ANNUAL REPORT (January – December 2014)	
LABORATORY	Condensed Matter Physics Laboratory (CMPL) - National Institute of Physics

SUMMARY

The Condensed Matter Physics Laboratory Semiconductor Group (CMPL Semicon) is one of the two clusters of the five research laboratories/groups of the National Institute of Physics. In the past, CMPL-Semicon has focused its research only on the fabrication and characterization of high temperature superconductors (HTSCs). Today, the laboratory deals with researches on designing, fabricating, characterizing and testing of electronic devices suited for RF application.

The Condensed Matter Physics Laboratory Superconductor Group (CMPL Supercon) is one of the two clusters of the five research laboratories/groups of the National Institute of Physics. This year, the research program will find and explore novel routes for the synthesis of Zinc Oxide nano particles and characterize these particles according to their electro-optic (UV), Semiconducting, Spectroscopic characteristics and Photocatalytic properties. It will attempt to produce new habits and structures which will then be characterized as well. The program also aims to set up a nano manipulation and nanomaterials probing capability. This test platform will attempt to find routes that control growth of particular habits and/or structures.

I. Research Projects (Funded):

1. PROJECT TITLE: Investigation of the effects of Ba-site Mn Doping in a $YBa_2CU_3O_{7-\delta}$ System, FUNDING AGENCY: UP-OVCRD AMOUNT: PhP 300,000.00

2. PROJECT TITLE: Fabrication of GaAs Lasers, FUNDING AGENCY: UP-OVCRD, AMOUNT:PhP 300,000.00

3. PROJECT TITLE: Development of an Ultra-high Temperature Chemical Vapor Deposition System, FUNDING AGENCY: National Research Council of the Philippines , AMOUNT:PhP 501,650.00

4. PROJECT TITLE: Development of a Low Temperature Time Terahertz Time-Domain Spectroscopy, FUNDING AGENCY: OVPPA Balik PhD Research Grant,AMOUNT: PhP 2,500,000.00

II. Publications:

A. ISI-Journals (9)

Zhenyu Zhao, Gudrun Niehues, Stefan Funkner, Elmer Estacio,Qifeng Han, Kohji Yamamoto, Jingtao Zhang, Wangzhou Shi,Qixin Guo, Masahiko Tani "Terahertz surface emission from $Cu_2ZnSnSe_4$ thin film photovoltaic material excited by femtosecond laser pulses" Applied Physics Letters (Impact Factor : 3.52). 12/2014; 105(23):231104. DOI: 10.1063/1.4903740

Maria Herminia Balgos, Rafael Jaculbia, Michael Defensor,Jessica Pauline Afalla, Jasher John Ibañes, Michelle Bailon-Somintac, Elmer Estacio, Arnel Salvador, Armando Somintac "Shell to core carrier-transfer in MBE-grown GaAs/AlGaAs core–shell nanowires on Si(1 0 0) substrates" Journal of Luminescence (Impact Factor: 2.37). 11/2014; 155:27–31. DOI: 10.1016/j.jlumin.2014.06.008

Satoshi Tsuzuki, Daiki Takeshima, Tomoya Sakon, Tetsuya Kinoshita, Tomohiro Nagase, Kazuyoshi Kurihara, Kohji Yamamoto, Fumiyoshi Kuwashima, Takashi Furuya, Elmer Estacio, Kodo Kawase, Michael I. Bakunov, Masahiko Tani "Highly sensitive electro-optic sampling of terahertz waves using field enhancement in a tapered waveguide structure" Applied Physics Express (Impact Factor: 2.73). 10/2014; 7(11):112401. DOI: 10.7567/APEX.7.112401

R.B. Jaculbia, M.H.M. Balgos, N.S. Mangila IV, M.A.C. Tumanguil, E.S. Estacio, A.A. Salvador, A.S. Somintac "Enhanced terahertz emission from GaAs substrates deposited with aluminum nitride films caused by high interface electric fields" Applied Surface Science (Impact Factor: 2.54). 06/2014; 303:241–244. DOI: 10.1016/j.apsusc.2014.02.155

