



ANNUAL REPORT 2020

© Copyright 2021 ASIA NANO FORUM

Asia Nanotechnology Leaders

Shaping the Future of Science & Technology for Socio-Economic Well-Being



<https://www.asia-anf.org>

CONTENTS

Annual Report 2020

Preface	ii
About Asia Nano Forum	1
Mission & Objectives	1
Working Groups	2
Member Organizations	3
Office Bearers (2020-2021)	4
Executive Committee	5
Former Presidents	6
Other Founding Members	7
Working Group Report	8
Standardization	8
User-Facility Network	12
Nano Safety and Risk Management	14
Commercialization	21
ANF Summit Report	23
Major Activities and R&D Highlights	29
Report from India	29
Report from Iran	32
Report from Japan	38
Report from Korea	46
Report from Malaysia	49
Report from Philippines	54
Report from Taiwan	63
Report from Thailand	73
Acknowledgements	80

Preface

2020 was a very challenging year for the whole world. The pandemic of coronavirus disease 2019 (COVID-19) continues to shape the global order. However, we managed to meet challenges and reach our goals. In this report, we can see an overall review of Working Groups, Summit events as well as activities and R&D highlights in our member countries in the past year.

By forming four active Working Groups including “Standardization”, “User-Facility Network”, “Nano Safety and Risk Management”, and “Commercialization”, ANF coordinates activities and aligns resources to better work toward common objectives in various areas. Take Standardization as an example. There are the Inter-Lab Comparison among Malaysia, Indonesia, Philippines, Iran, and Thailand, and a new scheme for mutual recognition of nano-enabled products certification between Taiwan’s nanoMark and Malaysia’s NANOVerify. Another example is the plan for mutual exchange for 2~4 weeks between professional engineers between NIMS (Japan) and NANOTEC (Thailand) under User-Facility Network. This report will also present more examples.

Through the collaborative efforts of all members, we are grateful to have a successful 17th ANF Summit and conjunctive events last October, including Advanced Materials Forum, 4th EU-Asia Dialogue on Nanosafety, and Commercialization Workshop. From nanosafety to materials, from materials to commercialization, we believe that all participants do learn a lot from challenging work and contributions made by our colleagues/representatives in these Summit events. As a network organization, ANF also aims at broadening cooperation with regional partners. One of the very successful efforts is the International Network-Initiative, a follow-up of the EU-Asia Dialogue. With the same vision of expanding the common knowledge base for (nano)materials of regulatory significance, this networking at its best results in the synergy between ANF and Nanosafety Cluster (NSC/EU) could be expected.

Keeping ANF successful relies on all members’ active participation as well as the cooperation with our network partners. We would like to express our thanks to all members as well as network partners for their continuous support and welcome our new member, TERI of India, to join the ANF Society. We are starting the year positively and looking forward to a substantial growth for 2021.



Ting-Kuo Lee
President, Asia Nano Forum

About Asia Nano Forum

■ Mission & Objectives

Asia Nano Forum (ANF) is a network organization, founded in May 2004 and now a registered society in Singapore, known as Asia Nano Forum Society, since October 2007.

Mission

The mission of the ANF is to promote responsible development of nanotechnology that will benefit each member on education, economy, and environment by fostering international network collaboration.

Objectives

- Foster nanotechnology in the region by creating mechanisms to share information, human and physical resources and expertise
- Support regional economic and environmental development through joint projects addressing major regional issues, with an emphasis on support of developing and emerging economies
- Coordinate joint investment in and mutual access to major infrastructure by member economies
- Promote and coordinate standardization and safety of nanotechnology concepts and measurements
- Act as an advocacy group for nanotechnology in the region and for adequate regional representation of nanotechnology at global forums
- Initiate, promote and manage co-operative scientific and technology research projects within the member economies
- Enhance public awareness and education of nanotechnology and associated social, environmental, health and economic issues

About Asia Nano Forum

■ Working Groups

Standardization

To coordinate the cross-sector activities of ANF members for the purpose of facilitating the development of standards in the area of nanotechnology.

Coordinators:

Dr. Tsing-Tang SONG (ITRI, Taiwan)

Prof. Ali BEITOLLAHI (INIC, Iran)

User-Facility Network

The purpose of the User-Facility Network working group is to advance exchange and partnership activities of professional engineers/researchers in academia and industry.

Coordinator:

Dr. Yasuo KOIDE (NIMS, Japan)

Nano Safety and Risk Management

To coordinate nanosafety activities in the region through the Asia Nano Safety Network, including harmonization of nano safety training, safety-by-design approach to nanotechnology development and translation of nano research to the marketplace.

To provide a coordinated response for community concerns and engagement on nanotechnology safety and risk management issues.

Coordinators:

Dr. Wannee CHINSIRIKUL (NANOTEC, Thailand)

Dr. Paul WRIGHT (RMIT, Australia)

Commercialization

To realize economic value of Nanotechnology Research & Development through commercializing demand driven and technology push initiatives in partnership with the industry for sustainable development of ANF member economies.

Coordinators:

Dr. Rezal Khairi AHMAD (NanoMalaysia, Malaysia)

Mr. Alexander POGANY (BMK, Austria)

Dr. Jun'ichi SONE (JST, Japan)

About Asia Nano Forum

■ Member Organizations

ANF has currently 15 organization members from 11 countries including Australia, Austria, India, Iran, Japan, Korea, Malaysia, Philippines, Taiwan, Thailand, and Vietnam.

Australian Nanotechnology Network (ANN), Australia

Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK), Austria

The Energy and Resources Institute (TERI), India

Iran Nanotechnology Innovation Council (INIC), Iran

National Institute of Advanced Industrial Science and Technology (AIST), Japan

Japan Science and Technology Agency (JST), Japan

National Institute for Materials Science (NIMS), Japan

Korea Nano Technology Research Society (KoNTRS), Korea

NanoMalaysia Berhad, Malaysia

National Nanotechnology Centre (NNC), Malaysia

Industrial Technology Development Institute (ITDI), Department of Science and Technology (DOST), Philippines

Institute of Physics, Academia Sinica, Taiwan

National Nanotechnology Center (NANOTEC), Thailand

King Mongkut's University of Technology Thonburi (KMUTT), Thailand

Vietnam Academy of Science and Technology (VAST), Vietnam

About Asia Nano Forum

Office Bearers (2020-2021)



Ting-Kuo LEE
President
NSYSU, Taiwan



Yasuo KOIDE
Vice President
NIMS, Japan



Wannee CHINSIRIKUL
Vice President
NANOTEC, Thailand



Rezal Khairi AHMAD
Treasurer
NanoMalaysia Berhad



Jason CHANG
Secretary
Academia Sinica, Taiwan



Annabelle V. BRIONES
Secretary
DOST-ITDI, Philippines

About Asia Nano Forum

Executive Committee

Chennupati JAGADISH

ANN, Australia

Rezai Khairi AHMAD

NanoMalaysia, Malaysia

Alexander POGÁNY

BMK, Austria

Ruslinda RAHIM

NNC, Malaysia

Alok ADHOLEYA

TERI, India

Annabelle V. BRIONES

DOST-ITDI, Philippines

Ali BEITOLLAHI

INIC, Iran

Maw-Kuen WU

Academia Sinica, Taiwan

Toshihiko KANAYAMA

AIST, Japan

Werasak SURAREUNGCHAI

KMUTT, Thailand

Junichi SONE

JST, Japan

Wannee CHINSIRIKUL

NANOTEC, Thailand

Yasuo KOIDE

NIMS, Japan

Tran Dai LAM

VAST, Vietnam

Byung-ki CHEONG

KoNTRS, Korea

(by alphabetical order of region/organization, one from each organization)

About Asia Nano Forum

■ Former Presidents



K. TANAKA

Founding Chairman
JST & AIST, Japan



Maw-Kuen WU

Founding President 2008-2009
Academia Sinica, Taiwan



Hak Min KIM

President 2010-2011
KAIST, Korea



Teruo KISHI

President 2012-2013
ISMA, Japan



Sirirug SONGSIVILAI

President 2014-2015
NANOTEC, Thailand



Ramam AKKIPEDDI

President 2016-2017
IMRE-A*STAR, Singapore



Toshihiko KANAYAMA

President 2018-2019
AIST, Japan

About Asia Nano Forum

■ Other Founding Members



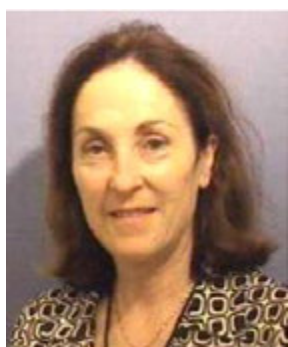
Hiroshi YOKOYAMA
Founding Treasurer 2007-2010
Kent State Univ. USA



Khiangwee LIM
Founding Vice President 2007-2010
NRF, Singapore



Venkatesh Rao AIYAGARI
India



Jane NIALI
Australia



Hong Khoi PHAN
Vietnam



Wiwut TANTHAPANICHAKOON
Thailand



Halimaton HAMDAN
Malaysia

Working Group Report

■ Standardization

Coordinators:

Dr. Tsing-Tang Song (ITRI, Taiwan)

Prof. Ali Beitollahi (INIC, Iran)

ANF Standardization working group has been collaborating with ANF members to facilitate the development of standardization in the field of nanotechnologies, such as mutual recognition on nano-enabled or nano-enhanced product certification and inter-laboratory comparison. As the official liaisons of ISO/TC229 and IEC/TC113 WG3, ANF representatives have also been participating in the activities of Plenary Meetings and Interim Meetings every year to maintain close links with the latest development of nanotechnology standardization. The following are brief reports on events related to nanotechnology standards activities and the ANF status in ISO/TC229.

