### e-ASIA Joint Research Program Final Report

1. Project title : Plasmonic Bio-Sensor for Detecting Serious Diseases in Southeast Asia

2. Joint Research period: Feb. 1st, 2013 - Dec. 31st, 2015

3. Research Team:

NIMS, Japan team (up to 6 people including the Principal Investigator) Funding period: Dec, 1, 2012 - Mar, 31, 2016 Total Funded Amount (in Local Currency): 42,627,000 JPY

	Name	Position	Affiliation	Role in the	
Ы	Kazushi Miki	Group Leader & Professor	National Institute for Materials Science (NIMS), Faculty of Pure and Applied Sciences, University of Tsukuba	Organize the project.	
Collaborator	Kenji Sakamoto	Senior Researcher	National Institute for Materials Science (NIMS)	Implement the project, assist, to organize the project, etc.	
Collaborator	Pincella Francesca	NIMS Junior Researcher & PhD course Student	National Institute for Materials Science (NIMS), Faculty of Pure and Applied Sciences, University of Tsukuba	Implement the project	
Collaborator	Yeji Song	NIMS Junior Researcher & Master course Student	National Institute for Materials Science (NIMS) Faculty of Pure and Applied Sciences, University of Tsukuba	Implement the project	
Collaborator	Satoko Nishiyama	NIMS Special Researcher	National Institute for Materials Science (NIMS)	Implement the project	
Collaborator	Karn-Orachai Kullavadee	PhD Course student	National Institute for Materials Science (NIMS) Faculty of Pure and Applied Sciences, University of Tsukuba	Implement the project	
Total number of participants including students: 6					

NANOTEC, NSTDA, Thailand team (up to 6 people including the Principal Investigator) Funding period: Dec, 1, 2012 - Mar, 31, 2016 Total Funded Amount (in Local Currency): not specified

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	Name	Position	Affiliation	Role in the project	
PI	Tararaj Dharakul	Senior advisor & Professor	National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA), Department of Immunology, Faculty of Medicine Siriraj Hospital, Mahidol University	Organize the project, experiments, analyses	
Collaborator	Sirirurg Songsivilia	Executive Director	National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA)	Supervise the project	
Collaborator	Rawiwan Laocharoensuk	Researcher	National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA)	implement the project, assist to organize the project, etc.	
Collaborator	Suwussa Bamrungsap	Researcher	National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA)	Implement the project	
Total number of participants including students: 4					

IMS, VAST, Vietnam team (up to 6 people including the Principal Investigator) Funding period: Feb, 1, 2013 - Dec, 31, 2015 Total Funded Amount (in Local Currency): 2,650,000,000 VND

	Name	Position	Affiliation	Role in the project	
PI	Liem Quang NGUYEN	Director General	Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)	Organize the project, experiments, analyses.	
Collaborator	Thi Dieu Thuy UNG	Researcher	Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)	Implement the project, assist to organize the project, etc.	
Collaborator	Thi Kim Chi TRAN	Researcher	Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)	Implement the project	
Collaborator	Thu Loan NGUYEN	Researcher	Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)	Implement the project	
Collaborator	Quoc Trung DANG	Researcher	Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)	Implement the project	
Collaborator	Anh Son HOANG	Researcher	Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)	Implement the project	
Total number of participants including students: 6					

4. Summary of the joint research (4.~6.で4ページ以内)

Using biomarkers, synthesis technology of metal nanoparticles, and sensing technology by surface enhanced Raman scattering (SERS) spectroscopy, a immunoassay system for clinical and early diagnosis of serious diseases or infectious diseases in Southeast Asia was demonstrated.

5. Outputs and Anticipated Outcomes of Joint Research

- 5-1 Scientific achievements and implemented activities of the joint research (More detail will be open within 1 year)
- 5-1-1 Development of biosensors

SERS spectroscopy is a simple and powerful tool for detecting trace amount of substances near metal nanostructures such as metal nanoparticles (NPs), owing to the strong electromagnetic field enhancement effect of metal nanostructures.

The SERS Immunosensor developed in this project consists of three major parts: a SERS substrate; antigens immobilized on the SERS substrate, SERS probes with selective binding ability to a target antigen. The SERS probe is composed of antigen recognition sites (antibodies), Raman reporter molecules, and metal nanostructures that enhance Raman scattering efficiency of the Raman reporter molecules.

The immuneassay protocol is as follows: (1) preparation of SERS substrates by the established recipe, (2) drop cast of antigen solution (immobilization of target-antigens on the SERS substrate), (3) drop cast of the SERS probe solution (antibody-antigen recognition), (4) removal of the excess SERS probes, and (5) Raman measurement. Assuming that the Raman scattered light intensity of the Raman reporter molecule correlates to the density of immobilized antigen, the antigen density can be deduced from the SERS signal intensity, using the calibration curve.

5.1.2 Development of SERS substrate fabrication process

The joint research team of Vietnam and Japan succeeded in organizing metal NPs of 10-100 nm in size into a two dimensional (2D) monolayer on a conductive transparent ITO substrate with a high surface coverage of around 80%. Especially, it should be noted that we solved the problem of dispersion unstability of alkanethiolate-capped AuNPs with a diameter over 10 nm in a mixture of hexane and acetone (9:1 v/v). The alkanethiol surface modification is necessary for our 2D arraying technique. The dispersion unstability was solved by forming a mixed self-assembled monolayer (SAM) of dodecanetiolate and octadecanethiolate on the AuNP surface, instead of a single component SAM. As a result, the long-term dispersion stability was realized even for AuNPs with a diameter of 50nm, and a 2D array of AuNPs could be formed on an ITO substrate with a high surface coverage of around 80% (Fig. 1). It should be also noted that Vietnam team has high quality synthesis technology of metal NPs and



could provide us AuNPs with a narrow size distribution of  $50 \pm 3.2$  nm (Fig.2). As a result, we could smoothly establish our SERS substrate fabrication process.

#### 5.1.3 Development of SERS immunesensor

ratio of the constituent alkanethiol of the SAM (right).

The joint research team of Thailand and Japan developed three elemental key parts for SERS immunesensors: SERS substrates, SERS probes, and an immunoassay protocol. The SERS substrate is a 2D array of 40 nm Au core-8.4 nm-thick Ag shell (Au@Ag) NPs (Fig. 3). The localized surface plasmon resonance wavelength of the 2D array was around 633 nm. With the use of rohdamin 6G as a test molecule, the enhancement factor due to the SERS substrate was estimated to be around 10<sup>7</sup>.



Fig. 3 EDX mapping image of Au@Ag NPs.

