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


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

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Affiliation</th>
<th>Role in the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>Kazushi Miki</td>
<td>National Institute for Materials Science (NIMS), Faculty of Pure and Applied Sciences, University of Tsukuba</td>
<td>Organize the project.</td>
</tr>
<tr>
<td>Collaborator</td>
<td>Kenji Sakamoto</td>
<td>National Institute for Materials Science (NIMS)</td>
<td>Implement the project, assist, to organize the project, etc.</td>
</tr>
<tr>
<td>Collaborator</td>
<td>Pincella Francesca</td>
<td>National Institute for Materials Science (NIMS), Faculty of Pure and Applied Sciences, University of Tsukuba</td>
<td>Implement the project.</td>
</tr>
<tr>
<td>Collaborator</td>
<td>Yeji Song</td>
<td>National Institute for Materials Science (NIMS), Faculty of Pure and Applied Sciences, University of Tsukuba</td>
<td>Implement the project.</td>
</tr>
<tr>
<td>Collaborator</td>
<td>Satoko Nishiyama</td>
<td>National Institute for Materials Science (NIMS)</td>
<td>Implement the project.</td>
</tr>
<tr>
<td>Collaborator</td>
<td>Karn-Orachai Kullavadee</td>
<td>National Institute for Materials Science (NIMS), Faculty of Pure and Applied Sciences, University of Tsukuba</td>
<td>Implement the project.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Affiliation</th>
<th>Role in the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>Tararaj Dharakul</td>
<td>National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA), Department of Immunology, Faculty of Medicine Siriraj Hospital, Mahdol University</td>
<td>Organize the project, experiments, analyses</td>
</tr>
<tr>
<td>Collaborator</td>
<td>Sirirurg Songsivilia</td>
<td>National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA)</td>
<td>Supervise the project</td>
</tr>
<tr>
<td>Collaborator</td>
<td>Rawiwan Laocharoensuk</td>
<td>National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA)</td>
<td>Implement the project, assist to organize the project, etc.</td>
</tr>
<tr>
<td>Collaborator</td>
<td>Suwussa Bamrungsap</td>
<td>National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA)</td>
<td>Implement the project</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Affiliation</th>
<th>Role in the project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liem Quang NGUYEN</td>
<td>Director General</td>
<td>Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)</td>
<td>Organize the project, experiments, analyses.</td>
</tr>
<tr>
<td><strong>Collaborator</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thi Dieu Thuy UNG</td>
<td>Researcher</td>
<td>Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)</td>
<td>Implement the project, assist to organize the project, etc.</td>
</tr>
<tr>
<td><strong>Collaborator</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thi Kim Chi TRAN</td>
<td>Researcher</td>
<td>Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)</td>
<td>Implement the project</td>
</tr>
<tr>
<td><strong>Collaborator</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thu Loan NGUYEN</td>
<td>Researcher</td>
<td>Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)</td>
<td>Implement the project</td>
</tr>
<tr>
<td><strong>Collaborator</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quoc Trung DANG</td>
<td>Researcher</td>
<td>Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)</td>
<td>Implement the project</td>
</tr>
<tr>
<td><strong>Collaborator</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anh Son HOANG</td>
<td>Researcher</td>
<td>Institute of Materials Science (IMS), Vietnam Academy of Science and Technology (VAST)</td>
<td>Implement the project</td>
</tr>
</tbody>
</table>

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, an 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 dodecanethiolate 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 ± 3.2 nm (Fig.2). As a result, we could smoothly establish our SERS substrate fabrication process.

5.1.3 Development of SERS immune sensor

The joint research team of Thailand and Japan developed three elemental key parts for SERS immune sensors: 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 $10^7$.