Esmerando Escoto, Joselito Muldera, Lean Dasallas, Elmer Estacio, Percival Almoro "Mapping of temporal coherence function for ultrafast lasers via statistical fringe analysis of reconstructed phase maps" Optics Communications (Impact Factor: 1.54). 01/2014; 329:190–195. DOI: 10.1016/j.optcom.2014.04.072

Intense and fast UV emitting ZnO microrods fabricated by low temperature aqueous chemical growth method. M. J. Empizo, K. Fukuda, R. arita, Y. Minami, K. Yamanoi, T. Shimizu,N. sarukura, R. Vargas, A. Salvador and R.V. Sarmago. Optical Materials (38), 2014.

Growth of $Bi_2Sr_2CaCu_2O_{8+\delta}$ thin films with enhanced superconducting properties by incorporating $CaIrO_3$ nanoparticles. JC De Vero, I Hwang, ACL Santiago, J Chang, J Kim, RV Sarmago, JH Song. Applied Physics Letters, 104, 172603, 2014.

Growth Evolution of $Bi_2Sr_2CaCu_2O_{8+d}$ Thin Films Deposited by Infrared (1064 nm) Pulsed Laser Deposition. Jeffrey C. de Vero, Jacque Lynn F. Gabayno, Wilson O. Garcia, Roland V. Sarmago. Physica C, 470(2):149-154.

Growth and superconducting properties of $Bi_2Sr_2CaCu_2O_8 + \delta$ thin films incorporated with iridate nanoparticles. Jeffrey C. De Vero, Inwoong Hwang, Hyeonseop Shin, Alvin Carl Santiago, Doopyo Lee, Jungwon Chang, Jinhee Kim, Roland V. Sarmago, Jong Hyun Song. Phys. Status Solidi A., 2014

B. Local (Peer Reviewed) Samahang Pisika ng Pilipinas (24)
Miranda. R, et al "RElectric field profiles of LTG-GaAs/GaAs and LTG-GaAs/n-GaAs samples"
Abrenica. JM, et al "Photoluminescence Studies of Silver-doped and Magnesium-doped Zinc Oxide Thin Films on Silicon Prepared by Intermittent Spray Pyrolysis"
Lopez. R, et al " XRD analysis on the effect of annealing temperature and flux content on the formation of epitaxial $YBa_2Cu_3O_{7-\delta}$ thin films deposited via sedimentation"
Salazar Jr. H, et al "Mn-doped ZnO micro structures grown by aqueous chemical growth "
Tacneng. J, Sarmago. R, "Intercalation Process of $Bi_2Sr_2CaCu_2O_8$, $CaCu_2O_3$ and CuO in Sedimentation Films via X-Ray Diffraction"
M.J. Felix, J. Muldera, A. Somintac, A. Salvador, and E. Estacio "A Report on Terahertz Notch and Low-Pass Filters Based on U-shaped Arrays"
A De Los Reyes, SA Vizcara, JD Vasquez, MA Faustino, L Lopez Jr., C Sadia, MHBalgos, R Jaculbia, J Muldera, C Que, GN Santos, A Somintac, A Salvador, E Estacio "Development of a cost-effective and portable THz-TDS set-up in transmission geometry"
VK Mag-usara, S Funkner, G niehues, EA Prieto, A Somintac, E Estacio "Measurement of Low Temperature-Grown GaAs Carrier Lifetime by Double Pump Terahertz Time-Domain Spectroscopy"
N Bareza, A Tuico, V Copa, A Somintac "Flex sensing application of the piezoresistive property of AlN"
S Ozawa, S Azuma, S Tsuzuki, K Yamamoto, T Furuya, K Kurihara, F Kuwashima, R de los Santos, A Somintac, E Estacio, M Bakunov, M Tani "THz-EO Sampling using GaAs in Cherenkov-phase-matching scheme at 1.55-um sampling wavelength"
NJ Oliver Jr, O Guitierrez, V Sarmiento, L Lopez Jr., MA Faustino, A Cafe, R Dizon, A Salvador, A Somintac "Fabrication and characterization of zinc oxide-coated silicon nanowires deposited via spray pyrolysis"
J Ignacio, C Tugado, A Tan, MA Faustino, A Cafe, L Lopez Jr., R Dizon, A Somintac "Optical Reflectivity of Synthesized Anodic Aluminum Oxide Enhanced Via Silver Deposition"
E Estacio "Ultrafast Terahertz Photonics Research: Its feasibility in the Philippine Setting"
M Rosete, MA Zosa, R Sarmago "Effect of KCl Solution Addition on the Terminal Setting Velocity of the Suspension of Bi 2212"
K Yamanoi, MJ Empizo, T Shimizu, N Sarukura, T Norimatsu, A Santos-Putungan, A Salvador, R Sarmago "Uniform and well-faceted ZnO micro rods with piscosecond UV emission as candidate scintillator and laser materials"
MA Zosa, R Sarmago "N-Body Simulation of a Fully Ionized Ice Crystal in a Charged Finite Cylindrical Shell"
A Santos-Putungan, R Vargas, A Salvador, R Sarmago, MJ Empizo "Low temperature aqueous chemical growth of UV emitting ZnO micro rods"
S Azuma, T Nagase, S Ozawa, S Funkner, G Niehues, A Iwamae, K Yamamoto, T Furuya, E Estacio, M Bakunov, M Tani "Terahertz Wave Detection by Heterodyne EO Sampling Using Position Sensitive Detector"
MH Balgos, J Muldera, EA Prieto, A Somintac, A Salvador, E Estacio "Subpicosecond carrier lifetime measurements using transient reflectance spectroscopy of MBE-grown low temperature GaAs"
Tingzon. P, "Efficiency enhancement of p-n heterojunction GaAs solar cells via wet chemical etching and pattern design of metal contact"