#### 5-2 Synergistic effects of the international joint research

Activities of female students and researchers were wonderful in our PJ. Especially it should be noted that Italian and Thai female graduate students (one of which is a Japanese government Scholarship Fellow) in the Japanese team contributed to the development of SERS substrates in the first half, and the optimization of immunoassay process and the final demonstration of detection of Influenza A with the SERS immunosensor in the latter half. They have Interdisciplinary backgrounds of Physics-Chemistry and Chemistry-Biology. Therefore, their activities really bridged Vietnam team in Physics field, Japanese team in Materials field, and Thailand team in Biology-Immunology fields, inducing synergy effect between the three teams to realize the SERS immunesensor.

#### 5-3 Broader impacts including contribution to society

The biosensors using our SERS substrates are rated as the demonstration level of influenza A detection. On the basis of our achievement, after 10 years, general-purpose SERS substrates for chemical sensors are likely to be supplied. In the case of general-purpose SERS substrates for biosensors, as is done well in simple diagnosis sensor kits, the SERS substrates should be sold together with the prescription and all treatment drugs for the hydrophilic process and antibody immobilization. After 20 years, SERS-based clinical diagnosis sensor kits are likely to be supplied.

#### 5-4 Development and sustainability of the cooperation

By this project, It became a lot more clear that both PIs and directors of both Vietnam and Thailand teams or institutes are conscious of a Japan team as an international joint research partner, besides the PJ achievements and the synergistic effect by the human exchange. Actually NANOTEC and NIMS had bilateral seminar in May26-28, 2016 for discussion about the next collaborations.

6. Recommendations and Comments to the Program

The final report and the progress report should be carried out in the international format.

#### Annex: List of Scientific Achievements and Implemented Activities of the Joint Research

1 Original Publications (All Authors' Names, Title, Journal Name, Volume, Page, Year, DOI)

#### 1.1 Co-authored among research teams

Ung Thi Dieu Thuy, Kenji Sakamoto, Satoko Nishiyama, Sayaka Yanagida, Nguyen Quang Liem, & Kazushi Miki. Assembly of mid-nanometer-sized gold particles capped with mixed alkanethiolate SAMs into high-coverage colloidal films. *Langmuir, 31*, 3494-13500. 2015. DOI: 10.1021/acs.langmuir.5b03594

#### 1.2 Published by single team

Ung Thi Dieu Thuy, Le Anh Tu, Nguyen Thu Loan, Tran Thi Kim Chi, & Nguyen Quang Liem. Comparative photoluminescence properties of type-I and type-II CdTe/CdS core/shell quantum dots. *Optical Materials*, *53*, 34-38. 2016. DOI:10.1016/j.optmat.2016.01.022

Raweewan Thiramanas, & Rawiwan Laocharoensuk. Competitive binding of polyethyleneimine-coated gold nanoparticles to enzymes and bacteria: A key mechanism for low-level colorimetric detection of gram-positive and gram-negative bacteria. *Microchim Acta, 183,* 389-396. 2016.

DOI: 10.1007/s00604-015-1657-7

Suwussa Bamrungsap , Alongkot Treetong, Chayachon Apiwat, Tuksadon Wuttikhun, &Tararaj Dharakul. SERS-fluorescence dual mode nanotags for cervical cancer detection using aptamers conjugated to gold-silver nanorods. *Microchim. Acta, 183,* 249-256. 2016. DOI : 10.1007/s00604-015-1639-9

Pattasuda Duangkaew, Satita Tapaneeyakorn, Chayachon Apiwat, Tararaj Dharakul, Somsak Laiwejpithaya, Proespichaya Kanatharana, & Rawiwan Laocharoensuk. Ultrasensitive Electrochemical Immunosensor based on Dual Signal Amplification Process for p16INK4a Cervical Cancer Detection in Clinical Samples. *Biosens, Bioelectron., 74,* 673–679. 2015. DOI :10.1016/j.bios.2015.07.004

Francesca Pincella, Katsuhiro Isozaki, Tomoya Taguchi, Yeji Song, & Kazushi Miki. Selective Two-Photon-Absorption-Induced Reactions of Anthracene-2-Carboxylic Acid on Tunable Plasmonic Substrate with Incoherent Light Source. *Journal of Nanoscience and Nanotechnology, 15,* 1171-1179. 2015.

DOI : http://dx.doi.org/10.1166/jnn.2015.9501

Takao Ochiai, Katsuhiro Isozaki, Satoko Nishiyama, & Kazushi Miki. Enhancement of self-assembly of large-sized (> 10 nm) gold nanoparticles locally on an ITO substrate. *Applied Physics Express, 7,* 065001. 2015.

DOI :10.7567/APEX.7.065001

Kullavadee Karn-orachai, Satoko Nishiyama, & Kazushi Miki. Surface Potential Change of Cationic Nanoparticles by Polymer Coating. *Journal of Photopolymer Science and Technology, 27(2),* 273-276. 2014. DOI : 10.2494/photopolymer.27.273

Francesca Pincella, Yeji Song, Takao Ochiai, Katsuhiro Isozaki, Kenji Sakamoto, & Kazushi Miki. Square-centimeter-scale 2D-arrays of Au@Ag core-shell nanoparticles towards practical SERS substrates with enhancement factor of 107. *Chemical Physics Letters*, 605-606., 115-120. 2014. DOI : 10.1016/j.cplett2014.05.020

Francesca Pincella, Katsuhiro Isozaki, & Kazushi Miki. Visible light-driven plasmonic photocatalyst. *Light: Science & Applications, 3,* e133(6pages). 2014.

DOI: 10.1038/lsa.2014.14

Nguyen Thi Minh Thuy, Tran Thi Kim Chi, Ung Thi Dieu Thuy, & Nguyen Quang Liem. Low-cost and large-scale synthesis of CuInS2 and CuInS2/ZnS quantum dots in diesel. *Optical Materials, 37,* 823–827. 2014.

