towards read-out process by using model 4500 Harshaw TLD reader. TLD-100 also shows a good response towards determination of TL properties by using TLD reader Harshaw model 4500 compared to using TLD reader Harshaw model 3500.

DEVELOPMENT OF NEUTRON STATISTICAL CALCULATOR FOR MUON NEUTRINO RESPONSE

Siti Syahirah Saroni and Dr. Izyan Hazwani Hashim

The study of muon response are important due to its significance towards the nuclear matrix elements (NMEs) of double beta decays (DBD). Although the experimental approaches toward the development of understanding of nuclear environment have been greatly developed, unresolved problems still remain. The development of neutron statistical model was an extension to the current model proposed in 2014 which focusing more on heavy nuclei (A>100) with the ratio of fast to slow neutron emission in the range of 15-25%. This report revises the neutron model made in 2014 by introducing a strength distribution model to identify the effect of nuclear density parameter (a) towards isotopic population distribution after muon capture reaction. The effect of PEQ and EQ ratio towards isotopic population distribution after muon capture and the relative capture strength for ^{100}Mo, ^{109}Ag dan $^{89}Y$for DBD experiment are determined. Simulation result indicates that from the statistical estimation, one could provide

information of eventful neutron emission after every capture process for validation of the experimental observation of isotopic population after muon capture, thus, provide useful information about relative capture strength for DBD experiment.

NUCLEAR CASCADE EFFECT ON ^{152}Eu

Wan Noor Amelia binti Wan Mohd Rasdi and Dr. Izyan Hazwani binti Hashim

Gamma spectroscopy technique is widely used in the nuclear industry, geochemical investigation and astrophysics field by providing quantitative analysis of radioisotope activity. However, the nuclear gamma cascade resulting from the simultaneous detection of gamma rays will affect the efficiency of the detector. Therefore, the evaluation of the nuclear cascade effect on ^{152}Eu which associated with the emission of gamma rays will be reported in this thesis. The activity of ^{152}Eu can be determined from the net count in the photopeak area from the gamma ray spectrum. The gamma ray spectrum is produced due to detection of the discrete energy and count rate of gamma rays by High Purity Germanium (HPGe) detector. The source-to-distance is varied from 1cm to 12 cm. In addition, the effect of collimator on the activity of ^{152}Eu will also be evaluated whereby the collimator is fixed on the detector with the same source-to-detector distance. The results from both collimated and non-collimated measurement are tabulated, compared and elaborated. Besides, the analysis of this experiment is mainly on the gamma rays detected by HPGe detector. Thus, for maximum detection to happen, three different aspects which are energy, peak resolution and detector efficiency should be considered.

4. PHYSICS INSTRUMENTATION

(ABSTRACTS)

VENUE :PhysicsInstrumentation Teaching Laboratory 4 (C21-310-01)
DATE :31May 2016 (Tuesday)
Chairperson session 1 : Hj Mohd Khalid Kasmin
Time : 08:30 am– 10:05am

1. Determination of Efficiency and Fluence of Flashlamp Pumped Nd:YAG Laser
   Iffah Nor Syahirah Binti Mohd Zaid & Dr. Roslinda Binti Zainal

2. Acoustic Guitar Tuner Using Piezoelectric Transducer
   Md Amiruddin bin Md Iskandar & Muhammad Zaki Yaacob

3. Infrared Light Emitting Diode to Detect Heart Pulse
   Muhamad Muizzudin bin Azali & Assoc. Prof. Dr. Ahmad Radzi bin Mat **Isa**

4. Development of An Optical Character Recognition Android Application for Digital Display Fonts
   Nurul Farhana Bt Muhammad Ghafi & Dr. Yang Yung Szen