G.R. Blanco-Ocampo and R.V. Sarmago. "Effects of magnetic field orientation on the magnetoresistivity and activation energy of Y-doped Bi-2212 films. "
F. I. N. de Vera, M.A. Zosa, X. A. Galapia and R.V. Sarmago " Effects of nominal doping of indium on Bi2Sr2CaCu8+d. "
L.V. Sayson, R. Sarmago, M.J. Empizo, K. Yamanoi, T. Shimizu N. Sarukura. "Effects of Post Annealing on Zno Microstructures grown by Carbothermal Growth Method"
J. de Mesa, A. Amo, L.V Sayson, W.O. Garcia and R.V. Sarmago "Study of morphological properties and elemental microcomposition of ZnO grown be femtosecond pulsed laser deposition"
C. Local (Peer Reviewed) 3rd Materials of Value and Essence Symposium (5)
LI Ballesteros, Z Bonagua, AG Cuevas, A Mata, E Estacio, A Salvador, A Somintac "Synthesis of fluorine-doped tin oxide films via intermittent nebulized spray pyrolysis as transparent conducting oxide for photodetectors"
JNA Barce, HAF Husay, MRR Ferrer, RAC Garcia, LG Gerna, AA Salvador, ES Estacio, AS Somintac "Growth and characterization of CuxO think films and nanowires"
JM Lopez, MAB Faustino, AI Cafe, LP Lopez Jr., NGE Saplagio, AI Mabilangan, AA Salvador, AS Somintac "Porous silicon for optical passive devices"
QS Garcia III, JM Abrenica, PMC Calaque, HMS Miguel, CJT Vergara, A Tuico, RT Veloz, MM Manrique, AA Salvador, ES Estacio, AS Somintac "Development of ZnO thin films and nanorods for optoelectronic and sensing applications"
K Cervantes, E Anguluan, A Salvador, A Somintac "Fabrication of vertically-aligned silicon nanowires using metal-assisted electroless etching"
D. International Conference Proceedings (18)
5th International Workshop on Far-Infrared Technologies,Presentor: E Anguluan, MH Balgos, HA Husay, R Jaculbia, E Estacio, A Salvador, A Somintac "Emission of THz Radiation from Cu2O Obtained by Thermal Oxidation of Cu Film on Glass Substrate"
5th International Workshop on Far-Infrared Technologies,Presentor: EA Prieto, A Somintac, A Salvador, E Estacio"Improved THz Emission in Low-Temperature-Grown GaAs Surfaces with n-doped GaAs Layer"
International Conference of Photonics and Applications ICPA 8, Da Nang City, Vietnam, Presentor: M.J. Felix, J. Muldera, A. Somintac, A. Salvador, and E. Estacio "Scalable and Low Cost THz Filter Based on U-shaped Array Fabricated Via Photolithography Utilizing Photomask Printed Using a Commercial Printer"
International Conference of Photonics and Applications ICPA 8, Da Nang City, Vietnam, Presentor: Eloise Anguluan, Philippe Tingzon, Niel Gabriel Saplagio, Joseph Christopher Ragasa, Arnel Salvador, Armando Somintac "Development of surface-enhanced Raman scattering platforms from harvested silicon nanowires"
International Conference of Photonics and Applications ICPA 8, Da Nang City, Vietnam, Presentor: Jessica Afalla, K Omambac, JD Vasquez, E Estacio "Low temperature photoluminescence of strained GaAs/AlGaAs MQWS on sapphire using epitaxial lift-off technique"
International Conference of Photonics and Applications ICPA 8, Da Nang City, Vietnam, Presentor: E Estacio, A Somintac, A Salvador " A review on the status of terahertz time domain spectroscopy research in the Philippines"
International Conference of Photonics and Applications ICPA 8, Da Nang City, Vietnam, Presentor: MA Faustino, AI Mabilangan, LP Lopez Jr., J Muldera, NG Saplagio, E Estacio, A Somintac "Terahertz emission of porous silicon"
International Conference of Photonics and Applications ICPA 8, Da Nang City, Vietnam, Presentor: A De Los Reyes, R Jaculbia, J Afalla, J muldera, KA de las Alas, JD Vasquez, S Vizcara, E Estacio, A Somintac, A Salvador "Temperature and excitation power-dependence of photoluminescence spectra in GaAs/AlGaAs Asymmetric double quantum wells"
Asian Conference on Nanoscience and Nanotechnology, Presentor: AR Tuico, VC Copa, JPR Ferrolino, CJT Vergara, JM Abrenica, AA Salvador, AS Somintac "Near-IR and UV photodetector based on p-n homojunction of undoped and phosphorus-doped zinc oxide nanorods"
Asian Conference on Nanoscience and Nanotechnology, Presentor: M.J. Felix, J. Muldera, A. Somintac, A. Salvador, and E. Estacio "Enhanced THz emission and Raman Signal from Silicon Nanopyramids"
Asian Conference on Nanoscience and Nanotechnology, Presentor: JD Lebitania, AA Salvador, AS Somintac "Anodized titanium dioxide nanotube film and its application for adsorption and spectroscopic detection of copper (II) ions in water"
Asian Conference on Nanoscience and Nanotechnology, Presentor: LP Lopez Jr., MAB Faustino, AI Mabilangan, NGE Salplagio, AA Salvador and AS Somintac "Thermo-optic coefficient of nanoporous silicon"