DOI: 10.1016/j.optmat.2014.09.016

Hai Yen Nguyen, Willy Daney de Marcillac, Clotilde Lethiec, Ngoc Hong Phan, Catherine Schwob, Agnès Maître, Quang Liem Nguyen, Van Vu Led, Paul Bénalloul, Laurent Coolen, & Pham Thu Nga. Synthesis and op1534–1541tical properties of core/shell ternary/ternary CdZnSe/ZnSeS quantum dots. *Optical Materials*, *36(9)*, 1534–1541. 2014. DOI : 10.1016/j.optmat.2014.04.020

Ung Thi Dieu Thuya, Nguyen Quang Liema, Christopher M.A. Parlettb, Georgi M. Lalevb, & Karen Wilsonb. Synthesis of CuS and CuS/ZnS core/shell nanocrystals for photocatalytic degradation of dyes under visible light. *Catalysis Communications, 44,* 62-67. 2014. DOI :10.1016/j.catcom.2013.07.030

Thu Loan Nguyen, Thi Dieu Thuy Ung, & Quang Liem Nguyen. Non-chapped, vertically well aligned titanium dioxide nanotubes fabricated by electrochemical etching. *Advances in Natural Sciences: Nanoscience and Nanotechnology, 5(2),* 025016 (6pp). 2014. DOI :10.1088/2043-6262/5/2/025016

Suwussa Bamrungsap, Chayachon Apiwat, Warangkana Chantima, Tararaj Dharakul, & Natpapas Wiriyachaiporn. Rapid and sensitive lateral flow immunoassay for influenza antigen using fluorescently-doped silica nanoparticles. *Microchim. Acta, 181,* 223-230. 2014 DOI :10.1007/s00604-013-1106-4

Kazushi Miki, Katsuhiro Isozaki, Takao Ochiai, Tomoya Taguchi, & Koh-ichi Nittoh. Gold Nanoparticle 2D-Arrays Chemically Immobilized as Large-Area Near-Field Light Source. *ECS Trans. 50(6),* 205-213. 2013. DOI :10.1149/05006.0205ecst

Takao Ochiai, Katsuhiro Isozaki, Francesca Pincella, Tomoya Taguchi, Koh-ichi Nittoh, & Kazushi Miki. Plasmon-resonant optics on an indium-tin-oxide film exciting a two-photon photochromic reaction. *Applied Physics Express, 6,* 102001 (4 pages). 2013. DOI : 10.7567/APEX.6.102001

Ung Thi Dieu Thuy, & Nguyen Quang Liem. Transition from type-I to type-II CdTe/CdS core/shell quantum dots synthesized in water at low temperature, Advances in Natural Sciences. *Nanoscience and Nanotechnology, 4(4),* 045010 (6pp). 2013 DOI : 10.1088/2043-6262/4/4/045010

Thi Hiep Nguyen, Thu Loan Nguyen, Thi Dieu Thuy Ung, & Quang Liem Nguyen. Synthesis and characterization of nano-CuO and CuO/TiO2 photocatalysts, Advances in Natural Sciences. *Nanoscience and Nanotechnology, 4, (2),* 025002 (6pp). 2013 DOI : 10.1088/2043-6262/4/2/025002

Weon-Sik Chae, Thi Dieu Thuy Ung, & Quang Liem Nguyen. Time-resolved photoluminescence and photostability of single semiconductor quantum dots, Advances in Natural Sciences. *Nanoscience and Nanotechnology, 4(4),* 045009 (5pp). 2013 DOI : 10.1088/2043-6262/4/4/045009

Nguyen Ngoc Hai, Vu Duc Chinh, Ung Thi Dieu Thuy, Tran Kim Chi, Nguyen Hai Ye, Dao Tran Cao, Nguyen Quang Liem, & Pham Thu Nga. Detection of the pesticide by functionalised quantum dots as fluorescence–based biosensor. *International Journal of Nanotechnology 10 (304)*, 137–145. 2013. DOI: http://dx.doi.org/10.1504/IJNT.2013.053126

Ung Thi Dieu Thuy, Axel Maurice, Nguyen Quang Liem, & Peter Reiss. Europium doped

In(Zn)P/ZnS colloidal quantum dots. *Dalton Trans, 42,* 12606-12610.2013. DOI : 10.1039/C3DT50526J

Tomoya Taguchi, Katsuhiro Isozaki, & Kazushi Miki. Enhanced Catalytic Activity of

Self-Assembled-Monolayer-Capped Gold Nanoparticles. *Advanced Materials, 24,* 6462–6467. 2012. DOI : 10.1002/adma.201202979

Thi Hoa Nguyen, Thi Dieu Thuy Ung, Thi Hien Vu, Thi Kim Chi Tran, Van Quyen Dong, Duy Khang Ding, & Quang Liem Nguyen. Fluorescence biosensor based on CdTe quantum dots for specific detection of H5N1 avian influenza virus. *Fluorescence biosensor based on CdTe quantum dots for specific detection of H5N1 avian influenza virus, 3(3),* 035014 (5pp). 2012. DOI : 10.1088/2043-6262/3/035014

Thi Dieu Thuy Ung, Thi Kim Chi Tran, Thu Nga Pham, Duc Nghia Nguyen, Duy Khang Dinh, & Quang Liem Nguyen. CdTe and CdSe quantum dots: synthesis, characterizations and applications in agriculture. *Advances in Natural Sciences: Nanoscience and Nanotechnology 3 (4),* 043001 (11pp), 2012. DOI: 10.1088/2043-6262/3/4/043001

Suwussa Bamrungsap, Zilong Zhao, Tao Chen, Lin Wang, Chunmei Li, Ting Fu, & Weihong Tan. Nanotechnology in therapeutics: a focus on nanoparticles as a drug delivery system. *Nanomedicine*, 7, 1253-1271. 2012. DOI : 10.2217/nnm.12.87

2 Presentations at conferences (Speaker, Title, Conference Name, Location, Date, Type of Presentation, etc.)

#### 2.1 Co-authored among research teams

Kenji Sakamoto, Ung Thi Dieu Thuy, Satoko Nishiyama, Sayaka Yanagida, Nguyen Quang Liem, & Kazushi Miki.

『混合アルカンチオール SAM 修飾による高被覆率金ナノ粒子 2 次元配列膜』 第 63 回応用物理学 会春季学術講演会 東京工業大学大岡山キャンパス 2016 年 3 月 20~22 日東京、2016 年 3 月 20 日 口頭発表

Kazushi Miki, Kenji Sakamoto, Satoko Nishiyama, Sayaka Yanagida, Ung Thi Dieu Thuy, Nguyen Quang Liem, Katsuhiro Isozaki, Hikaru Takaya, and Masahiro Nakamura.

'Assembly of Various-Sized Au Nanoparticles 2D Array for Enhanced Catalysis Substrate'. Institute for Chemical Research International Symposium 2016 (ICRIS'16, March 7 - 8, 2016). Uji, March 7, 2016. Poster Session.

Kullavadee Karn-orachai, Kenji Sakamoto, Rawiwan Laocharoensuk, Suwussa Bamrungsap, Tararaj Dharakul, & Kazushi Miki.