ABSTRACT

DETERMINATION OF EFFICIENCY AND FLUENCE OF FLASHLAMP PUMPED Nd:YAG LASER

Iffah Nor Syahirah Binti Mohd Zaid and Dr. Roslinda Binti Zainal

Flashlamp pumped Nd:YAG laser is widely used and essential in many applications such as medical and industrial. The purpose of this research is to determine the threshold voltage, conversion efficiency and fluence of flashlamp pumped Nd:YAG laser. The characterization of the output beam Nd:YAG laser was investigated as a result of a single pulse and variable repetition rate of 1-5 Hz. The Nd:YAG laser at 1064 nm was pumped by xenon flashlamp. The flashlamp was triggered using external triggering method. This laser system is in free running mode. The variable high input voltage of 650 – 1000 V range was supplied to the 92 uF capacitor bank. The operation of the Nd:YAG laser was controlled by a custom made control unit. The result shows that the lowest threshold voltage of 502.6 V was obtained at 2 Hz repetition rate. Meanwhile, the highest electrical to optical conversion efficiency of 2.76% was obtained at 5 Hz repetition rate. The Nd:YAG laser fluence on sand paper sample was investigated at high output energy of 1000 V and variable repetition rate. The highest laser damage threshold was obtained at 4 Hz of 2.94 x 10^5 mJ/cm^2.

ACOUSTIC GUITAR TUNER USING PIEZOELECTRIC TRANSDUCER

Md Amiruddin bin Md Iskandar and Muhammad Zaki Yaacob

The purpose of this study is to design an audio frequency detector that can be used to precisely tune an acoustic guitar. This device consists of piezoelectric disc as the transducer, an operational amplifier, Arduino Nano microcontroller, a computer and a Java-based open-source software, Netbean. The piezolectric disc will measure the acoustic sound waves produced by an acoustic guitar and give out an analogue output in the form of voltage. The operational amplifier will amplify the input voltage up until 4V. The voltage signal then will be processed by the Arduino Nano microcontroller. The Arduino will measure the frequency of the incoming voltage signal to be processed by the computer. The favored range of frequency will be from 80 Hz until 350 Hz. During this stage, the analogue value of the voltage is converted into the form of digital value so that it can be processed by the computer. The Netbean software will compute the frequency of the voltage measured and differentiate it with the setpoint value of the precised frequency of a perfectly-tuned acoustic guitar. The result of such process is presented in the form of a display with a fluctuating bar. This bar will exhibit whether the measured frequency of the waves is the same as the setpoint value or not. And thus, we have ourselves a guitar tuner using a piezoelectric disc. This instrument is now capable of aiding in calibrating a guitar.

INFRARED LIGHT EMITTING DIODE TO DETECT HEART PULSE

Muhamad Muizzudin bin Azali and Prof. Madya Dr. Ahmad Radzi bin Mat Isa

Infrared (IR) is invisible radiant energy. The wavelength of the infrared is longer than the visible light, extending from the nominal red edge of the visible spectrum at 700nm to 1mm. The range adjacent to the visible spectrum is called “near infrared” and the longer wavelength part is called “far infrared”. Infrared light emitting diode (LED) used in this study due to infared is a good absorbance of oxygenated blood at infrared wavelength. In addition, the IR receiver is used to specified the wavelength of light received, so the other source of light cannot be interfere the result. The TLV2741 amplifier is used to amplify and a capacitor is used to filter the signal of the sensor. The hole cover is built up to make a appropriate sensor cover. The program interface is built using Ardiuno and this program can show immediately the signal of heart pulse. The data of the time domain graph can be transform into frequency domain by using Octave software to measure the value of beat per minute (BPM). This study will detect the heart pulse with the various condition such as in normal condition or after doing exercise

condition. The result will be show the reading in range of 60 – 100 bpm at normal condition and above 100 bpm at after exercise condition. The result of heart pulse will be shown instantenously using NetBeans IDE 7.4 and Gnuplot sofware.