Activities in ISO/TC229

The 22nd Meeting was held between 11 and 15 November 2019 in Hangzhou. At this meeting, Dr. Tsing-Tang Song from Taiwan on behalf of ANF presented a Preliminary Work Item (PWI) entitled 'Nanotechnologies – Performance evaluation of nanosuspensions containing clay nanoplates for quorum quenching'. The clay nanoplate suspension in water is designed to inhibit the growth of pathogenic bacteria to protect crops from diseases. Moreover, as an additional benefit, harvesting yield increases. It is expected to create substantial value in crop production and reduction chemical usage. ISO TC 229 agreed that the PWI be registered and led by Dr. Song. ISO/TC 229 members were invited to appoint experts to join this project. After ISO/TC229 Interim Virtual Meeting from 18 to 22 May, 2020, experts from Canada, Iran, Japan, Korea, Singapore, and the US were committed to participating in this project. The 23rd Meeting (virtual) was held between 9 and 13 November 2020. The ISO/TC229 agreed that ISO/PWI 4971 'Nanotechnologies - Performance evaluation of nanosuspension containing clay nanoplates for quorum quenching' could proceed to New Work Item Proposal (NWIP) ballot stage, and invited ANF Liaison member to submit the proposal by the end of December 2020, with Dr. Tsing-Tang Song as Project Leader. The ballot for turning this PWI project into a NWIP was issued via the electronic balloting procedure on 11 Jan 2021 and its voting deadline will be 5 April 2021.

Mutual Collaboration between nanoMark and NanoVerify

For the nano-enabled or nano-enhanced product certification programs among the ANF community, Taiwan's nanoMark and Malaysia's NanoVerify are collaborating on a new scheme for possible mutual recognition. ITRI of Taiwan and Malaysia's MIMOS TEM laboratories

were accepted and qualified as the testing laboratories for mutual recognition. Both mark systems are opening for foreign company applications. Taiwan's JM Material Technology is the first mutual recognition certified manufacturer, which produces nano-TiO₂ and silver nanocomposite aqueous solution coating.



The first Mutual Recognition Certified Manufacturer - JM Material Technology (Taiwan)

Iran's activities on nanostandardization

In 2020, Iran has developed 15 national standards in the fields of terms and definitions, measurement methods, health and safety, as well as assessment the performance of nanotechnology products, also 2 international standards, which were being developed by leadership of Iran in ISO/TC229 were published:

- 1- ISO/TS 21975:2020 -Nanotechnologies — Polymeric nanocomposite films for food packaging with barrier properties — Specification of characteristics and measurement methods,
- 2- ISO/TS 23459:2021 -Nanotechnologies — Assessment of protein secondary structure during an interaction with nanomaterials using ultraviolet circular dichroism.

Another Iran-led international standard entitled” Nanotechnologies — Evaluation of the antimicrobial performance of textiles containing manufactured nanomaterials”, was finalized in 2020 and will be published soon by ISO.

Moreover, Iran proposed 3 international standards as Potential NWIP to ISO/TC229 with the following titles:

- 1- Nanotechnologies- Disinfectant Suspensions Containing Nanomaterials - Surfaces Removal Covid-19 -Performance Assessment
- 2- Nanotechnologies- a test method for detection of nano-object/s release from respiratory masks media under different working conditions

3- Nanotechnologies- Super-hydrophobic textile containing nanomaterial- performance assessment

Inter-Laboratory Comparison Workshop in Thailand

On 6 January 2020, NANOTEC with the support from ANF organized the Inter-Laboratory Comparison (ILC) 2019 Workshop at Thailand Science Park, Pathum Thani, Thailand. The aim of this workshop is to discuss the result of the analysis of the gold nanoparticles size measurement among participating laboratories. There were 14 participating laboratories from 5 nations including Indonesia, Iran, Malaysia, Philippines, and Thailand. The workshop offered an insight into the knowledge sharing on the topic of “Preparation and Characterization of Nanoparticles” along with the ILC 2019 results and discussion. This discussion focused on the harmonization of measurement capability for nanoparticle size among the participating laboratories due to the measurements and regulations of nanoparticle characterizations are necessary to be in harmony of nanoproducts development in order for utilizing the most advantages of the nanoparticles. The variety and result discussion sessions are important steps to promote collaborations and strengthen the networking among peers’ countries.

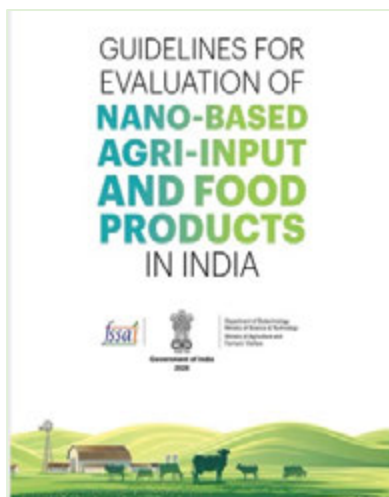
Development of National Nanotechnology Standards in Philippines

The Department of Science and Technology (DOST)- Industrial Technology Development Institute (ITDI), is at the forefront of developing the country’s standards for nanotechnologies. DOST-ITDI, together with the Department of Trade and Industry’s Bureau of Philippine Standards (DTI-BPS), spearheaded the establishment of the National policy/standards on Nanotechnologies by conducting monthly technical committee meetings on Nanotechnologies. As of December 2020, the BPS Technical Committee (TC-85) on Nanotechnologies have reviewed, endorsed ISO standards, published and adapted 40 Philippine National Standards (PNS) on Nanotechnologies. During the COVID-19 pandemic, TC-85 on Nanotechnologies continuously work on the different standards on Nanotechnology and was able to publish a total of 21 PNS of which 6 PNS from subcommittee 1 (SC-1) on Measurement and Characterization, 9 PNS from subcommittee 2 (SC-2) on Health, Safety and Environmental Aspects of Nanotechnologies and 6 PNS from subcommittee 3 (SC-3) on Materials Specifications.

Guidelines for Evaluation of Nano-based Agri-input and Food Products in India

The Government of India released the first ”Guidelines for Evaluation of Nano based Agri-input and food products in India” on 7th July 2020. These guidelines are developed by Department of Biotechnology (DBT), Ministry of Science and Technology, Ministry of Agriculture and Farmers’ Welfare and Food Safety and Standards Authority of India, Ministry

of Health and Family Welfare and is an outcome of all concerned Inter-Ministerial efforts coordinated by DBT. These guidelines will encourage Indian innovators and industries to develop and commercialize new nano-based agri-input and food products and could be beneficial for ANF members to help make policy decisions for nano-based products in agriculture and food.



<http://dbtindia.gov.in/sites/default/files/Guidelines%20Document.pdf>

Working Group Report

■ User-Facility Network

Coordinator:

Dr. Yasuo Koide (NIMS, Japan)

The 2020/2021 activities of User-Facility Network working group (UFN-WG)

1. Engineers/researchers exchange program and workshop

The User-Facility Network working group (UFN-WG) was newly launched at January, 2020. The purpose is to accelerate exchange and partnership activities of user-facility networks and professional engineers and researchers in industry and academia. The plan in 2020 is a trial attempt for mutual exchange for 2~4 weeks between engineers/researchers in NIMS (Japan) and Nanotech (Thailand) where the host research institute arranges the training and practice programs and accommodation. Unfortunately, the plan has been stopped now due to the CORONA virus pandemic. The examples of training program are as-follows:

I. Materials analysis course a. X-ray diffraction b. ICP luminescence spec. c. TOF-SIMS/XPS d. SEM & EDS	II. Observations & Analysis course a. S/TEM & Lorentz TEM b. Micro-focus X-ray CT c. STM & SPM d. Gas Chromatography
III. Nanofabrication course a. EB & Maskless lithography b. Thin film deposition by evaporation and sputtering c. Thin film deposition by CVD/ALD	IV. Nanobio course a. Liquid chromatography-tandem mass spectroscopy b. Observation and analysis of cell c. Measurement of gene expression

The activity plan in 2021 is (1) after the CORONA-disaster overload subsides, we will proceed to visit each other with travel mitigation, and (2) the workshop on “Current status & prospect of user-facility project in Asia” in nanotech 2022 which will be held on Jan. 26-28, 2022, will be scheduled.

2. Starting a new relationship between NIMS in Nanotechnology Platform Japan (NPJ) and National Nanotechnology Coordinated Infrastructure (NNCI) in USA

NIMS Nanotechnology Platform Center joined the Global Quantum Leap (GQL) project which was funded in 2020 by the US National Science Foundation (NSF) through a “AccelNet” program for creating a network-of-networks” to support strategic linkages between the NNCI and complementary networks in the US and oversees working on

quantum computing and information sciences. The NIMS Center in NPJ and Cornell University in NNCI have been running the NNCI-Cornell-NIMS summer internship program for past 10 years as shown in Fig. 1.

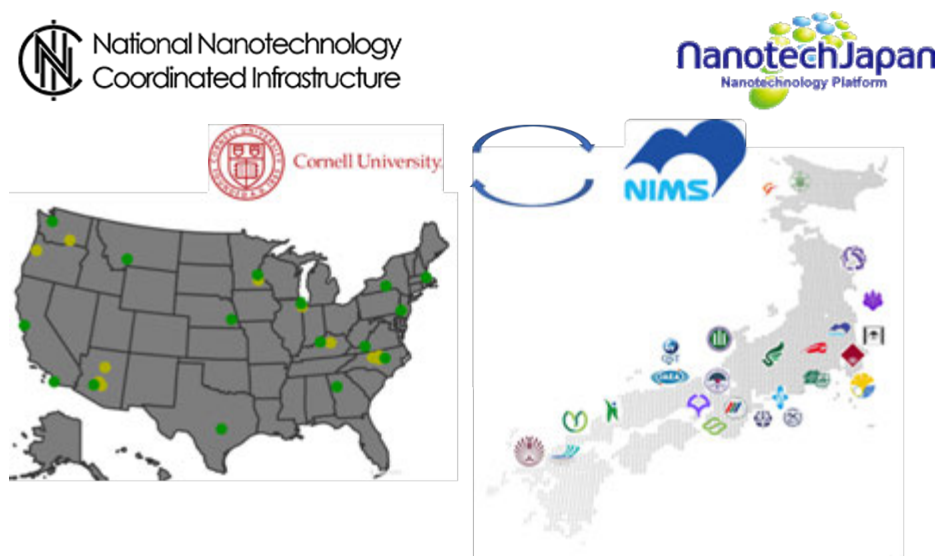


Fig. 1 Relationship between Cornell University in NNCI and NIMS in NPJ.