'Development of SERS substrates for biosensing applications'. Students Seminar of University of Tsukuba with Universities in Taiwan (Nov.1-2, 2015), Hsinchu, Taiwan, Nov. 1, 2015. Oral Presentation.

Kullavadee Karn-orachai, Kenji Sakamoto, Rawiwan Laocharoensuk, Suwussa Bamrungsap, Tararaj Dharakul, & Kazushi Miki.

'SERS immunosensor for detecting Influenza A'. The 4th JSAP-OSA Joint Symposia (the JSAP Autumn Meeting 2015, 13-16 September 2015). Nagoya, Sep. 16, 2015. Oral Presentation.

Kazushi Miki, Karn-Orachai Kullavadee, Kenji Sakamoto, Koh-ichi Nittoh, Satoko Nishiyama, Sayaka Yanagida, Rawiwan Laocharoensuk, Suwussa Bamrungsap, Tararaj Dharakul, Sirirurg Songsivilai, Thi Dieu Thuy Ung, Thi Kim Chi Tran, & Liem Quang Nguyen. 'Surface Enhanced Raman Spectroscopy (SERS) Substrate towards bio-sensor for detecting serious diseases in Southeast Asia'. The 7th International Workshop on ADVANCED MATERIALS SCIENCE AND NANOTECHNOLOGY (IWAMSN 2014). Nov. 2-6, 2014. Halong Bay, Vietnam, Nov. 5, 2014. Guest/Invited Speaker.

#### 2.2 Published by single team

Suwussa Bamrungsap, Alongkot Treetong, Chayachon Apiwat, Tuksadon Wuttikhun, & Tararaj

Dharakul.

'Aptamer conjugated gold nanorods for cancer detection based on surface enhanced Raman scattering (SERS)' IEEE 15th International Conference on Nanotechnology(July 27-30, 2015), Rome, Italy, July 28, 2015. Poster Session.

Katsuhiro Isozaki, Francesca Pincella, & Kazushi Miki. 'Visible light-driven photocatalyst with gold nanoparticle two-dimensional arrays as a high intense field light sourse'. Pacifichem 2015 (The 2015 International Chemical Congress of Pacific Basin Societies). December 15-20, 2015. Honolulu, Hawaii, USA, December 17, 2015. Poster Session.

Katsuhiro Isozaki, Tomoya Taguchi, Kosuke Ishibashi, Hikaru Takaya, Masaharu Nakamura, & Kazushi Miki.

'Enhanced Catalysis of Alkanethiolate-Self-Assembled-Monolayer-Capped Gold Nanoparticles towards Silane Alcoholysis' Pacifichem 2015 (The 2015 International Chemical Congress of Pacific Basin Societies). December 15-20, 2015. Honolulu, Hawaii, USA, December 15, 2015. Oral Presentation.

磯崎 勝弘、石橋 幸典、高谷 光、中村 正治、三木 一司 『自己組織化単分子膜ー金ナノ粒子界面を利用した高効率触媒反応』第64回高分子討論会(2015 年9月15日(火)~17日(木)、東北大学 川内キャンパス.) 仙台 2015年9月16日 口頭発表

Kazushi Miki. Metal nanoparticle plasmonics: Visible light-driven photocatalyst with gold nanoparticle two-dimensional arrays as a high intense field light source. School Seminar, Scool of Materials Science and Enginnering, Southeast University, Nanjing, China, July 9, 2015. Guest/InvitedSpeaker.

磯崎 勝弘、石橋 幸典、三木 一司、高谷 光、中村 正治 『高機能触媒を目指した超分子界面修飾型金微粒子の合成』第62回有機金属化学討論会 (関西 大学千里山キャンパス、大阪市 平成27年9月7日 口頭発表

Katsuhiro Isozaki, Tomoya Taguchi, Kosuke Ishibashi, Hikaru Takaya, Masaharu Nakamura, & Kazushi Miki. 'Enhanced Catalysis of Alkanethiolate-Self-Assembled-Monolayer-Capped Gold Nanoparticles towards Silane Alcoholysis' Pacifichem 2015 (The 2015 International Chemical Congress of Pacific Basin Societies (Pacifichem). Honolulu, Hawaii, USA, December 15-20, 2015. December 15, 2015. Guest/Invited Speaker.

Katsuhiro Isozaki, Tomoya Taguchi, Kosuke Ishibashi, Hikaru Takaya, Masaharu Nakamura, & K.azushi Miki. 'Enhanced Catalysis of Self-Assembled-Monolayer-Capped Gold Nanoparticles towards Silane Alcoholysis'' ISMPC15 - International Symposium on Monolayer Protected Clusters (Yamanaka Dormitory-Naito Seminar House, Yamanashi, July 13-16, 2015). Jul 16, 2015. Oral Presentation.

Katsuhiro Isozaki, Tomoya Taguchi, Kosuke Ishibashi, Hikaru Takaya, Masaharu Nakamura, & Kazushi Miki. 'Enhanced catalysis of gold nanoparticles capped by alkanethiol-self-assembled monolayer' Fourth International Conference on Mulifunctional, Hybrid and Nanomaterials (Hybrid Materials 2015, 9 - 13 March 2015). Sitges, Spain, March 11, 2015. Oral Presentation.

Kazushi Miki, & Katsuhiro Isozaki. '2D Array of Gold Nanoparticles Immobilized on Large-area Substrate Towards Nanophotonics Applications' The 5th International Conference on Nanotechnology: Fundamentals and Applications (ICNFA 2014, Aug. 11th-13th, 2014), Prague, Czech Republic, August 12, 2014. Oral Presentation.

三木 一司 『ナノスケールの光を使った機能性材料』防衛大学校機能材料工学科4年生向け課外講演(主催:防衛大学校機能材料工学科、防衛大学校機能材料工学科視聴覚教室)、横須賀2014年10月21日 招待講演

Kazushi Miki 'Metal Nanopartcles Plasmonics for Chemical Reactor and Bio Sensor' Department Seminar, Department of Electrical Engineering, University of California, Los Angeles October 6, 2014. Guest/Invited Speaker.

三木 一司, Pincella Francesca, 磯崎 勝弘『可視光駆動可能なチタニア結晶光触媒デバイス』応用

物理学会 2014 秋季講演会 薄膜・表面シンポジウム「固液界面を使った新しい酸化物エレクトロニクス:化学とデバイスの融合」(北海道大学) 札幌 2014 年 9 月 18 日 ロ頭発表

Katsuhiro Isozaki, Taguchi Tomoya, Kosuke Ishibashi, Hikaru Takaya, Masaharu Nakamura, & Kazushi Miki. "Enhanced Catalysis of Gold Nanoparticles Surrounded by Alkanethiol Self-Assembled Monolayers" The XXVI International Conference on Organometallic Chemistry (ICOMC2014, July 13-18, 2014), Sapporo, July 17, 2014. Oral Presentation.