Asian Conference on Nanoscience and Nanotechnology, Presentor: MR Ferrer, HF Husay, AA Salvador, AS Somintac "Nanocrystalline CuO thin films fabricated via spray pyrolysis for acetone vapor sensing"
4th Thailand International Nanotechnology Conference, Presentor: Eloise Anguluan, Philippe Martin Tingzon, Arnel Salvador, Armando Somintac "Development of cost-effective Raman-SERS system for nanosensing"
4th Thailand International Nanotechnology Conference, Presentor: Anthony Tuico, Vernalyn Copa, Laureen Ida Ballesteros,John Paul Ferrolino, Christopher Jude Vergara, "Enhanced near-infrared photodetection of p-n junction zinc oxide nanorods on n-type silicon substrate suitable for medicinal analysis"Jefferson Abrenica, Arnel Salvador, Armando Somintac
4th Thailand International Nanotechnology Conference, Presentor: Evan Angelo Q. Mondarte, Armando S. Somintac, Arnel A. Salvador "ZnO/CuO Thermoelectric Nanofilms for Self-powering Integrated Devices"
4th Thailand International Nanotechnology Conference, Presentor: R delos Santos, J Ibanes, MH Balgos, E Estacio, A Salvador, A Somintac, C Que, K Yamamoto, M Tani "GaAs/AlGaAs Core-shell Nanowires on Si (100) Substrates as Terahertz Emitter for Potential Imaging Applications"
11 th International Conference on the Structure of Surfaces , University of Warwick, Coventry, UK, Presentor: Cyril Sadia "Selected properties of Gaas layers grown on GaSb(001)