The GQL kickoff meeting was held by online on February 10-11, 2021. The attending institutes were in the following; University of Minnesota as a host institute, The University of Chicago, Cornell University, Chicago Quantum Exchange, Georgia Tech, NNCI, ML4Q, NPJ, and OpenSuperQ.

Working Group Report

Nano Safety and Risk Management

Coordinators:

Dr. Wannee Chinsirikul (NANOTEC, Thailand)

Assoc. Prof. Paul Wright (RMIT University, Australia)

1. Nanosafety issue in the use of plastic packaging: ProPak Webinar



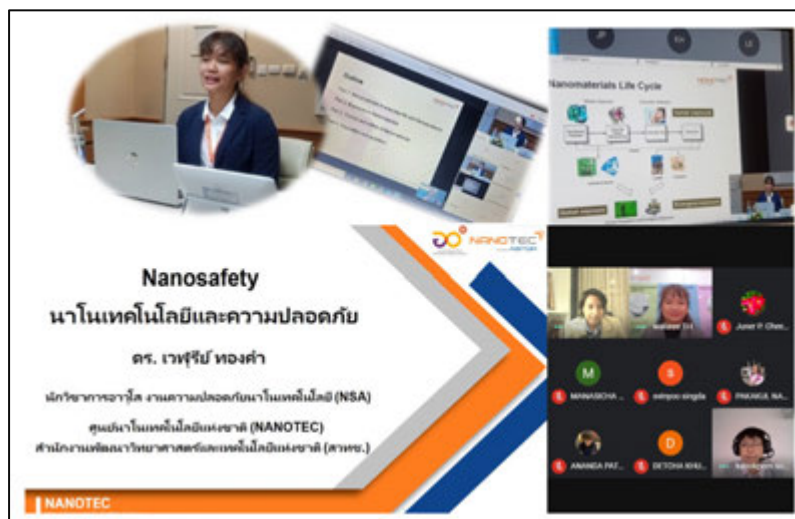
ProPak Webinar on “*Directions for the use of plastic in packaging*”

ProPak Asia, the major processing and packaging event for the continent, have engaged the working collaboration of Informamarkets to organize webinar session. On 16th June 2020, NANOTEC participated in a panel discussion session under the topic of “Directions for the use of plastic in packaging”. Panelists included Dr. Wannee Chinsirikul, Executive Director NANOTEC, Mr. Veera Kwanloetchit, President of Plastic Institute of Thailand, Dr. Waluree Thongkam, Senior Technical Officer, NANOTEC with Dr. Sanchai Kuboon, Researcher NANOTEC acting as moderator. The panel discussion covered topics such as Bio Circular and Green Economy (BCG), trends and status of plastic use in Thailand, standards, and safety, and use of nanotechnology in packaging. Over 300 online registration viewed this panel discussion session.

2. Promote awareness of nanosafety to high school students

On 4th September 2020, NANOTEC promoted awareness of nanosafety by hosted an on-line workshop on Nanosafety with students and teachers from the College of Nanotechnology, King Mongkut's Institute of Technology Ladkrabang (KMUTL). Over 70 students and teachers joined the workshop. Dr. Waluree Thongkam, Senior Technical Officer at Nanosafety Alliance Section, NANOTEC was the presenter. The workshop

focused on nanotechnology in general, applications, and issues related to using of nanotechnology in humans and the environment. As part of the workshop, the college will require the students to do post assessment test to analyze their understanding of nanotechnology and nanosafety.



Nanosafety on-line workshop

3. Thailand joined OECD agreement on mutual acceptance of chemical safety data (MAD)



On 7th September 2020, Thailand joined the OECD system for the Mutual Acceptance of Data (MAD) in the Assessment of Chemicals, ensuring that its non-clinical safety data related to the protection of human health and the environment will be accepted by all 44 countries adhering to MAD. The MAD system composited of a multilateral agreement that allows participating countries to share the results of various non-clinical safety tests done on chemicals and chemical products, such as industrial chemicals and pesticides. This collaboration saves

governments and chemical producers around EUR 309 million annually. Participation in the MAD system requires that testing be carried out using OECD standards for test methods (OECD Test Guidelines) and data quality (OECD Principles of Good Laboratory Practice). Governments verify laboratory compliance using OECD procedures. At present, all 37 OECD countries, as well as Argentina, Brazil, India, Malaysia, Singapore, South Africa, and Thailand, adhere to the system.

4. Seminar on Protecting factory workers from potential risks of nanomaterials



Seminar on Protecting factory workers from potential risks of nanomaterials

On 23rd September 2020, Nanosafety Network for Industry project initiated by NANOTEC organized a seminar on "Protecting factory workers from potential risks of nanomaterials exposure" to promote awareness of nanosafety and industrial standards. Speakers included representatives from NANOTEC, the Department of Industrial Works (DIWs), and IRPC Public Company Limited (IRPC). Attendees included participants from industry and research agencies. The talk focuses on the potential risk associated with exposure of nanomaterials on workers. The risk factors are determined by the amount of exposure and toxicity. The seminar was held as part of the Department of Industrial Works Annual Conference 2020 in Bangkok.

5. The 4th EU-Asia Dialogue on NanoSafety Advanced Materials and Emerging Issues Forum Commercialization Workshop

Due to the COVID-19 pandemic, the virtual meeting on “The 4th EU-Asia Dialogue on NanoSafety Advanced Materials and Emerging Issues Forum Commercialization Workshop” was held on 7th October 2020. A number of participants from more than 20 countries joined this workshop which focusing on connecting Asian and European countries with respect to safe nanomaterials including standardization and test guideline development. Two major themes were addressed which was “The Malta Initiative” and “The proposal developed under the collaboration between EU and Asian countries”.

4 ANF members have been selected as representatives to be a part of the International Network-Initiative Group that was set up for the collaboration between ANF and Nanosafety Cluster (NSC/EU) on nanosafety which composited of:

- 1) Alexander Pogany (BMK, Austria)
- 2) Ali Beitollahi (Iran Nanotechnology Initiative Council, Iran)
- 3) Ting-Kuo Lee (president Asia Nano Forum & National Sun Yat-sen University, Taiwan)
- 4) Wannee Chinsirikul (NANOTEC Thailand)



The 4th EU-Asia Dialogue on NanoSafety Online Workshop, held in October 2020

The goal of this initiative would be to establish a collaboration between the European NanoSafety Cluster/ Community and interested countries from other continents in order to expand the common knowledge base for (nano)materials of regulatory significance and to support the needs of various stakeholders including regulatory bodies and industry.

6. BCG economy towards the development of packaging technology and testing models for safety

Bio-Circular-Green Economic Model (BCG) was introduced and promoted by the Thai government as a new economic model for inclusive and sustainable growth. The BCG model capitalizes on the country's strengths in biological diversity and cultural richness and employs technology and innovation to transform Thailand into a value-based and innovation-driven economy. The BCG model will focus on four industries: agriculture and food; medical and wellness; bioenergy, biomaterial and biochemical; and tourism and creative economy.



Event - BCG economy towards the development of Packaging Technology, Propak Asia, October 2020

On 21st October 2020, NANOTEC and Nanosafety Network for Industry with support from Council of Scientific and Technological Associations of Thailand (COSTAT), Informa Markets, and Ministry of Higher Education, Science, Research and Innovation (MHESI) organized a panel discussion on "Bio Circular Green (BCG) economy towards the development of packaging technology" and a technical presentation on "Testing models for food safety and food contact materials" at Propak Asia 2020 in Bangkok. Panelists included Dr. Wannee Chinsirikul, Executive Director of NANOTEC, Assoc. Prof. Vanee Chonhenchob, Associate Dean for Special Projects, Faculty of Agro-Industry, Kasetsart University, Dr. Bongkot Hararak, Senior Assistance Researcher of MTEC (moderator), and Dr. Waluree Thongkam, Senior Technical Officer, NANOTEC Nanosafety Alliance Section. On the technical side, NANOTEC researchers from Nano Environment, Health, and Safety Lab (EHS) presented the following talks: "In vitro models for food safety and food contact material testing" by Dr. Ratjika Wongwanakul, researcher from Nano Environment, Health, and Safety Lab (EHS) and "In vivo models for safety evaluation of food packaging materials" by Dr. Wittaya Pimtong researcher from Nano Environment, Health, and Safety Lab (EHS).

7. Nanosafety Network for Industry announced collaborative agreement

On 9th December 2020, Nanosafety Network for Industry an initiative under NANOTEC announced the collaborative partnership agreement with nine agencies consisting of the Department of Industrial Works (DIWs), Consumer Protection Board (OCPB), Council of Scientific and Technological Associations of Thailand (COSTAT), Federation of Thai Industry (FTI), Food and Drug Agency (FDA), National Institute of Metrology Thailand (NIMT), Nanotechnology Association of Thailand (NAT), Thai Industrial Standards Institute (TISI) and National Nanotechnology Center (NANOTEC). According to Dr. Wannee Chinsirikul, Executive Director of NANOTEC, nanosafety is an integral part of nanotechnology development. The same can also be said when it comes to the safe use of nanomaterials in the industry. The safety of workers must be a priority.



MOU Signing Ceremony for Nanosafety Network for Industry, December 2020

The aim of this partnership is to drive the Nanosafety and Ethics Strategic Plan 2017-2021 to enhance industrial understanding and awareness of how new nano-enabled products can pose concerns regarding human health and environmental risks. In addition to use existing industrial standards related to nanotechnology, the network will also explore the implementation of other activities such as the production of industrial data base and easy to read safety publications/ manuals including participating in seminars and exhibitions.