カーンオラチャイ カラバデイ,西山 聡子,三木 一司 『高分子被覆ナノ粒子の表面電位測定』フォトポリマーコンファレンス 千葉大学 2014 年 6 月 8-11 日 口頭発表

Takao Ochiai, Katsuhiro Isozaki, Satoko Nishiyama, & Kazushi Miki. 'Mixed alkanethiol-SAM on large-sized (> 10 nm) gold nanoparticles for enhancement of their self-assembly on an ITO substrate' NIMS conference 2014 "A Strong Future from Soft Materials" (July 1 - 3, 2014, Tsukuba Epocal)., Tsukuba, July 2, 2014. Poster Session.

Katsuhiro Isozaki, Taguchi Tomoya, Kosuke Ishibashi, Hikaru Takaya, Masaharu Nakamura, & Kazushi Miki. 'Enhanced Catalysis of Self-Assembled Monolayer-Capped Gold Nanoparticles' Seventh Tokyo Conference on Advanced Catalytic Science and Technology (TOCAT7 Kyoto2014, June 1-6, 2014), Kyoto, June 5, 2014. Oral Presentation.

Kazushi Miki. 'Metal Nanopartcles 2D array for Chemical Reactor and Bio Sensor' 国立交通大学理 学部化学科セミナー,国立交通大学理学部. April 18, 2014. Guest/Invited Speaker.

Katsuhiro Isozaki, Tomoya Taguchi, & Kazushi Miki. 'Catalytic Enhancement Effect of Alkanethiol-Self-Assembled-Monolayer on Gold Nanoparticles' The Eighth International Symposium on Integrated Synthesis (ISIS-8(Todaiji Temple Cultural Center, Nara, Nov. 29 –Dec. 1st, 2013). Nara, November 30, 2013. Oral Presentation.

Francesca Pincella, Katsuhiro Isozaki, & Kazushi Miki. 'Visible light photocatalyst based on plasmon-enhanced two-photon absorption' The 2nd JSAP-OSA Joint Symposia (The 74th JSAP Autumn Meeting 2013, Kyotanabe Campus, Doshisha University, Kyoto. September 16 -20, 2013). September 17, 2013. Oral Presentation.

Yeji Song, Pincella Francesca, Katsuhiro Isozaki, & Kazushi Miki. 'Dense 2D arrays of Au@Ag and Au@Ag@Au as efficient SERS substrates' The 2nd JSAP-OSA Joint Symposia (The 74th JSAP Autumn Meeting 2013. Kyotanabe Campus, Doshisha University, Kyoto, September 16 -20, 2013). September 16, 2013. Oral Presentation.

Katsuhiro Isozaki, Tomoya Taguchi, and Kazushi Miki. 'Enhanced Catalysis of Self-Assembled-Monolayer-Capped Gold Nanoparticles, Challenges in Organic Materials & Supramolecular Chemistry' ISACS10, Jun. 18-21, 2013, Royal Society of Chemistry), Kyoto, June 19, 2013. Oral Presentation.

Kazushi Miki, Tomoya Taguchi, & Katsuhiro Isozaki. 'Self-Assembled Monolayer-Capped Gold Nanoparticle 2D-arrays as Enhanced Catalysis' Symposium on Surface and Nano Science 2013 (SSNS'13) (B-3, Zao, January 15-18th, 2013). Zao, Miyagi, January 16, 2013. Guest/Invited Speaker.

三木一司 『大面積・高輝度近接場光源を利用したマイクロフロー光反応』 光科学技術研究振興財団助成金 平成 23 年度研究助成 報告講演会(ホテルクラウンパレス浜松)、 浜松、2014 年 2 月 13 日 招待講演

磯崎 勝弘、Francesca Pincella、三木 一司 『金ナノ粒子2次元配列を用いる可視光駆動型光触媒』錯体化学会第63回討論会(琉球大学千原 キャンパス、2013年11月2日~4日)、沖縄、2013年11月2日 口頭発表

3 Organization of workshops, seminars, symposia, etc. (Organizer, Title of Event, Date,

Location, Number of Participants, etc.)

Kazushi Miki. Workshop 'For detecting a virus, R&D of SERS type Biosensor' (兼第4回全体会議). 2014 年 11 月 12 日~2014 年 11 月 14 日 日本、つくば及び日光、物質・材料研究機構及びホテル 日光千姫物語 参加人数:12

4 Researcher exchanges including students (Description of Exchange, Destination, Duration, etc.)

Karn-Orachai Kullavadee, Ph.D. course student, University of Tsukuba. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 7<sup>th</sup> NANOTC-NIMS meeting Days of stay: 4days; Mar.23<sup>rd</sup>, 2016~Mar. 26<sup>th</sup>, 2016.

Kenji Sakamoto, Senior Researcher, NIMS. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 7<sup>th</sup> NANOTC-NIMS meeting Days of stay: 4days; Mar.23<sup>rd</sup>, 2016~Mar. 26<sup>th</sup>, 2016.

Kazushi Miki, Group Leader, NIMS. Visited to: NANOTEC, Thailand and IMS, Vietnam. Purpose of the visit: To attend 7<sup>th</sup> NANOTC-NIMS meeting, 4<sup>th</sup> IMS-NIMS meetings, and JST e-ASIA workshop. Days of stay: 9days; Mar.23<sup>rd</sup>, 2016~Mar. 31<sup>st</sup>. 2016.

Sirirurg Songsivilai, Executive Director, NANOTEC, Thailand. Visited to: NIMS, Japan. Purpose of the visit:To attend e-ASIA project steering meeting Days of stay: 5days; Jan. 26<sup>th</sup> 2016~Jan.30<sup>th</sup> 2016.

Karn-Orachai Kullavadee, Ph.D. course student, University of Tsukuba. Visited to: NANOTEC, Thailand Purpose of the visit: To attend 4<sup>th</sup> e-ASIA project and 6<sup>th</sup> NANOTEC-NIMS meetings. Days of stay: 3days; Oct. 12<sup>th</sup>, 2015~Oct. 14<sup>th</sup>, 2015.

Kenji Sakamoto, Senior Researcher, NIMS. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 4<sup>th</sup> e-ASIA project and 6<sup>th</sup> NANOTEC-NIMS meetings. Days of stay: 3days; Oct. 12<sup>th</sup>, 2015~Oct. 14<sup>th</sup>, 2015.