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 immunosensor.
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 May 26-28, 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

DOI: 10.1021/acs.langmuir.5b03594

1.2 Published by single team

DOI: 10.1016/j.optmat.2016.01.022

DOI: 10.1007/s00604-015-1657-7

DOI: 10.1007/s00604-015-1639-9

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

DOI: 10.7567/APEX.7.065001

DOI: 10.2494/photopolymer.27.273

DOI: 10.1016/j.cplett2014.05.020


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


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


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


Kazushi Miki, Karn-Orachai Kullavadee, Kenji Sakamoto, Koh-ichi Nittou, Satoko Nishiyama, Sayaka Yanagida, Rawiwan Laocharoensuk, Suwussa Bamrungsap, Tararaj Dharakul, Sirirurg Songsivilai, Thi Dieu Thuy Ung, Thi Kim Chi Tran, & Liem Quang Nguyen.


2.2 Published by single team

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

Katsuhiro Isozaki, Francesca Pincella, & Kazushi Miki.

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

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


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


Yej 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.


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

礦崎 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

Organization of workshops, seminars, symposia, etc. (Organizer, Title of Event, Date,
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 7th NANOTC-NIMS meeting

Kenji Sakamoto, Senior Researcher, NIMS.
Visited to: NANOTEC, Thailand.
Purpose of the visit: To attend 7th NANOTC-NIMS meeting

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

Sirirurg Songsivilai, Executive Director, NANOTEC, Thailand.
Visited to: NIMS, Japan.
Purpose of the visit: To attend e-ASIA project steering meeting

Karn-Orachai Kullavadee, Ph.D. course student, University of Tsukuba.
Visited to: NANOTEC, Thailand.
Purpose of the visit: To attend 4th e-ASIA project and 6th NANOTEC-NIMS meetings.

Kenji Sakamoto, Senior Researcher, NIMS.
Visited to: NANOTEC, Thailand.
Purpose of the visit: To attend 4th e-ASIA project and 6th NANOTEC-NIMS meetings.

Miki Kazushi, Group Leader, NIMS.
Visited to: NANOTEC, Thailand.
Purpose of the visit: To attend 4th e-ASIA project and 6th NANOTEC-NIMS meetings.

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

Kenji Sakamoto, Senior Researcher, NIMS.
Visited to: NANOTEC, Thailand.
Purpose of the visit: To attend 5th NANOTEC-NIMS meeting.
Days of stay: 3days; Feb.19th~Feb. 21st, 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 5th NANOTEC-NIMS meeting.
Days of stay: 50days; Jan.7th~Feb.25th, 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.1st 2015~Dec.3rd 2015.

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

Miki Kazushi, Group Leader, NIMS.  
Visited to: NIMS, Japan.  
Purpose of the visit: To attend 3rd e-ASIA project meeting/workshop, and 3rd IMS-NIMS meeting.  
Days of stay: 1day; Dec.16th 2014.

Suwassa Bamrungsap, Researcher, NANOTEC.
Visited to: NIMS, Japan.
Purpose of the visit: To attend 3rd e-ASIA project meeting/workshop, and 4th NANOTEC-NIMS meeting.

Rawiwan Laocharoensuk, Researcher, NANOTEC.
Visited to: NIMS, Japan.
Purpose of the visit: To attend 3rd e-ASIA project meeting/workshop, and 4th NANOTEC-NIMS meeting.

Tararaj Dharakul, Senior Advisor, NANOTEC.
Visited to: NIMS, Japan.
Purpose of the visit: To attend 3rd e-ASIA project meeting/workshop, and 4th NANOTEC-NIMS meeting.

Sirirurg Songsivilia, Executive Director, NANOTEC.
Visited to: NIMS, Japan.
Purpose of the visit: To attend 3rd e-ASIA project meeting/workshop, and 4th NANOTEC-NIMS meeting.

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

Satoko Nishiyama, Researcher, NIMS.
Visited to: IMS, Vietnam.
Purpose of the visit: To attend 1st IMS-NIMS meeting.

Kenji Sakamoto, Senior Researcher, NIMS.
Visited to: IMS, Vietnam.
Purpose of the visit: To attend 1st IMS-NIMS meeting.