Events in 2021

1. Virtual Forum on Nanosafety: From Lab to Society

NANOTEC (Thailand) and NNC (Malaysia) will co-organize the virtual Forum on Nanosafety: From Lab to Society on 24th March 2021. The forum serves as a venue to address the potential issues, knowledge exchange, and to promote sustainability of nanotechnology development by implementing awareness campaign related to potential environmental, health, and safety (EHS) impact of nanotechnology, as it is divided into 3 sessions as below:

- 1) Technical/Research
- 2) Awareness of Nanosafety
- 3) Panel discussion on Implication and impact of nanosafety towards society

2. Virtual Seminar on Knowledge of Registration Entrepreneur for Cosmetics & NanoQ

NANOTEC (Thailand) will organize the virtual Seminar on Knowledge of Registration Entrepreneur for Cosmetics & NanoQ on 26th March 2021. The objective of this seminar is to disseminate knowledge and understanding related to the procedure of cosmetics registration and NanoQ label request for entrepreneurs in the cosmetic industry including stakeholders using nanomaterials in the production process and to promote entrepreneurs realizing the importance of products containing nanomaterials and strengthen the confidence of consumers in the quality of nanoproducts.

The seminar is focusing on 3 topics as below:

- 1) Cosmetics Registration
- 2) The Importance of Nanoscale Dimension Measurement
- 3) How to request NanoQ Label

Forum on Nanosafety
FROM LAB TO SOCIETY
24 March 2021, 9:00 A.M. - 5:10 P.M. [Thailand time, GMT (+7)]

Organized by


 National Nanotechnology Center (NANOTEC)
THAILAND


 National Nanotechnology Center (NNC)
MALAYSIA

Opening Ceremony by **Dr. Chaisarnong Cherdika**
Industrial Network Development on Nanosafety Program, NANOTEC-NBISA, THAILAND

SESSION 1: TECHNICAL & RESEARCH
Moderator: **Mr. Mohd Helmi Helan**
National Nanotechnology Center (NNC), MALAYSIA

"Web Assessment and Safety Initiatives in the Philippines"
Dr. Pernia Ada N. de Yee
Industrial Technology Development Institute, PHILIPPINES

"Zebrafish Model for Nanosafety Assessment"
Dr. Wuttaya Pinitpong
National Nanotechnology Center (NANOTEC), THAILAND

"Research on the Safety Assessment of Cellulose Nanofibers"
Dr. Masashi Gamo
National Institute of Advanced Industrial Science & Technology (AIST), JAPAN

"Role of Nanosafety Network in Toxicovigilance of Nanotechnology"
Prof. Mahmood Ghazi-Khanjari
Iran Nanosafety Network of Nanotechnology Initiative Council (INNC), IRAN

"The Safety Initiatives of Nano-based Products in Malaysia"
Dr. Mohd Badri MA. Tiff
ICI Nanotechnology, SIRIM Berhad, MALAYSIA

"Real-Time Monitoring of Cardiovascular Physiology Changes as a Model for Acute and Chronic Nanotoxicity Detection and Assessments"
Dr. Kiew Lih Yuen
University Malaya, MALAYSIA

SESSION 2: WHY PROMOTING AWARENESS OF NANOSAFETY IS CRUCIAL?
Moderator: **Prof. Lemis Hureyyah**
Asian Institute of Technology (AIT), THAILAND

"Nanosafety: Should We Really Care?"
Mr. Mar Gonzalez
OECD Environment Directorate, FRANCE

"Effective Co-creation Methods for Developing Nanotechnology Applications"
Dr. Paul Wright
RMIT University, AUSTRALIA

"Nanosafety Awareness through WHO Guidelines and ISO Standards"
Dr. Vladimir Muresan
National Institute for Occupational Safety, U.S.A.

"Nanosafety Awareness in Malaysia - Social Media's Role"
Mr. Johan Iskandar Hassan
Nanosafety Sdn. Bhd., MALAYSIA

SESSION 3: PANEL DISCUSSION ON IMPLICATION AND IMPACT OF NANOSAFETY TOWARDS SOCIETY
Moderator: **Dr. Wuttaya Pinitpong**
National Nanotechnology Center (NANOTEC), THAILAND

"Panelists"
Mr. Johan Iskandar Hassan
Nanosafety Sdn. Bhd., MALAYSIA
Dr. Chuchawan Changfong
BPC Public Company Limited, THAILAND
Prof. Mahmood Ghazi-Khanjari
Iran Nanosafety Network of Nanotechnology Initiative Council (INNC), IRAN

Closing Remarks by

Dr. Wuttaya Chaisrikrul
Executive Director of National Nanotechnology Center (NANOTEC), THAILAND

Assoc. Prof. Dr. Rudinda A. Rahim
Director of National Nanotechnology Center (NNC), MALAYSIA

Scan here Free WebEx Registration!



NANOTEC THAILAND

สัมมนาการขึ้นทะเบียนเรื่องน่ารู้สำหรับผู้ประกอบการ
Cosmetics & NanoQ

26 มีนาคม 2564 เวลา 09:00 - 12:00 น.

พิธีกรกล่าวต้อนรับและประธานกล่าวเปิดการสัมมนา
โดย พลตรี รองศาสตราจารย์ ดร.ธีรภัทร ธีระกุล
ประธานคณะกรรมการพัฒนาการวิจัยและพัฒนาภาคอุตสาหกรรม
เรื่อง ความปลอดภัยในภาคไทย

เรื่อง การขึ้นทะเบียนเรื่องสำอาง
โดย ผู้เชี่ยวชาญ จากสำนักงานคณะกรรมการอาหารและยา (อย.)

เรื่อง ความสำคัญในการขอข้อมูลขนาดใหญ่ใน
โดย ดร.ธิดาภา สารคุณวิทย์
นักวิจัย กลุ่มวิจัยการวิเคราะห์ระดับนาโนในสิ่งสูงและความปลอดภัย (ANCS)
ศูนย์นาโนเทคโนโลยีแห่งชาติ สวทช.

เรื่อง การขอข้อมูลนาโน (NanoQ)
โดย ผู้เชี่ยวชาญจาก พล.อ.ดร.ธีรภัทร ธีระกุล
ประธานคณะกรรมการพัฒนาการวิจัยและพัฒนาภาคอุตสาหกรรม
เรื่อง ความปลอดภัยในภาคไทย



ลงทะเบียน

ติดต่อสอบถามข้อมูล : nsa@nanotec.or.th

Virtual Forum on Nanosafety: From Lab to Society

Virtual Seminar on Knowledge of Registration
Entrepreneur for Cosmetics & NanoQ

Working Group Report

Commercialization

Coordinators:

Dr. Reza Khairi Ahmad (NanoMalaysia, Malaysia)

Mr. Alexander Pogany (BMVI, Austria)

Dr. Junichi Sone (JST, Japan)

Workshops on Commercialisation have been held every year since the Commercialisation Working Group (CWG) formation at ANFoS 2016, Singapore. The Commercialisation Working Group aims to promote cross-border commercialisation activities facilitated by Asia Nano Forum (ANF) platform at strategy and implementation levels. The Commercialisation Working Group also acts as a convergence and exchange platform facilitating cross-border technology transfer between businesses, research institutes and academia.

In 2020, the Workshop on Commercialisation 2020 was organised during the 17th Asian Nano Forum Summit, held concurrently with the 4th EU-Asia Dialogue on NanoSafety in Austria on 9 October 2020. Due to the coronavirus pandemic, this year's Workshop was conducted online via Zoom.



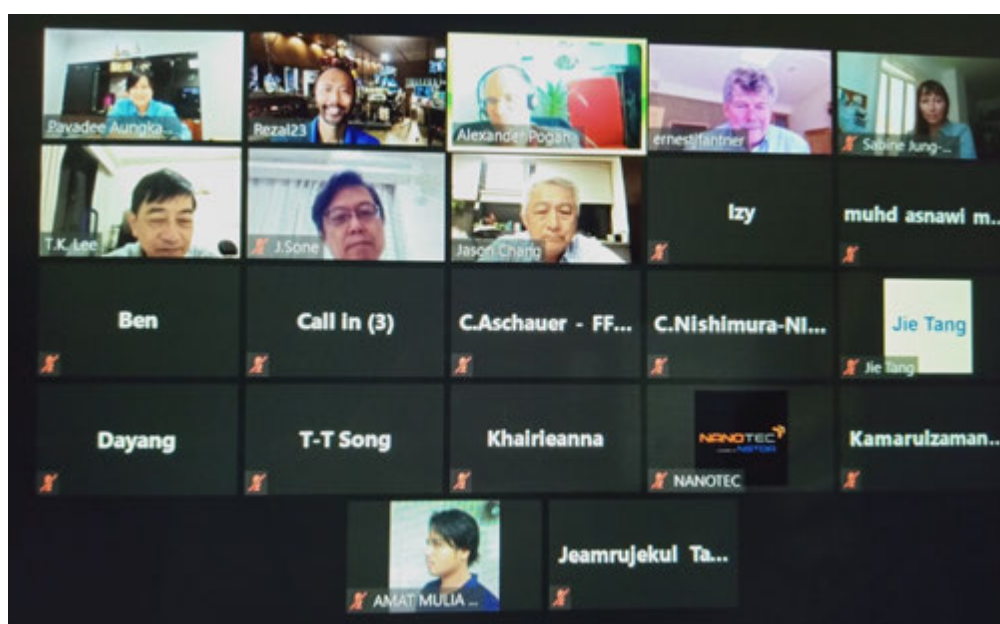
Among the topics and speakers that presented during the Workshop were:

1. “Business challenges and policy issues in the innovation environment of nano- and converging technologies” (Sabine Jung-Wacli, Brimatech)
2. “Introducing a new high-tech nanotech product into the global market - what we have learned as a start-up company” (Ernest Fantner, GeTEc)
3. “Functional and commercial attractive nanocoatings with atmospherical plasma spray process” (Andreas Hinterer, Inocon)
4. “Supercapacitor composed of Graphen/Carbon nanotube 3D stacking” (Dr. Tang Jie, Materials Innovation Tsukuba Corporation)
5. “From researcher to be an Entrepreneur” (Pinit Khueansuwong, IDEA2EX- PERT CO., LTD)

Two companies from Malaysia were also presentations, namely from Enhance Track Pte Ltd and Serdang Paste Pte Ltd.

The Workshop allowed participants to discuss the policy, challenges and solutions for nanotechnology commercialisation.

The following Workshop on Commercialisation is slated to be held in December 2021 during the next ANF Meeting in Thailand. The format will be confirmed to take into account how the pandemic situation will develop by then.