III. Graduates:	
A. BS Physics (2)	
Rome Garcia	Thesis Title: Synthesis and Characterization of CuO Nanowires
Alexander delos Reyes	Thesis Title: Tunneling in GaAs/AlxGa1-x as Asymetric Double Quantum Wells Investigated via Temperature and Excitation Power-Dependent Photoluminescence Spectroscopy
B. BS Applied Physics (9)	
Nestor Bareza Jr.	Thesis title: Piezoresistive Transduction and Fabrication of Prototype Flex Sensor based on Aluminum Nitride
Cheeny Rose Bulacan	Thesis Title: Fabrication and Characterization of Surface Textured p-Type (100) Silicon (p-Si) Photovoltaic (PV) Cell
Erik Lorenzo Galvez IV	Thesis Title: Development of Nebulizer-Based Zinc Oxide Thick Film Deposition Technique
Anthony Tuico	Thesis Title:Temperature Sensor Based on Sputtered and Fabricated Aluminum Nitride Thin Film as a Prototype for Harsh Environments
Philippe Tingzon	Thesis Title: Demonstration of the Performance of Highly Resistive (100) Silicon Photovoltaic Cells with and without Silver Nanoparticles Based on Electroless Etched Silicon Nanowires
Bernadette Masil	Thesis Title: Fabrication of Zinc Oxide-Based Piezoelectric Device for Energy Harvesting Applications
Ana Marie Geronimo	Thesis Title: Characterization of Granular Properties of Mn-Doped YBCO Using Magnetic Susceptibilty Measurements
Louisse Anne C. Fulgencio	Thesis Title: Fabrication of Superconducting Bi-2212 Films by Electrophoretic Depostion (EPO) and Melt-Quenching with Annealing Unto Silver Coated MgO Substrate
Benjamin D. Villaflor	Thesis Title: Fabrication of Constriction Josephson Junction on Bi2Sr2CaCu2Ox+1(Bi-2212) Film Grown via Sedimentation with Potassium Chloride (KCl)
C. MS Physics (2)	
Kaye Ann De Las Alas	Thesis Title: Photoluminiscence Excitation Spectroscopy of Coupled and Decoupled GaAs-AlxGal-xAs Double Quantum Wells
Renish Simon	Thesis Title: Lineshape, Intensity and Lifetime Dependence of GaAs/AlGaAs Multiple Quantum Wells on Well Width and Number of Wells
D. MS Material Science And Engineering (0)	
E. PhD Physics (3)	
Jessica Pauline Afalla	Thesis Title: Photoluminescence and Carrier Dynamics of MBE-Grown GaAs/AlGaAs Quantum Wells
Jasher John Ibanes	Thesis Title: Terahertz emission from GaAs-AlGaAs core-shell nanowires

Karim Omambac	Thesis Title: Application of External Tensile and Compressive Strain on Epitaxially Lifted-Off Single Layer InAs/GaAs Quantum Dots