Miki Kazushi, Group Leader, NIMS. Visited to: NANOTEC, Thailand Purpose of the visit: To attendt 4<sup>th</sup> e-ASIA project and 6<sup>th</sup> NANOTEC-NIMS meetings. Days of stay: 4days; Oct. 11<sup>th</sup>, 2015~Oct. 14<sup>th</sup>, 2015.

Miki Kazushi, Group Leader, NIMS. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 5<sup>th</sup> NANOTEC-NIMS meeting. Days of stay: 3days; Feb.19<sup>th</sup> 2015~ Feb. 21<sup>st</sup>, 2015.

Kenji Sakamoto, Senior Researcher, NIMS. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 5<sup>th</sup> NANOTEC-NIMS meeting. Days of stay: 3days; Feb.19<sup>th</sup> 2015~ Feb. 21<sup>st</sup>, 2015.

KARN-ORACHAI Kullavadee, Ph.D. course student, University of Tsukuba. Visited to: NANOTEC, Thailand. Purpose of the visit: Carrying out the collaborative research, participation for 5<sup>th</sup> NANOTEC-NIMS meeting. Days of stay: 50days; Jan.7<sup>th</sup> 2015~Feb.25<sup>th</sup>, 2015.

Nguyen Quang Liem, Director General, IMS, Vietnam.

Visited to: NIMS, Japan Purpose of the visit: To attend e-ASIA project steering meeting Days of stay: 3days; Dec.1<sup>st</sup> 2015~Dec.3<sup>rd</sup> 2015.

Karn-Orachai Kullavadee, Ph.D. course student, University of Tsukuba. Visited to: NANOTEC, Thailand. Purpose of the visit: Carrying out the collaborative research. Days of stay: 42days; Aug.7<sup>th</sup> 2014~Sep.17<sup>th</sup> 2014.

Miki Kazushi, Group Leader, NIMS. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 3<sup>rd</sup> NANOTEC-NIMS meetings. Days of stay: 4days; Feb. 24<sup>th</sup>, 2014~Feb.27<sup>th</sup>, 2014.

Kenji Sakamoto, Senior Researcher, NIMS. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 3<sup>rd</sup> NANOTEC-NIMS meetings. Days of stay: 4days; Feb. 24<sup>th</sup>, 2014~Feb.27<sup>th</sup>, 2014.

Satoko Nishiyama, Researcher, NIMS. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 3<sup>rd</sup> NANOTEC-NIMS meetings. Days of stay: 4days; Feb. 24<sup>th</sup>, 2014~Feb.27<sup>th</sup>, 2014.

Song, Yeji, Master course student, University of Tsukuba. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 3<sup>rd</sup> NANOTEC-NIMS meetings. Days of stay: 4days; Feb. 24<sup>th</sup>, 2014~Feb.27<sup>th</sup>, 2014.

Francesca Pincella, Ph.D. course student, University of Tsukuba. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 3<sup>rd</sup> NANOTEC-NIMS meetings. Days of stay: 4days; Feb. 24<sup>th</sup>, 2014~Feb.27<sup>th</sup>, 2014.

Karn-Orachai Kullavadee, Ph.D. course student, University of Tsukuba. Visited to: NANOTEC, Thailand. Purpose of the visit: Carrying out the collaborative research and participation for 3<sup>rd</sup> NANOTEC-NIMS meetings. Days of stay: 7days; Feb. 24<sup>th</sup>, 2014~Mar.2<sup>nd</sup>, 2014.

Pichayalak Pichayakul, Instructor, Faculty of Business Administration, Chiang Mai University. Visited to: NIMS, Japan Purpose of the visit: To attend e-Asia JRP site visit Days of stay: 1day; Dec.16<sup>th</sup> 2014.

Meita Rumbayan, Lecturer,Department Electrical Engineering, College of Enginnering, Sam Ratulangi University Visited to: NIMS, Japan. Purpose of the visit: e-Asia JRP site visit. Days of stay: 1day; Dec.16<sup>th</sup> 2014.

Nguyen Trung Dung, Lecturer, Hanoi University of Science and Technology. Visited to: NIMS, Japan. Purpose of the visit: e-Asia JRP site visit. Days of stay: 1day; Dec.16<sup>th</sup> 2014.

Enrico Camero Paringit, Associate Professor, College of Engineering, University of the Philippines. Visited to: NIMS, Japan. Purpose of the visit: e-Asia JRP site visit Days of stay: 1day; Dec.16<sup>th</sup> 2014.

Nguyen Quang Liem, Director General, IMS. Visited to: NIMS, Japan. Purpose of the visit: To attend 3<sup>rd</sup> e-ASIA project meeting/workshop, and 3<sup>rd</sup> IMS-NIMS meeting. Days of stay: 4days, Nov.11<sup>th</sup>, 2014~Nov. 14<sup>th</sup>, 2014.

Suwassa Bamrungsap, Researcher, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: To attend 3<sup>rd</sup> e-ASIA project meeting/workshop, and 4<sup>th</sup> NANOTEC-NIMS meeting. Days of stay: 4days, Nov.11<sup>th</sup>, 2014~Nov. 14<sup>th</sup>, 2014.

Rawiwan Laocharoensuk, Researcher, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: To attend 3<sup>rd</sup> e-ASIA project meeting/workshop, and 4<sup>th</sup> NANOTEC-NIMS meeting. Days of stay: 4days, Nov.11<sup>th</sup>, 2014~Nov. 14<sup>th</sup>, 2014.

Tararaj Dharakul, Senior Advisor, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: To attend 3<sup>rd</sup> e-ASIA project meeting/workshop, and 4<sup>th</sup> NANOTEC-NIMS meeting. Days of stay: 4days, Nov.11<sup>th</sup>, 2014~Nov. 14<sup>th</sup>, 2014.

Sirirurg Songsivilia, Executive Director, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: To attend 3<sup>rd</sup> e-ASIA project meeting/workshop, and 4<sup>th</sup> NANOTEC-NIMS meeting. Days of stay: 4days, Nov.11<sup>th</sup>, 2014~Nov. 14<sup>th</sup>, 2014.

Ung Thi Dieu Thuy, Researcher, IMS. Visited to: NIMS, Japan. Purpose of the visit: Carrying out the collaborative research. Days of stay: 183days, June 1<sup>st</sup>, 2014~Nov.30<sup>th</sup>, 2014.

Satoko Nishiyama, Researcher, NIMS. Visited to: IMS, Vietnam. Purpose of the visit: To attend e-ASIA project steering meeting, 2<sup>nd</sup> e-ASIA project, and IMS-NIMS meetings. Days of stay: 3days; Dec.17<sup>th</sup>, 2013~Dec. 19<sup>th</sup> 2013.