ANF Summit Report

The 17th Asia Nano Forum Summit

in conjunction with
4th EU-Asia Dialogue on NanoSafety
Advanced Materials and Emerging Issues Forum
Commercialization Workshop

Summary of the 17th ANF Summit

Due to COVID-19 pandemic, ANF members held the online Summit meeting at 09:00 Vienna time (CEST, GMT+2:00 “Summer Time”) on 8th October 2020 via the Zoom.

I. 13th Annual General Meeting (AGM, by Secretariat)

1. Dr. Annabelle V. Briones succeeded Dr. Blessie A. Basilia as Secretary

- The most updated Office Bearers for a two-year term are Prof. Ting-Kuo Lee (President), Dr. Yasuo Koide (Vice President), Dr. Wannee Chinsirikul (Vice President), Dr. Rezal Khairi Ahmad (Treasurer), Prof. Jason Chang (Secretary), and Dr. Annabelle Briones (Secretary).
- Welcome Dr. Annabelle Briones, the new official representative of the Department of Science and Technology – Industrial Technology Development Institute (DOST-ITDI) in ANF, who succeeded Dr. Blessie Basilia as Secretary of ANF this January.
- Congratulations to Dr. Wannee Chinsirikul. She has just been selected as the new president of Nanotechnology Association of Thailand (NAT).

2. Host country for the ANFoS2021 – Thailand

- According to the minutes of ANF Summit 2019 in Philippines, Thailand is the host country for the next Summit in 2021. Dr. Wannee Chinsirikul expressed her thanks for having the opportunity to organize this very important meeting, the 18th ANF Summit in Thailand, and prepared a presentation for the planning.
- There are two options for scheduling the ANFoS2021. The first plan is to hold the meeting at Chatrium Hotel Riverside Bangkok on 4-7 August, 2021, but it could be rescheduled to the end of August considering getting European speakers for the workshop in conjunction with the ANF Summit. The second one, a backup under the pandemic, will be in November and concurrent with the NanoThailand 2021. In that case it's suggested to hold a back-to-back event during ANFoS2021, the 5th EU-Asia Dialog on Nanosafety in Malaysia."
- The draft agenda for the ANFoS2021 is as follows.
Day 1: *Arrival of participants*
Day 2: *Nanosafety session*
Day 3: (morning session) *The 18th Summit meeting* and (afternoon session) *the (ANF) Presidents' Forum*

- In addition, the 5th EU-Asia Dialogue on NanoSafety in Malaysia would probably be held in October or November.
- As a follow-up to the discussion at the Dialogue on Nanosafety the day before, a small working group will be set up for the collaboration between ANF and Nanosafety Cluster (NSC/EU) on nanosafety. Members from ANF will be part of the Steering Group. They are Prof. Ali Beitollahi, Dr. Wannee Chinsirikul, Mr. Alexander Pogany (intermediary for this initiative), and Prof. Ting-Kuo Lee who will be probably replaced by another colleague from Korea. Dr. Tae Geol Lee from Korea showed quite a lot of experience for nanosafety at the Dialogue yesterday. It would be great if Korea can also join the group

3. 2nd International Nanotechnology Olympiad

- The 2nd International Nanotechnology Olympiad (INO) scheduled in January 2021 in Oman has been postponed to 2022.
- It is suggested that ANF members can also observe the streaming or activities from the internet. That would be helpful, especially for young scientists and students to learn the nature of the competition better.

II. Working Group Presentations

1. Standardization

Coordinators: Dr. Tsing-Tang SONG (ITRI, Taiwan) and Dr. Ali BEITOLLAHI (INIC, Iran)

- Dr. Song updated members on ANF standards activities including changes of ISO/TC229 and IEC/TC113 Liaison status, nanotechnology standards led by ANF and Iran, ISO preliminary work item “*Nanotechnologies – Performance Evaluation of Nanosuspension Containing Clay Nanoplates for Quorum Quenching*” (PWI4971) proposed by ANF, and mutual certification program for nano-enabled products between Taiwan’s nanoMark and Malaysia’s NANOVerify.
- Prof. Beitollahi added that the collaboration among ANF member economies or between Asian and EU countries could be enhanced. Through the establishment of a workshop in capacity building, experts from Asia and EU could work with each other to exchange information on standards, framework of ISO/TC229 and so on. The other suggestion is that there may be some way of rewarding for experts who engage in development of joint standards among Asian countries or between Asian and EU countries.

2. User-Facility Network

Coordinator: Dr. Yasuo KOIDE (NIMS, Japan)

- Dr. Koide made a brief report on the planned exchange and partnership activities of user-facility networks and professional engineers in industry and academia between NIMS (Japan) and NANOTEC (Thailand). Unfortunately, the plan has been stopped due to COVID-19 pandemic. Still, he gave some examples of training program on NIMS’s side including materials analysis course, observations & analysis course,

nanofabrication course, and nanobio course. In addition, Dr. Koide's already planning a workshop on "*Current status & prospect of user-facility project in Asia*" which could be held either in ANF Summit 2021 or in nanotech 2022 late January 2022. A list of related user-facility webpage was also made for members' reference.

3. Nano Safety & Risk Management

Coordinators: Dr. Paul WRIGHT (RMIT, Australia) and Dr. Wannee CHINSIRIKUL (NANOTEC, Thailand)

- On behalf of the Coordinators, Mr. Ramjitti Indaraprasirt reported on the work progress related to nanosafety and risk management that included Inter-Laboratory Comparison (ILC) 2019 workshop earlier this year. The ILC workshop, with funding support from ANF is a good example of lateral collaboration between Standardization WG and Nano Safety & Risk Management WG and should be encouraged. A seminar on "*Protecting factory workers from potential risks of nanomaterials exposure*" was organized by NANOTEC this September to promote the awareness of Nanosafety in industrial setting.
- With regard to ILC initiative there was a suggestion to make certain of justification for ILC initiative and that participating labs do have necessary lab certification in order to be allowed to participate.

4. Commercialization

Coordinators: Dr. Rezal Khairi AHMAD (NanoMalaysia, Malaysia), Mr. Alexander POGANY (BMVIT, Austria), and Dr. Jun'ichi SONE (JST, Japan)

- Dr. Ahmad summarized ANF commercialization activities. ANF Commercialization Working Group, formed at ANF Summit 2015 in Singapore to facilitate realization of economic value of nanotechnology research and development, organized the pilot workshop in 2017 in association with ANF Summit in Malaysia. There has also been a series of workshops at Nanotech 2018 (Japan), ANF Summit 2018 (Taiwan), Nanotech 2019 (Japan), ANF Summit 2019 (The Philippines), Nanotech 2020 (Japan), and this year's ANF Summit 2020 (online).

III. TERI, India – Membership Application

TERI's ANF membership application was proposed to discussion and then had unanimous support at the ANF Summit meeting.



Online 17th ANF Summit, 8. October, 2020

Programs of conjunctive events

◆ 4th EU-Asia Dialogue on NanoSafety

7th October, 2020

Keynote Lectures

- "Nanosafety Network for Industry"
Ramjitti INDARAPRASIRT (NANOTEC Thailand; Asia Nano Forum - ANF)
- "Major Scientific Achievements of the EU-NSC in Past Five Years"
Eugenia VALSAMI-JONES (University of Birmingham, Great Britain; EU NanoSafety Cluster - NSC)
- "Using a Modified Electrical Aerosol Detector to Predict Nanoparticle Exposures to Different Regions of the Respiratory Tract for Workers in a Carbon Black Manufacturing Industries"
Perng-Jy TSAI (Department of Environmental & Occupational Health, College of Medicine, National Cheng Kung University, Taiwan)
- "Risk Governance Council (NMBP-13°3)"
Monique GROENEWOLD (RIVM - National Institute for Public Health and the Environment, Netherlands)
- "A Platform Towards Enhanced Synergy"
Ali BEITOLLAHI (Iran Nanotechnology Initiative Council)
- "Joint Activity Towards ISO Standardization"

Damjana DROBNE (University of Ljubljana, Slovenia)

- "Guideline for Evaluation of Nano-based Agri-Input and Food Products in India"

Alok ADHOLEYA (TERI-Deakin Nanobiotechnology Centre, Gurugram, India)

- "Knowledge Transfer from EU NanoSafety Cluster Project Towards OECD WPMN Projects"

Flemming CASSEE (RIVM - National Institute for Public Health and the Environment, Netherlands; EU NanoSafety Cluster - NSC)

- "How OECD Deals with Test Guidelines and Guidance Documents to Accommodate Testing of Nanomaterials"

Mar GONZALEZ (Organization for Economic Co-operation and Development - OECD)

Short Speeches of Young Scientists

- "Bridging Sustainability and Innovation in Nanotechnology Governance"

Gloria ROSE (Institute of Technology Assessment, Austrian Academy of Sciences, Austria) and Anna PAVLICEK (Institute of Technology Assessment, Austrian Academy of Sciences - ITA and Institute of Waste Management of the University of Natural Resources and Life Sciences – BOKU, Austria)

- "Methods for Risk Assessment of Graphene-Based Products"

Florian PART (University of Natural Resources and Life Sciences, Austria)

- "An Evaluation of Acute Toxicity and Aquatic Toxicity of Titanium Dioxide Nanoparticles"

Mar Christian QUE (Industrial Technology Development Institute, Department of Science and Technology, Philippines):

Session A – Thematic Collaboration Fields – How/what to contribute to the Malta Initiative?

Session B – Risk Governance – Where Do We Stand, Where Do We Go

Reflections, Announcement and Closing Remarks

◆ **Advanced Materials and Emerging Issues Forum**

8th October, 2020

- Introduction: Advanced Materials and Emerging Issues

Dr. Andre Gazso, Austrian Academy of Sciences

- Data-driven Materials Science and Technology - Materials Informatics

Dr. Yasuo Koide, National Institute for Materials Science (NIMS), Japan

- "Challenges for complex materials with diverse crystal stable phases".