DEVELOPMENT OF AN OPTICAL CHARACTER RECOGNITION ANDROID APPLICATION FOR DIGITAL DISPLAY FONTS

Nurul Farhana Bt Muhammad Ghafi and Dr. Yang Yung Szen

In recent years, smartphones are drastically becoming part of human's daily life in ways unimaginable just 20 years ago. Current smartphones are equipped with multicore processors, high resolution cameras and a multitude of sensors for various purposes. The aim of this project is to study the feasibility of using a smartphone to acquire data from digital displays commonly found on many scientific instruments. This project utilizes the built-in camera of a smartphone to photograph images of the digital displays, which are then converted into text - a process is known as optical character recognition (OCR). A homemade software running on Android mobile operating system (colloquially known as "apps") was developed based on Tesseract OCR engine for image processing. The image recognition accuracy depends on the quality of the image and a major complication is that Tesseract OCR does not recognize digital display fonts.Using the homemade "apps", training of Tesseract OCR was done using two other softwares based on three types of fonts: "Digital Dream Fat Narrow", "Let's Go Digital" and "Serak Seven Segment" using two other softwares. The first software, jTessBoxEditor, was used to generate Tagged Image File Format (TIFF) images, which was then fed into the second software, Serak Tesseract Trainer to generate TessData. By incorporating TessData into Tesseract OCR engine, the homemade "app" was able to recognize similar digital display fonts. To further improve the image recognition accuracy, the effects of surrounding brightness and camera setting were also investigated to determine the optimal conditions to produce the most accurate results.From the experimental results, the "Digital Dream Fat Narrow" font was found to produce the most accurate results for the test samples. By varying the surrounding light intensity around the test subject and measuring the light intensity using a lux meter, accurate text recognition was obtained above 40 lx for ISO setting at 100,200,400 and 800. As a conclusion, this project concludes that a smartphone can be made into a data acquisition device provided that the OCR has been trained properly and that the camera settings and surrounding brightness are within the optimal conditions.

Chairperson Session 2 : Mr. Muhammad Zaki Hj. Yaacob
Time : 11.00am – 1.00pm

1. (No abstract)
   Nur Qamaliyah Binti Mohd Tarmidi & Dr. Abd Rahman Tamuri

2. The Development of Robot Arm for Stem Education
   Nazirah Binti Mohd Razali & Assoc. Prof. Dr. Hazri Bakhtiar

3. Lane Departure Helper System
   Nur Emalina Binti Mohd Suhaimi & Mohd Khalid Bin Kasmin

4. (No abstract)
   Muhammad Afiq Aiman Bin Maleki & Assoc. Prof. Dr. Md Supar Rohani

5. Simulation of Single Mode-Multimode-Single Mode Fiber Temperature Sensor
   Ng Ying Xuan & Dr. Amiruddin Shaari

ABSTRACT

THE DEVELOPMENT OF ROBOT ARM FOR STEM EDUCATION

Nazirah Binti Mohd Razali and Assoc. Prof. Dr. Hazri Bakhtiar

Integrating robot activities in Science, Technology, Engineering and Mathematics (STEM) curriculum provides a lot of opportunities to engage students in real world science and technology. Through these activities, it can help them to develop conceptual understanding of science and mathematics principles through the process of investigation, data analysis, physical design, and construction. In this project, a model of robotic arm for educational purpose is developed. Its workspace and payloads capacity are analyzed. The robot arm is controlled using Arduino micro-controller board and the instructions are programmed using S4A software interface. The model is designed using SolidWorks and the parts are printed using 3D printer. The limitation of the robot movement is determined by data analysis. Gnuplot software is used to plot 2-Dimensional (2D) workspace of robot arm. The robot is tested to lift the slotted masses using different mass and torque to determine its payload capacity. The finding shows the mathematical equation developed from the design can be used to determine the robot 2D workspace. Higher torque motor can lift greater mass of payloads.

LANE DEPARTURE HELPER SYSTEM

Nur Emalina Binti Mohd Suhaimi and Mohd Khalid Bin Kasmin

Advanced Driver Assistance Systems and Intelligent Transport System are installed in some recent cars to enhance car safety features. Lane Departure Warning and Lane Keeping Assist for instance are for making the sure the vehicle does not leave the lane. None of the latest technology is for helping a driver leaving the lane in overtaking or changing lane based on human decision. Lane Departure Helper System is a system built to assist drivers changing lane easily and safely. It is a human decision system that shows whether the next lane is safe to change into. The system captures video using a rear facing wifi web camera installed at the back of the car. The program then breaks the video in frames for it easier analyzing. The program then analyze each frame of the video to detect the presence of car at the other lane. Detection of car in the scene is done by using object recognition algorithm. The program then calculate the area of the detected car. The difference of area of detection of car in each frame will give us information about the speed of the car. However, the driver makes the decision whether he wants to change lane or not. If the relative speed of the incoming rear car in the next lane is greater than 30kmh, it is considered unsafe to change lane and red indicator is given to the driver. If it is safe to change lane, green indicator is given. Lane Departure Helper System is hope to improve on how we are driving and for a better idea designs in safety features in a car.