Miki Kazushi, Group Leader, NIMS.
Visited to: IMS, Vietnam.
Purpose of the visit: To attend 1st IMS-NIMS meeting.
Sirirurg Songsivilai, Executive Director, NANOTEC.
Visit to: NIMS, Japan.
Purpose of the visit: To attend e-ASIA project steering meeting.

Tran Thi Kim Chi, Researcher, IMS.
Visit to: NIMS, Japan.
Purpose of the visit: Carrying out the collaborative research.

Ung Thi Dieu Thuy, Researcher, IMS.
Visit to: NIMS, Japan.
Purpose of the visit: Carrying out the collaborative research.

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

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

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

Nguyen Quang Liem, Director General, IMS
Visit to: NIMS, Japan.
Purpose of the visit: To attend for e-ASIA project steering meeting.

Sirirurg Songsivilai, Executive Director, NANOTEC.
Visit to: NIMS, Japan.
Purpose of the visit: To attend e-ASIA project steering meeting.

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

Khine Zar Wynn Myint, Graduate student, Mandalay Technical University.
Visit to: NIMS, Japan.
Purpose of the visit: MEXT fellowship student.

Karn-Orachai Kullavadee, Graduate student, Mahidol University & NANOTEC.
Visit to: NIMS, Japan.
Purpose of the visit: MEXT fellowship student.

Watunyoo Techapoonyong, Analyst, NANOTEC.
Visit to: NIMS, Japan.
Purpose of the visit: MEXT fellowship student.

Channarong Prommaka, Alliance Affair Coordinator, NANOTEC.
Visit to: NIMS, Japan.
Purpose of the visit: Visitation at NIMS, discussion for collaborations, and attendance to NANOTEC
exhibition.

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 1st e-ASIA project meeting, and 1st NANOTEC-NIMS meeting.

Kenji Sakamoto, Senior Researcher, NIMS.
Visited to: NANOTEC, Thailand.
Purpose of the visit: To attend 1st e-ASIA project meeting, and 1st NANOTEC-NIMS meeting.

Miki Kazushi, Group Leader, NIMS.
Visited to: NANOTEC, Thailand.
Purpose of the visit: To attend 1st e-ASIA project meeting, and 1st NANOTEC-NIMS meeting.

Nguyen Quang Liem, Director General, IMS.
Visited to: NIMS, Japan
Purpose of the visit: To attend e-ASIA project steering meeting.

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 7th, 2015.
Kenji Sakamoto:
Poster Prize (the first prize in physics section) in International Liquid Crystal Conference 2014 (ILCC 2014)
July 4th, 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’
(3rd NANOTEC-IMS-NIMS e-ASIA annual meeting) &
4th NANOTEC-NIMS e-ASIA meeting
3rd IMS-NIMS e-ASIA meeting

Organizer Chairman: Prof. Kazushi Miki, NIMS, Tsukuba
Nov. 12th-14th 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’
3rd NANOTEC-IMS-NIMS e-ASIA annual meeting
with 4th NANOTEC-NIMS e-ASIA meeting, 3rd IMS-NIMS e-ASIA meeting
Nov. 12th-14th 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 Laocharoeensuk, Ph.D : NANOTEC, Researcher
4) Dr. Suwassa Bamrungsap, Ph.D : NANOTEC, Researcher
5) Ms. Kunruetha 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. 12th

**NANOTEC-NIMS 4th 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 Laocharoeensuk, 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 3rd meeting at NIMS (13:15-15:15)**
Room 231, MANA Building, Namiki Campus

13:25-14:25 Achievement of IMS-NIMS collaboration by Dr. Ung Thi Dieu Thuy
14:25-15:15 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
14:10-14:15 Introduction of invited speaker by Dr. Kenji Sakamoto
14:12-16:00 (including 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 Laocharoenuk, 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