Dr. Jun'ichi Sone, Japan Science and Technology Agency)

- Biomimetic and Bioinspired Advanced Materials

Prof. Dr. Ilse Gebeshuber, Technical University of Vienna

- Questions and Answers

- Plenary Debate on Advanced Materials
 - Advanced Materials: Applications and Trends
 - Further Actions by the ANF

◆ **Commercialization Workshop**

9th October, 2020

- "Business challenges and policy issues in the innovation environment of nano- and converging technologies"
Sabine Jung-Waclik, Brimatech
- "Introducing a new high-tech nanotech product into the global market - what we have learned as a start-up company"
Ernest Fantner, GeTEc
- "Functional and commercial attractive nanocoatings with atmospherical plasma spray process"
Andreas Hinterer, Inocon
- Company presentation
Benedict Foo, Enhance Track Pte Ltd
- Company presentation
Mr. Asnawi Kusaimi, Serdang Paste Pte Ltd
- Super capacitor composed of Graphen / Carbon nanotube 3D stacking
Dr. Tang Jie, Materials Innovation Tsukuba Corporation
- From researcher to be an Entrepreneur (Video)
Mr. Pinit Khueansuwong, IDEA2EXPERT CO., LTD

Major Activities and R&D Highlights

INDIA

TERI Deakin Nanobiotechnology Centre

India, among top 3 countries in nanotechnology, is ready to forge ahead at global level by having first 'Guidelines for Evaluation of Nano based Agri-input & food products in India' intended not only to ensure quality, safety and efficacy of these products but also to ease product development in nano agri and food sectors.



Dr Harsh Vardhan, Hon'ble Minister for Science & Technology, Earth Sciences and Health & Family Welfare and Shri Narendra Singh Tomar Hon'ble Union Minister for Agriculture & Farmers Welfare and Rural Development & Panchavati Raj jointly released the First "Guidelines for Evaluation of Nano based Agri-input and food products in India" on 7th July 2020. These guidelines are developed by Department of Biotechnology (DBT), Ministry of Science and Technology, Ministry of Agriculture and Farmers' Welfare and Food Safety and Standards Authority of India, Ministry of Health and Family Welfare and is an outcome of all concerned Inter-Ministerial efforts coordinated by DBT.

TERI-Deakin Nanobiotechnology Centre (TDNBC) has played an active role in conceiving and preparing this along with DBT. These guidelines are aimed at providing science based information to help make policy decisions by providing information on the existing regulations for nano-based products in agriculture and food and also to ensure quality, safety and efficacy of the targeted products.

TDNBC was established in 2010 by signing an MoU between India's research think-tank TERI and Australia's Deakin University with a vision to identify and develop novel approaches of farm profitability through application of nanobiotechnology while conserving natural resources. Since its inception, TDNBC has been making significant strides in developing nanonutrients, nanopesticides and nanoformulations to develop targeted solutions for global challenges such as soil health, food security and water safety. The Centre is now uniquely poised to deliver path breaking technologies and products using biologicals interwoven with nanotechnologies and biocompatible materials. Simultaneously, the TDNBC projects dealing with development of nanoproducts; and safety and life-cycle assessment of nanoproducts are shouldering the

scientific and social responsibilities of providing safe and sustainable solutions to mankind. Such activities are being pursued jointly through strategic collaborations with Deakin University and over 26 academic and industrial partners worldwide across various research streams. TDNBC's research has been recognized through national and international conference presence, multiple awards to PhD students and faculty members. In the last decade TDNBC has produced over 120 Research publications in most reputed journals, 8 granted patents and 5 new patent applications and 26 externally funded projects to its credit.

Centre's research efforts have been recognized by the Government of India in the form of support for National Centre for advanced research in Agri-nanotechnology which has its key focus on innovation of safe and efficacious green nanoproducts and technologies including nano-fertilizers, nano-pesticides and nanocarriers. These products have been tested as per the existing international (OECD) and national guidelines and have been found to be safe and non-toxic to human and environment. Production technology for these nanofertilizers has also passed all the tests at pilot scale and TDNBC is now ready for mass production.

4th International Conference on Nanobiotechnology for Agriculture NANOFORAGRI 2020

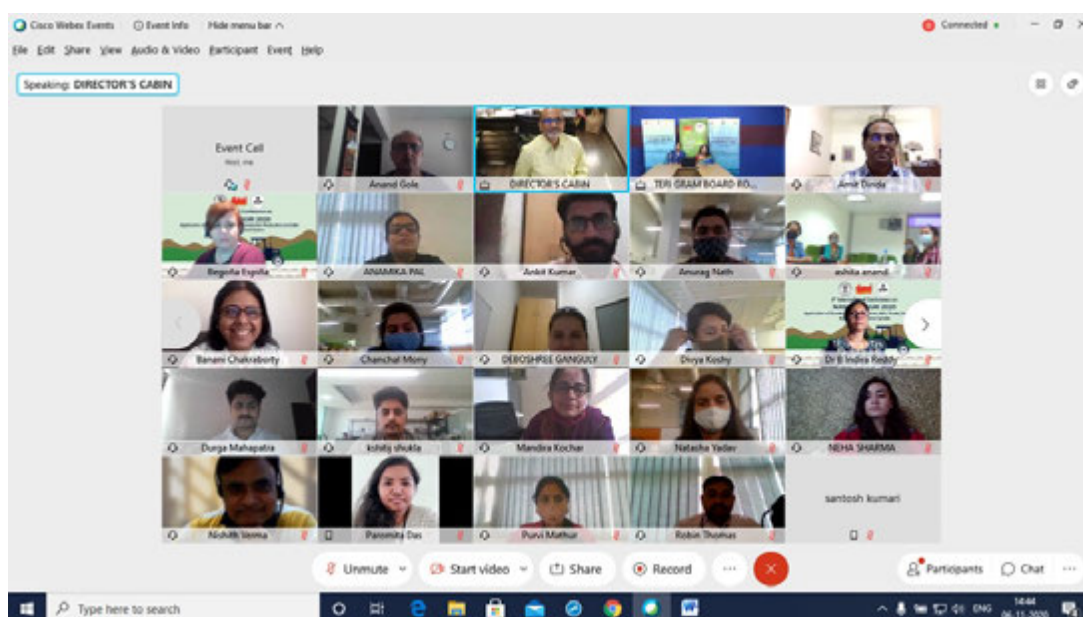
“Application of Nanotechnology for Sustainable, Productive and safer Agriculture and Food System”
5-6th November, 2020

(Organized by TERI-Deakin Nanobiotechnology Centre, India in collaboration with Department of Biotechnology, Govt of India)



NanoforAgri 2020 has provided an interactive arena for networking of researchers, building collaborations, and a platform for budding young scientists and research scholars. Thematic talks and discussions in the conference focused on various aspects of nanotechnology for enhancement of crop nutrition and its protection, post-harvest management, food preservation, toxicity of agri-nano products and regulatory and compliance challenges for translational research in food and agriculture sectors across five sessions. The Science-Society-Policy actions for Agriculture and Food Nanotechnology being spear-headed by DBT and supported by TERI were a key focus of the conference. This virtual event also saw Scientist and Scholar Oral Research Pitches providing a glimpse into some selected pioneering research projects. This conference involved thought-provoking discussions between the ~150 participants in related fields and focused on developing scientific linkages across different themes to foster innovation and targeted solution development for challenges in agricultural research. The

Conference highlighted the key areas requiring interventions and also how nano-enabled systems will help address contemporary issues in agriculture related to efficient delivery of fertilizers, pesticides and nutrients, post-harvest management, soil conservation, pathogen detection and for the farm and food sector.



Major Activities and R&D Highlights

IRAN

Iran's Proposed Standard on Clay Nanomaterial has been Published by the International Standardization Organization (ISO)



After 4 years of continuous efforts by Iranian experts, the proposal on "Nanotechnologies — Clay nanomaterials — Part 1: Specification of characteristics and measurement methods for layered clay nanomaterials" has finally been approved and published by ISO.

The standard was proposed by INIC's Nanotechnology Standardization committee to the International Standardization Organization (ISO) four years ago. After considerable lengthy discussions and debates, the document has been finally approved and published and it is now available at www.iso.org (standard number: ISO/TS 21236-1:2019).

Reports indicate that clay nanomaterials are of particular importance in today's industry and technology all over the world. Clay nanomaterials could be used in various medical and pharmaceutical industries, packaging, paint and coating, automotive, rubber and polymer composites. This standard deals with the various characteristics of Clay nanomaterials including mechanical, thermal, physical, chemical etc. and their measurement methods, which can be referred to and used as a basic standard in international transactions.

The 6th Iranian-led International Nanotechnology Standard is published

The international standard entitled "air filter media containing polymeric nanofibers — Specification of characteristics and measurement methods" was published by ISO after four years of tireless efforts of Iranian experts as well as other partner countries' experts. This was the 6th international standard that was directed by Iranian team collaborating with ISO technical committee (TC229) responsible for the development of international nanotechnology standards.



This standard has been developed with the support of Iran Nanotechnology Innovation Council (INIC) and leadership of a knowledge-based company being pioneer in the field of development of nanofiber technology as well as Nano filter media production for air filter applications. It is worth to mention that, Iran is among few countries which has developed nanofiber technology for wide range of applications, including air filters for vehicles, power generators, and facial respiratory masks such as N95 and N99 grades that have been highly recommended by various international medical authorities for being used as a reliable respiratory protection against corona virus these days.

The published standard specifies the key characteristics and parameters of the air filter media containing polymeric nanofibers affecting its efficiency and their measurement methods are also explained in this document as well. The utilization of this standard will facilitate the communications between the seller and the buyers of this Nano product.

Nanotechnology in the front line of battling Coronavirus in Iran

Several private companies, and organizations including INIC have joined forces to produce N95 and N99 Nano mask in Iran since few past months to overcome Coronavirus outbreak.

Iran's N95 and N99 Nano mask production has reached to over 500,000 masks per day.

This was the result of several private companies, and organizations including INIC joining forces to boost Nano mask production in Iran during few past months to overcome Coronavirus outbreak.

This production is being done in several industrial plants including the biggest mask manufacturing plant in west Asia. The technology uses Nano fibers to prevent virus pass through the mask. This technology is completely developed in Iran and patented internationally.