SIMULATION OF SINGLE MODE-MULTIMODE-SINGLE MODE FIBER TEMPERATURE SENSOR

Ng Ying Xuan and Dr. Amiruddin Shaari

A temperature sensor which can immune to electromagnetic interference and resists to chemicals is overwhelming in various industries especially in chemical and petroleum industry. This project is about the theoretical investigation of the in-fiber temperature sensor with single mode – multimode – single mode fiber (SMS) structure by achieving multimode interference (MMI) in reflection mode. The SMS structure has been studied by many researchers due to the high sensitivity compares to existing method such as fiber Bragg grating. Besides, the SMS structure is also much easier to be fabricated since it is only constructed by splicing one of multimode fiber (MMF) segment in between two of single mode fiber (SMF) segments. Despite the fact, the effect from the length of different segments to the temperature sensitivity still remains unclear. Finite-difference time-domain (FDTD) method has been used to simulate the temperature sensing property of SMS structure. The structure first been built using computer

aid design, then a c-band Gaussian pulsed plane wave is used to excite the sensor. The reflected electric field is recorded and the shifting of the dip wavelength in the spectral is used to detect the change in temperature. The different MMF and end tip SMF's lengths combinations' sensitivities then been analysed. The spectral response of the sensors to the temperature are agreed with the literature.

Chairperson Session 3 : Dr. Amirudin Shaari
Time : 2.30pm – 5.00pm

1. The Design and Construction of a Motorized Rotary Gyroscope
   Amalina Athira binti Ibrahim & Dr. Abd. Khamim bin Ismail

2. The Design and Construction of a Cantilever-Based Resonant Mass Sensor
   Nor Hariz Bin Kadir Rosman & Dr. Abd Khamim Ismail

3. No abstract
   Zairil Azmil bin Zulkifli & Assoc. Prof. Dr. Hazri Bakhtiar

4. White Light Generation Using RGB Laser
   Nor Aisyah Zawawi & Dr. Abd Rahman Tamuri

5. Variable Voltage and Repetation Rates Dependance Properties of Er:YAG Laser
   Nur Syazana Binti Abdul Kadir & Dr. Roslinda Binti Zainal

ABSTRACT

THE DESIGN AND CONSTRUCTION OF A MOTORIZED ROTARY GYROSCOPE

Amalina Athira binti Ibrahim and Dr. Abd. Khamim bin Ismail

Multi-axis rotary gyroscope is a simple classical model to study directional reference, orientation, positioning, balancing and stabilizing as part of the navigation system. The rotary gyroscope construction is very challenging especially to manufacture a perfect balance of cyclic symmetry structure of the disc, gimbal and its multi-axis frame. The dynamic of the system should also minimize the vibration which can produce resonance to the parts and components of the system. The structural imperfection will cause deterioration to the whole performance of the gyroscope. In this study, a one-axis rotary gyroscope has been successfully constructed by using a motorized spinning disc, gimbal, base frame, rotational position sensor and signal conditioning circuit. The rotation of the gimbal is detected by rotational position sensor using a precision potentiometer (20kΩ ± 5%) mounted to the axis. A signal conditioning circuit converts the rotation into analog voltage and finally into digital signal using Arduino nano USB interface card connected to the computer. A graphical user interface was built using Netbeans IDE for signal interpretation. The rate of change in angle is measured as the gyroscope gimbal response to yawing and pitching. From the angular displacement reading, instantaneous angular velocity, and instantaneous angular acceleration were measured. The highest deflection of the gimbal measured is up to 90 degrees.