IV. Members and apprentices:

A. BS Physics (6)		
Ganzon, Ely Victor Julius Ganzon	Ahmad, Al-Khadeem	Garcia, Querubin III
Gonzales, Karl Cedric	Garcia, Rome	Miranda, Rosa
B. BS Applied Physics (14)		
Camille Victoria Cantor	Mata, Anna Carmela	Alcantara, Crizia
Nestor Daniel Fernandez	Cervantes, Kerr	Gerna, Lheander
Isabel Ophelia Fernando	Ferrolino, John Paul	Manrique, Mylenne
Barce, Jermaine Nicole	Fulgencio, Louisse Anne	Escolano, Arvin
	Veloz, Raymond	Dominguez, Victor Michael
C. MS Physics (24)		
DC Vistro	Jonalds Tacneng	De Los Reyes, Alexander
Ray Vargas	Leonalyn Bambao	Pulutan, Lance Kristoferson
Shielo Namuco	Jerome Taguba	Vizcara, Sheryl Ann
Rusty Lopez	Jamaica Pangasinan	Anguluan, Eloise
Zosa, Myles Allen	Jerine Amado	Santiago, Alvin Carl
Michael Francis Permejo	Hernanie Salazar, Jr.	Vasquez, John Daniel
Cyrus Ayala	Joybelle Lopez	Debinya Buenafe
De Las Alas, Kaye Ann	Bambao, Leonalyn	Duldulao, Mel Anthony
D. MA Physics (0)		
E. MS Material Science And Engineering (30)		
Xyrus Galapia	Tuico, Anthony	Copa, Vernalyn
Verdad Agulto	Tingzon, Philippe	Cainglit, Michaelrey
Lucevida Sayson	Café, Arven	Vergara, Christopher Jude T.
Maricar Rosete	Lumantas, Deborah Anne	Calaque, Precy Mae
Mayrene Uy	Catindig , Gerald Angelo	Faustino, Maria Angela B.
Felix, Mark Jayson	Saplagio, Niel Gabriel	Ang, Jade Nadine
Lopez, Roma	Tumanguil, Mae Agatha	Husay, Horace Andrew
Mangila, Nemesio IV	Ballesteros, Laureen Ida M.	Dilla, Ed Adrian
Mondarte, Evan Angelo	Lopez, Lorenzo Jr. P.	Mendoza, Jamie
Lebitania, Julie Ann D.	Miguel, Heinritz Majella	Ferrer, Marleane Rovi R.
F. PhD Physics (25)		
Bess Singidas	Jaculbia, Rafael	Afalla, Jessica Pauline
Francesca Isabel de Vera	Muldera, Joselito	Simon, Renish
Glaiza Rose Ocampo	Sadia, Cyril	Laganapan, Aleena Maria
Hannah R. Bardolaza	delos Santos, Ramon	Ibanes, Jasher John
Bugante, Jan Isaac	Rillera, Hannah	Cabello, Neil Irvin
Omambac, Karim	Ocampo , Glaiza Rose	de Vero, Jeffrey
Presto, Jorge Michael	Guaio, Luisito	Lao, Mayraluna
Prieto, Elizabeth Ann	Roca, Ronel Christian	Defensor, Michael
Maria Hermina Balgos		

V. Award/s

Best Poster Award at Asina Conference of Nanoscience and Nanotechnology , Paper Title: NSP 21, Development of pH Sensor Based on Zinc Oxide Nanorods

VI. Extension Programs:

DOST Grant Title: Summer Immersion Program 2014 Project Leader: Roland V. Sarmago Duration: April 2014 - May 2014, Participants: Denise Faye G. Lensoco (Bicol), Alyza Me Carballo (Central Luzon), Maria Gillian de Luna (Main), Warren Edrick Chu (Eastern Visayas), Andrea Rica Advincula (Eastern Visayas), Earvin L. Borromeo (MSU-IIT), Lyster Rey B. Cabardo (MSU-IIT) , Ronald Ray C. Gran (MSU-IIT) , Aldwin Christian T. Lacuesta (UPLB), Rovi Angelo B.Villaos (UPLB), Jessalyn C. Grumo (MSU-IIT) , Lady Jaharah Y. Jabber (MSU-IIT) , Marie Rose C. La Madrid (MSU-IIT), Miceh Rose D. Magdadaro (MSU-IIT), Everjoy S. Mones (UPLB) , Maria Jane S. Poncardas (MSU-IIT)

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