It is worth mentioning that the Industrial machinery used for production of Nano-based Masks,



are completely designed and produced by Iranian Hi-tech companies.

The industrial production line has been already exported to several industrial countries. The quality and price of the machinery is quite competitive, which is very important in helping countries to meet the demands of tackling with the current Coronavirus outbreak.

The 7th International Iran-led Standard in Nanotechnology has been published

International standard developed for polymeric food packaging entitled "Nanotechnologies- Polymeric nanocomposite films for food packaging with barrier properties — specification of characteristics and measurement methods" has recently been published. This standard was led by Iranian experts.

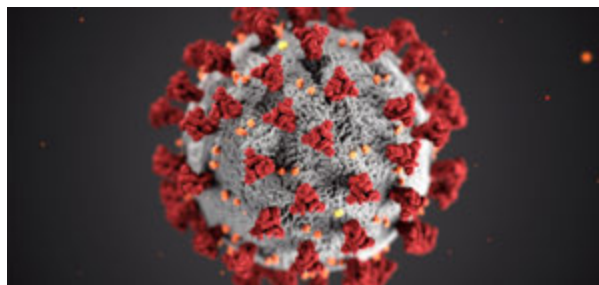
The seventh international standard in nanotechnology with leadership of Iran Nanotechnology Innovation Council (INIC) was developed and published.

This standard addresses the barrier property of polymeric nanocomposite films to improve the quality of food packaging. The barrier property includes the exchange of gas (e.g. oxygen) and water vapor as well as Ultraviolet-Visible light transparency.



Early Diagnosis of The New Coronavirus Made Possible by A Reactive Oxygen Species Measuring Device

Iranian researchers successfully developed a device for early diagnosis of the new coronavirus by measuring the amount of reactive oxygen species (ROS) in sputum. The device has been now tested on more than 700 patients and it will be commercialized soon.



"Our team had previously shown how reactive oxygen species (ROS) can be used to diagnose lung diseases," said Dr. Mohammad Abdolahad, head of an Iranian knowledge-based company, "but we recently discovered that ROS increase in sputum can be considered as an indicator of infection with

SARS-CoV-2". While describing the advantages of this method of diagnosis, he added: "the level of ROS in patients infected with the virus changes even when a patient is asymptomatic. Therefore, by measuring ROS levels, we can diagnose the presence of the virus. An increase in ROS levels can be attributed to two factors; the body's inflammatory function against the presence of the virus, as well as cellular activities during exposure to the virus."

He added that this project has now reached the commercialization stage after it successfully showed satisfactory results for more than 700 patients in various hospitals in Iran and in the region. It should be mentioned that this device can be tuned for diagnosis of not only SARS-CoV-2, but also other lung diseases such as asthma and tuberculosis.

Over the past four years, Dr. Abdolahad has patented more than 20 US, European and Chinese patents and published more than 50 articles in some of the world's most prestigious scientific journals, most of which are related to cancer diagnosis methods.

More information about the technique is available in a recent scientific article entitled "Real-time diagnosis of reactive oxygen species (ROS) in fresh sputum by electrochemical tracing; correlation between COVID-19 and viral-induced ROS in lung/respiratory epithelium during this pandemic" which has been accepted for publication in "Biosensors and Bioelectronics", the second most important journal in electrochemistry area.

Iran Proposed Four New International Standards in the Field of Nanotechnology

Iran has proposed four new international standards in the field of nanotechnology to the International Standardization Organization (ISO). So far, Iran has been project leader of developing 7 international standards in the field of nanotechnology.

ISO / TC229 (ISO's technical committee on Nanotechnology) online meeting was recently held in November, 2020. Delegates from more than 20 countries participated in the event where Iran proposed the development of 4 new standards and presented a progress report of two of its ongoing international standards.

Considering the recent outbreak of the novel coronavirus, Iran presented its proposal on characterizing nanotechnology-based disinfectants as well as assessing the release of nanomaterial in nano-enhanced respirators masks.

Currently, few countries including Iran produce COVID-19 related nanotechnology products. Considering the applications and efficiency of these nanotechnology products, the proposed two standards were greatly received by the participating countries. Currently, nanotechnology-based masks and disinfectants are produced by several Iranian companies and are readily available in the market. This enforces the importance of standards in this area. The other proposal from Iran was about evaluation of the performance and durability of super-hydrophobic nano-coatings and super –hydrophobic textile containing nanomaterials. Super-hydrophobic nano-coatings have different applications and several Iranian companies produce these materials. The initial design and proposal of the aforementioned standards were prepared with the help of experts and manufacturing companies and the special support of the INIC.

In addition to the above proposals, two other international standards that are already being developed by leadership of Iran were also discussed in the meeting. “Antibacterial textiles containing nanomaterials- performance determination” is one of the Iran-led standards which was finalized and submitted for publication. Another standard that is currently being developed is “Measurement of bioavailability of nanomaterial produced in aquatic environments.”

It is worth mentioning that International Committee for Nanotechnology Standardization meetings are held every six months in order to review the policies of the committee. In these meetings, members discuss new projects and standardization proposals submitted by main member countries. Iran is among the active members of the International Committee for Nanotechnology Standardization, which has so far developed seven international standards.

The 8th International Conference on Nanostructure was successfully held on November 18-20, 2020.

The 8th ICNS event was originally planned to be held on 20-22 of April 2020 at the main campus of Sharif University of Technology; however, due to the outbreak of COVID-19, an online version of the conference was scheduled for November 18-20, 2020.

International Conference on Nanostructures (ICNS) started its mission as a workshop in 2006 when researchers at Sharif University of Technology and Iran Nanotechnology Innovation Council noticed the importance of providing a meeting ground for experts, young researchers and manufactures to discuss Nanoscience and Nanotechnology. By 2012, the small biannual gathering had turned into an international event and one of the largest meetings on nanotechnology in our region.

The scientific program of ICNS8 included a diversity of topics and parallel sessions in which more than 360 papers were presented in oral or poster presentation sessions. The main topics included Low-dimensional Nanostructures, Nanobiotechnology and Nanomedicine,

Nanosensors and Nanobiosensors, Nanostructures in Magnetism, Electronics, Photonics and Plasmonics, Nanostructures for Water and Environment, Nanostructures for Energy Conversion and Storage, Advanced Fabrication and Characterization Methods.

As in previous events, ICNS8 hosted distinguished scientists from different countries including Prof. Jean-Marie Lehn, Chemistry Nobel Laureate (1987) from University of Strasbourg Institute for Advanced Study (USIAS), France, Prof. Justin Gooding (Editor-in-Chief of ACS Sensors) from University of New South Wales, Australia, Prof. Nitish V. Thakor from Johns Hopkins University, USA, Prof. Jianfang Wang from Faculty of Science, Chinese University of Hong Kong, Hong Kong, Prof. Teri W. Odom from Northwestern University, USA, Prof. Norbert Koch from Humboldt-Universität zu Berlin, Germany, Prof. Nicola Pinna from Humboldt University of Berlin, Germany, Prof. Thomas Jay Webster from Northeastern University, USA, and Dr. Morteza Mahmoudi from Michigan State University, USA.

During the three-day event, more than 400 people actively participated in 9 keynote talks, 16 invited talks and 26 oral and poster presentation sessions.

INIC's proposal for establishing an Asia-EU nanosafety cooperation platform was welcomed in the 4th Dialogue on Asia-EU Nanosafety and nanocertification

Following previous three rounds of the Asia-EU dialogue on Nanosafety and nanocertification in Iran(2017), Austria(2018), and Thailand(2019), the fourth dialogue was held virtually on 7 October 2020 hosted by the Austrian federal ministry of climate action, environment, energy, innovation and technology.

It is worth mentioning that this program was initiated based on the suggestion by Iran Nanotechnology Innovation Council to European Commission in 2017 and the first event was held in Tehran in the same year by participation of representatives from European Commission of research and innovation as well as active countries from Asia and Europe.

In the 4th dialogue, Prof. Beitollahi, the senior advisor of INIC's standardization and nanosafety department, presented INIC's proposal for establishment of a cooperation platform between Asia and Europe in nanosafety called "Asia-EU Network of Networks on NanoSafety (NONNS)". As the first step it was suggested that a founding committee be formed and start working on establishment of intercontinental network on nanosafety standardization. The proposal was welcomed in the dialogue in principle after comments and suggestions made in a panel during the dialogue and the founding committee was formed of representatives from Iran, Thailand, South Korea, Taiwan, EU nanosafety cluster and Austria to draft the concept and action plan, and present it to the European Commission.

The proposed platform is supposed to facilitate communication and cooperation in different layers of relevant players of nanosafety in the form of provision of services and conducting various relevant activities.

In the fourth dialogue, representatives from a number of Asian and European institutions participated and discussed different problems and challenges of the area, exchanged experience,

and explored various ways to boost the cooperation between the two continents.

From EU, representatives from Europe Commission on Research and Innovation, European Nanosafety Cluster, Austria's Bionanonet, Nano Risk Governance Council, Malta initiative, and the Germany's Federal Institute of Occupational Safety and Health as well as the OECD participated. In addition representatives from relevant institutions from Slovenia, Denmark, Norway, Belgium, Finland, Netherland, Swiss, France, Luxemburg, Spain, England, and Italy were present in the dialogue.

From Asia also representatives from institutions including Iran Nanotechnology Innovation Council, Taiwan's Academia Sinica, Thailand's Nanotech, Philippine's Nanotech initiative, India's Nanobiotechnology Center, and the South Korea's Research Institute of Standards and Science participated.

Oral Nano-Curcumin Formulation, A Promising Adjuvant Treatment for the Management of Hospitalized COVID-19 Patients

While the viral infection due to the novel coronavirus spreads globally, researchers seek to find innovative remedies to control and combat the disease.

Among these, curcumin, being an anti-inflammatory, antioxidant, and anti-apoptotic agent, has shown substantial potential to control lung inflammation due to COVID-19. For this purpose, Dr. Sepideh Elyasi and Professor Mahmoud Reza Jaafari have recently introduced a nano-formulated curcumin containing agent (SinaCurcumin) with significantly increased bioavailability.