Miki Kazushi, Group Leader, NIMS. Visited to: IMS, Vietnam. Purpose of the visit: To attend e-ASIA project steering meeting, 2<sup>nd</sup> e-ASIA project, and IMS-NIMS meetings. Days of stay: 5days; Dec.15<sup>th</sup>, 2013~Dec. 19<sup>th</sup> 2013.

Kenji Sakamoto, Senior Researcher, NIMS. Visited to: IMS, Vietnam. Purpose of the visit: To attend e-ASIA project steering meeting, 2<sup>nd</sup> e-ASIA project, and IMS-NIMS meetings. Days of stay: 12days; Dec.8<sup>th</sup>, 2013~Dec.19<sup>th</sup>, 2013.

Francesca Pincella, Ph.D. course student, University of Tsukuba. Visited to: IMS, Vietnam. Purpose of the visit: To attend 1<sup>st</sup> IMS-NIMS meeting Days of stay: 4days; Mar.4<sup>th</sup>, 2013~Mar.7<sup>th</sup>, 2013.

Kenji Sakamoto, Senior Researcher, NIMS. Visited to: IMS, Vietnam. Purpose of the visit: To attend 1<sup>st</sup> IMS-NIMS meeting Days of stay: 4days; Mar.4<sup>th</sup>, 2013~Mar.7<sup>th</sup>, 2013.

Miki Kazushi, Group Leader, NIMS. Visited to: IMS, Vietnam. Purpose of the visit: To attend 1<sup>st</sup> IMS-NIMS meeting Days of stay: 4days; Mar.4<sup>th</sup>, 2013~Mar.7<sup>th</sup>, 2013. Sirirurg Songsivilai, Executive Director, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: To attend e-ASIA project steering meeting. Days of stay: 6days; Jan. 27<sup>th</sup>, 2013~Feb. 1<sup>st</sup>, 2013.

Tran Thi Kim Chi, Researcher, IMS. Visit to; NIMS, Japan. Purpose of the visit: Carrying out the collaborative research. Days of stay: 15days; Oct. 17<sup>th</sup>, 2013-Oct. 31<sup>st</sup>, 2013.

Ung Thi Dieu Thuy, Researcher, IMS. Visit to; NIMS, Japan. Purpose of the visit: Carrying out the collaborative research. Days of stay: 61days; Sep.1<sup>st</sup>, 2013~Oct. 31<sup>st</sup>, 2013.

Rawiwan Laocharoensuk, Researcher, NANOTEC. Visit to; NIMS, Japan. Purpose of the visit: To attend 3<sup>rd</sup> NANOTEC-NIMS meeting. Days of stay: 3days; Aug. 26<sup>th</sup>, 2013~Aug. 28<sup>th</sup>, 2013.

Suwussa Bamrungsap. Researcher, NANOTEC. Visit to; NIMS, Japan. Purpose of the visit: To attend 3<sup>rd</sup> NANOTEC-NIMS meeting. Days of stay: 3days; Aug. 26<sup>th</sup>, 2013~Aug. 28<sup>th</sup>, 2013.

Tararaj Dharakul, Dupity Director, NANOTEC. Visit to: NIMS, Japan. Purpose of the visit: To attend 3<sup>rd</sup> NANOTEC-NIMS meeting. Days of stay: 3days; Aug. 26<sup>th</sup>, 2013~Aug. 28<sup>th</sup>, 2013.

Nguyen Quang Liem, Director General, IMS Visit to: NIMS, Japan. Purpose of the visit: To attend for e-ASIA project steering meeting. Days of stay: 3days; Jul. 11<sup>th</sup>, 2013~Jul. 13<sup>th</sup>, 2013.

Sirirurg Songsivilai, Executive Director, NANOTEC. Visit to: NIMS, Japan. Purpose of the visit: To attend e-ASIA project steering meeting. Days of stay: 7days; Jan.27<sup>th</sup>, 2013~Feb. 2<sup>nd</sup>, 2013.

Kunruethai Faisadcha, Project Analyst, NANOTEC. Visit to: MS, Japan. Purpose of the visit: To attend for 3<sup>rd</sup> e-ASIA project meeting/workshop, and 4<sup>th</sup> NANOTEC-NIMS meeting. Days of stay: 4days; Nov.11<sup>th</sup>, 2013~Nov. 14<sup>th</sup>, 2013.

khine zar wynn myint, Graduate student, Mandalay Technical University. Visit to: NIMS, Japan. Purpose of the visit: MEXT fellowship student. Days of stay: 547days; Oct. 1<sup>st</sup>, 2013~Mar. 31<sup>st</sup>, 2015.

Karn-Orachai Kullavadee, Graduate student, Mahidol University & NANOTEC. Visit to: NIMS, Japan. Purpose of the visit: MEXT fellowship student Days of stay: 182days, Oct.1<sup>st</sup>, 2013~Mar.31<sup>st</sup>, 2014.

Watunyoo Techapoonyong, Analyst, NANOTEC. Visit to: NIMS, Japan. Purpose of the visit: MEXT fellowship student. Days of stay: 3days, Aug. 26<sup>th</sup>, 2013~Aug. 28<sup>th</sup>, 2013.

Channarong Prommaka, Alliance Affair Coordinator, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: Visitation at NIMS, discussion for collaborations, and attendance to NANOTEC exhibition. Days of stay: 7days, Jan.27th, 2013~Feb. 2nd, 2013.

Paisan Khanchaitit, Researcher, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: Visitation at NIMS, discussion for collaborations, and attendance to NANOTEC exhibition. Days of stay: 7days, Jan.27th, 2013~Feb. 2nd, 2013.

Benyapa Suwa, International Collaboration Coordinator, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: Visitation at NIMS, discussion for collaborations, and attendance to NANOTEC exhibition. Days of stay: 7days, Jan.27th, 2013~Feb. 2nd, 2013

Chuleekorn Chotsuwan, Researcher, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: Visitation at NIMS, discussion for collaborations, and attendance to NANOTEC exhibition. Days of stay: 7days, Jan.27th, 2013~Feb. 2nd, 2013

Surat Jantarak, Manager of Budget and Planning Management Section, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: Visitation at NIMS, discussion for collaborations, and attendance to NANOTEC exhibition. Days of stay: 7days, Jan.27th, 2013~Feb. 2nd, 2013

Vipada Phrommanop, Deputy Executive Director, NANOTEC. Visited to: NIMS, Japan. Purpose of the visit: Visitation at NIMS, discussion for collaborations, and attendance to NANOTEC exhibition.