THE DESIGN AND CONSTRUCTION OF A CANTILEVER-BASED RESONANT MASS SENSOR

Nor Hariz Bin Kadir Rosman and Dr. Abd Khamim Ismail

A traditional spring balance and ordinary electronic scales intrinsically measure the weight of an object which varies with location due to the variation of gravitational field strength. In contrast, the mass of an object is a measure of the amount of matter in the object and should be measured without the influence of gravitational field. A resonant cantilever mass sensor is a device used to measure mass and it works based on resonant frequency. Its resonant frequency can be altered by adding mass to further decrease the resonant frequency. In this study, a vibrating structure of a resonant mass sensor was built based on a steel cantilever with an electromagnetic actuation and optical detection. The electromagnet was actuated using a PWM pulse generator circuit in order to vibrate the cantilever to its resonant frequency. The pulse generator circuit was constructed using Timer 555 in astable mode circuit configuration and the output current driving capability was boosted using Darlington transistor TIP 122. The vibration of the cantilever is detected by an optical detection technique. An infrared beam was transmitted using infrared LED to the vibrating cantilever and the reflected IR beam was detected by infrared photodiode into oscillating photocurrent. The photodiode current was further amplified into voltage using I-to-V convertor amplifier and finally converted into digital signal using Arduino nano USB interface card to the computer. For signal interpretation a graphical user interface was built using Netbeans IDE. The resonant cantilever mass sensor was successfully designed and constructed to measure added mass between 6g to 12g range.

WHITE LIGHT GENERATION USING RGB LASER

Nor Aisyah Zawawi and Dr. Abd Rahman Tamuri

White light is significant in household applications. Laser is used due to its high efficiency and brighter generation of white light. In this study, red, green and blue (RGB) lasers were used to produce high intensity of white light. In order to control the intensity of each laser, a laser driver is designed using Arduino Uno. Three pulse width modulations (PWM) channels were programmed to produce three different output with different duty cycle which is from 0 to 100%.Three potentiometer were used to control the output of PWM. The maximum value for each laser diode was set to 100mW. Then, all the lasers were combined using combiner prism and combiner mirrors. A digital camera, power meter and spectrometer were used to characterise the white light generated using RGB lasers. The image of white light is captured

using a digital camera. The power meter was used to measure the power for each laser while the spectrometer was used to measure the intensity of different wavelength. Current is employed to control power of the lasers as well as their intensities. The power of two laser were kept constant with one laser was varied and red laser was kept constant while other lasers were varied. In order to get white light, the variations of intensity were captured using digital camera. Image captured is then analysed using software of ImageJ. From the result obtained, the image captured was compared to HTML color codes. The average of the percentage error is 0.2%, 0.1% and 0.1% for red, green and blue laser respectively. As a conclusion, the high intensity of white light can be produced by controlling the power of RGB lasers.

VARIABLE VOLTAGE AND REPETITION RATES DEPENDANCE PROPERTIES OF Er:YAG LASER

Nur Syazana Binti Abdul Kadir and Dr. Roslinda Binti Zainal

Er:YAG laser have been proposed for medical treatments and the development of such laser is worth exploring. The purpose of this research is to determine the threshold voltage, conversion efficiency and laser fluence of Er:YAG laser pumped by a Xenon flashlamp. The output laser at 2940 nm was characterized with an input voltage of 900 – 1200 V and repetition rates of 1 – 6 Hz. The results show that the mid-infrared Er:YAG laser produced no output at 1 Hz. Er:YAG laser at low repetition rate at 2 Hz needed very high threshold voltage of 960.14 V and it decreases as the repetition rate increases. The optimum electrical to optical conversion efficiency off 2.94 % of flashlamp pumped Er:YAG laser was obtained at 5 Hz repetition rate. The Er:YAg laser-matter interaction was observed on several green leaves and the laser fluence was calculated. Er:YAG laser damage threshold was investigated on the green leaves with variable repetition rates. The laser damage threshold was obtained at 4 Hz which was 8318.87 mJ/cm2.