Days of stay: 7days, Jan.27th, 2013~Feb. 2nd, 2013

Francesca Pincella, Ph.D. course student, University of Tsukuba. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 1<sup>st</sup> e-ASIA project meeting, and 1<sup>st</sup> NANOTEC-NIMS meeting. Days of stay: 4days, Dec. 17th, 2012~Dec.20th, 2012.

Kenji Sakamoto, Senior Researcher, NIMS. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 1<sup>st</sup> e-ASIA project meeting, and 1<sup>st</sup> NANOTEC-NIMS meeting. Days of stay: 4days, Dec. 17th, 2012~Dec.20th, 2012.

Miki Kazushi, Group Leader, NIMS. Visited to: NANOTEC, Thailand. Purpose of the visit: To attend 1<sup>st</sup> e-ASIA project meeting, and 1<sup>st</sup> NANOTEC-NIMS meeting. Days of stay: 4days, Dec. 17<sup>th</sup>, 2012~Dec.20<sup>th</sup>, 2012.

Nguyen Quang Liem, Director General, IMS. Visited to: NIMS, Japan Purpose of the visit: To attend e-ASIA project steering meeting. Days of stay: 5days, Dec. 24th, 2012~Dec. 28th, 2012.

#### 5 Number of patent applications : 2

6 Awards

> Miki Kazushi: Outstanding Paper Published in Light: Science & Applications Ranked Top 10 in Visits in 2014 July 7<sup>th</sup>, 2015.

e-ASIA JRP Final Report Ver.1

Kenji Sakamoto: Poster Prize (the first prize in physics section) in International Liquid Crystal Conference 2014 (ILCC 2014) July 4<sup>th</sup>, 2014.

7 Others (Including agenda of workshop, photos of research teams, meetings, and etc.)

(Agenda of workshop)

National Institute for Materials Science (NIMS) organizes Workshop 'For detecting a virus, R&D of SERS type Biosensor' (3<sup>rd</sup> NANOTEC-IMS-NIMS e-ASIA annual meeting) & 4<sup>th</sup> NANOTEC-NIMS e-ASIA meeting 3<sup>rd</sup> IMS-NIMS e-ASIA meeting

> Organizer Chairman: Prof. Kazushi Miki, NIMS, Tsukuba Nov. 12<sup>th</sup>-14<sup>th</sup> in NIMS, Tsukuba & Nikko, Japan

> > All the meeting will be in English.

Participants:

Invited Speaker Prof. Masayuki Futamata, Ph. D., Saitama University

Workshop 'For detecting a virus, R&D of SERS type Biosensor' 3<sup>rd</sup> NANOTEC-IMS-NIMS e-ASIA annual meeting with 4<sup>th</sup> NANOTEC-NIMS e-ASIA meeting, 3<sup>rd</sup> IMS-NIMS e-ASIA meeting Nov. 12<sup>th</sup>-14<sup>th</sup> in NIMS, Tsukuba & Nikko, Japan



#### NANOTEC, NASDA, Thailand

1) Prof.Sirirurg Songsivilia, M.D., Ph.D : NANOTEC, Executive Director

2) Prof. Tararaj Dharakul, M.D., Ph.D. : NANOTEC, Senior Advisor

3) Dr. Rawiwan Laocharoensuk, Ph.D : NANOTEC, Researcher

4) Dr. Suwassa Bamrungsap, Ph.D : NANOTEC, Researcher

5) Ms. Kunruethai Faisadcha : NANOTEC, Project Analyst

IMS, VAST, Vietnam

1) Prof. Nguyen Quang Liem, Ph. D, IMS, Director General

2) Dr. Ung Thi Dieu Thuy, Ph. D, IMS, Researcher

3) One more person

NIMS, Japan

1) Prof. Kazushi Miki, Ph.D : NIMS, Group Leader

2) Prof. Kenji Sakamoto, Ph.D : NIMS, Researcher

3) Dr. Satoko Nishiyama, Ph.D : NIMS, Researcher

4) Dr. Sayaka Yanagida, Ph.D: NIMS, Posdoc Researcher

5) Ms. KARN-ORACHAI Kullavadee, M.S., Graduate Student, Tsukuba University

## Schedule

Nov. 12<sup>th</sup>

## NANOTEC-NIMS 4<sup>th</sup> meeting at NIMS (9:30-11:45) Room 231, MANA Building, Namiki Campus

9:30-9:40 Greeting & Introduction of new members

9:40-10:20 Achievement of NANOTEC by Prof. Tararaj Dharakul, Dr. Rawiwan Laocharoensuk, Dr. Suwassa Bamrungsap 10:20-11:00 Achievement of NIMS by Ms. KARN-ORACHAI Kullavadee

11:00-11:45 Discussion of milestone of the next half & our midterm report

# Lunch with Prof. Ushioda, the president, NIMS (12:00-13:00)

Room 409 & 410, Collaborative Research Building, Namiki Campus

## IMS-NIMS 3<sup>rd</sup> meeting at NIMS (13:15-15:15)

Room 231, MANA Building, Namiki Campus

13:15-13:25 Greeting & Introduction of new members13:25-14:25 Achievement of IMS-NIMS colloboration by Dr. Ung Thi Dieu Thuy14:25-15:15 Discussion of milestone of the next half

Move to Nikko by chartered bus (15:30-18:00) Stay at Kanaya Hotel

Nov. 13th

## Discussion of strategy of financial year 2015 of e-ASIA (10:00-12:00)

## Workshop 'For detecting a virus, R&D of SERS type Biosensor' (14:00-18:00) Nikko Senhime Monogatari Hotel, Nikko

14:00-14:10 Greeting & Introduction of all members
14:10 introduction of invited speaker by Dr. Kenji Sakamoto
14:12-16:00 (included discussion time) Invited speech about Surface Enhanced Raman
Spectroscopy by Prof. Masayuki Futamata, Saitama University
16:00-16:15 break
16:15-16:25 Overview of the e-ASIA PJ by Prof. Kazushi Miki
16:25-16:45 Report from NANOTEC by Prof. Tararaj Dharakul,M.D, Dr. Rawiwan
Laocharoensuk, and Dr. Suwassa Bamrungsap
16:45-17:05 Report from NIMS by Kenji. Sakamoto, Ms. KARN-ORACHAI
Kullavadee
17:05-17:25 Report from IMS by Prof. Nguyen Quang Liem, and Dr. Ung Thi Dieu
Thuy

17:25-18:25 Discussion about SERS detection lead by Prof. Futamana

Stay at Hotel Senhime Monogatari, Nikko