In a recent study, forty-one patients underwent a clinical investigation with this approach for two weeks. As a result, a significant relief from some of their symptoms, including fever and chills, tachypnea, myalgia, and cough were recorded. In addition, the results indicate that oral consumption of SinaCurcumin could substantially accelerate the recovery time.

The study has been published in the journal of Phytotherapy Research. 2021; 1:8. You can find the original article at <https://www.ncbi.nlm.nih.gov/research/coronavirus/publication/33389761> .

Major Activities and R&D Highlights



Latest Strategic Proposals on Materials/Nanotechnology in CRDS of JST

Since its establishment in 2003, the Center for Research and Development Strategy (CRDS) who is an affiliated institution of Japan Science and Technology Agency (JST) has made a significant contribution nationally as a public think tank by independently carrying out the investigation and analysis and by making proposals on science, technology, and innovation policy and/or research and development strategy. CRDS issued following three strategic proposals in the field of materials and Nanotechnology in the fiscal year of 2019. (available at <https://www.jst.go.jp/crds/report/report01/index.html> in Japanese)

(1) Sensor Fusionon Technologies in IoT Era

“Multimodal Sensing and Data Processing for Creating New Value”

A sophisticated IoT system capable of adding high values to sensing data requires an excellent edge-side sensing system along with high performance cloud servers and network, that acquires a variety of useful data, and processes those data in order to send them to the cloud side. So far, most sensing systems tend to be used in specified areas for a limited application and only acquire and process specific types and limited amount of data. On the contrary, the IoT system are currently required to collect much wider range of data without human intervention. In that situation, it becomes important to collect a variety of information at the edge side, to make a decision on the spot, and to take necessary actions instantly. With strength in sensing technology, which is positioned in the lower layer of IoT system, Japan is expected to lead IoT industry from the lower layer by developing an excellent edge-side sensing system.

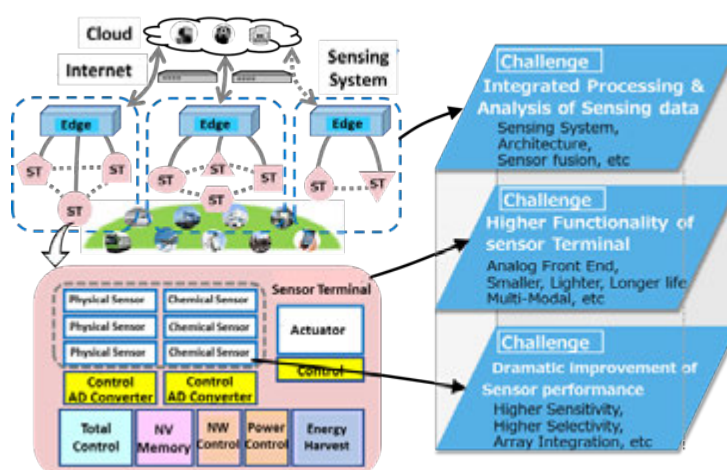
Under this situation, this proposal proposes to work on the following research and development challenges in order to realize a sensing system capable of acquiring a variety of information and processing them in an integrated manner.

- Integrated processing of sensing information (system level challenge)
With consideration given to the role of the cloud, located at the upper layer of the IoT system, the architecture of an edge side information processing device and sensing system have to be designed. The research and development challenges also include those associated with sensor fusion which merges multiple types of sensing data to derive information with high-added values, with event-driven sensing which detects temporal changes in data to make changes of commands for actuation, and with active sensing which works with an actuator to change the way of next data acquisition based on the date acquired.
- Development of sophisticated sensor terminals (sensor terminal level challenge)
Sensor terminals involve individual blocks such as those related to sensor control, analog front end, data storage, analog-to-digital data conversion, communication, and power supply devices. Further research and development are required for each of these blocks. The integration and mounting technologies are also important in creating sensor terminals

with optimal functions and capabilities.

- Improvement in sensor performance (sensor level challenge)

In order to extract more useful information, it is required to increase the type and range of sensing data, and to improve the performance of sensors and to apply new detection principles to sensing. In particular for biosensors, it is required to increase the sensitivity of the sensors and improve selectivity in order to detect infinitesimal biomarker molecules. In addition, it is also important to apply new sensing principles, new physical phenomena and chemical reactions, and new materials to detect physical, chemical, and biological quantities that have been undetectable.



Technological Challenges for Sensor Fusion System

(2) Quantum 2.0

“Quantum Science and Technology open up New Horizon”

Quantum 2.0 is defined as the ability to control and utilize quantum specific properties which were difficult to utilize in the past, such as quantum coherence and entanglement. The related wide-ranging R&D should be promoted along with efforts to address social and economic issues, to strengthen national security and industrial competitiveness, and to form new academic fields, communities, and research networks. The movement to apply quantum mechanics to computation and communication goes back to Feynman’s proposal of quantum simulation in the 1980s. However, it was not until the late 1990s, when quantum behavior was able to be manifested and controlled as theoretically expected, that there was significant R&D progress after the birth of quantum information science from the merger of quantum mechanics and information science. In this proposal, the future R&D subjects in the four major areas of quantum science and technology are shown.

- Quantum computing and simulation

The R&D of hybrid quantum-classical algorithms, indispensable for killer applications of NISQ (Noisy Intermediated-Scale Quantum computing) machines such as quantum-chemical simulations and quantum machine learning should be promoted. Development of real machines with superconducting qubits as the building blocks, development of the overall computer architecture towards the realization of the fault-tolerant quantum

computer as a final goal, and basic R&D related to the control of various qubit physical systems are also important tasks to be tackled.

- Quantum measurement and sensing

In sensing technology using diamond nitrogen vacancy (NV) centers and/or quantum entanglement of light or matter, it is important to develop applications for biomedical measurement and to produce or commercialize prototype for medical and diagnostics purposes. Atomic interferometer type gyroscopes and optical lattice clocks should be miniaturized and stabilized to demonstrate practical application of self-location estimation and relativistic geodesy, respectively.

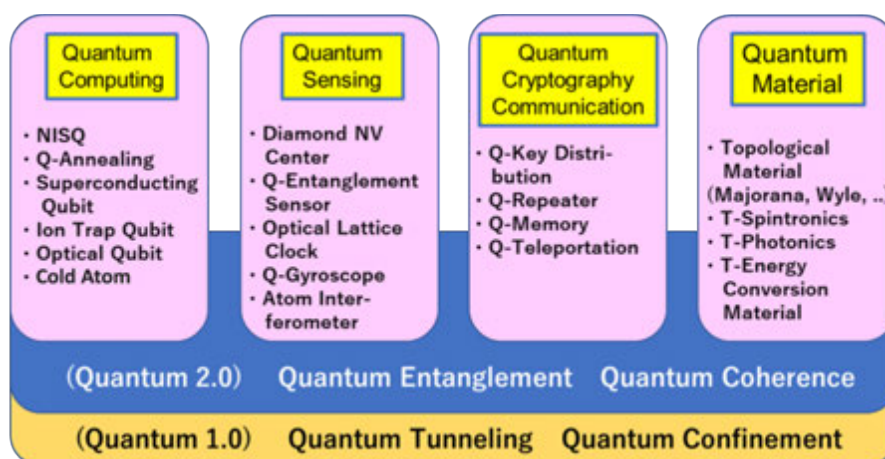
- Quantum cryptography and communications

In the short term, we should search for killer applications of quantum key distribution (QKD) devices, identify their application fields by early commercialization or trial use, and lower their price. In the medium-to-long term, it is necessary to promote the R&D of the satellite-based QKD, long-range QKD, and new-principle-based QKD technologies. Intensive standardization activities in international organizations are also required for the future.

- Quantum materials

We should make continuous effort to develop new quantum materials that are robust to environmental disturbance and produce attractive functions. Representative example are topological quantum materials, spintronic materials, energy-conversion materials, and photonic materials.

In order to promote R&D of quantum science and technology where diverse knowledge and technologies are needed to realize their practical applications, establishment of R&D core hubs is desirable, which can become internationally recognized and therefore be expected to serve as a place to attract excellent researchers from Japan and overseas.

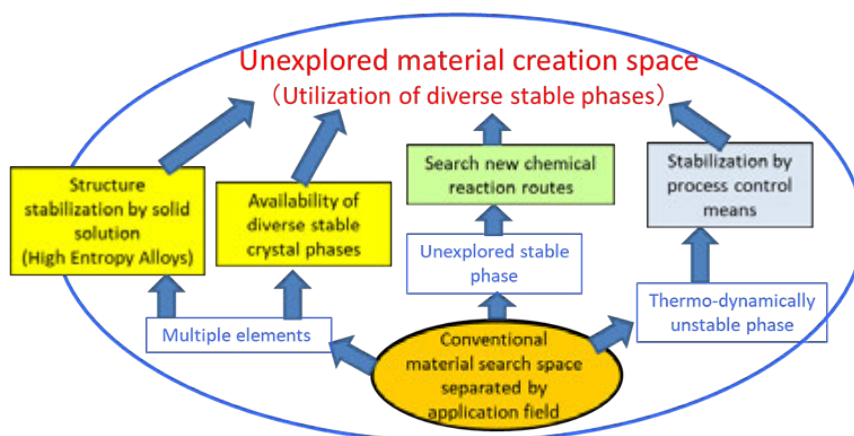


Quantum 2.0 Overview

(3) Future Materials Exploring Initiative

“Engineering for Diverse Crystal Stable Phase”

There is a growing demand and expectations for higher performance and advanced functionality of materials and devices to cope with diverse social requirements. These include the massive introduction of renewable energy and advanced energy management technology aimed at reducing CO₂, realizing Society 5.0 through comfortable and safe automobiles with autonomous driving and smart cities supported by IoT/AI, and lessening environment impacts associated with product manufacturing and at their use. In these applications, demands for higher performance materials with coexistence of multiple functions and compatibility of conflicting functions are becoming acute. In order to design and synthesize new materials to fulfil these complex requirements from the application side, expanding the material search space by increasing number of constituent elements, utilizing emerging diverse crystal stable phases including metastable ones with different properties, and realizing targeted crystal stable phase by process control means through controlling chemical reaction route dynamically are required. In the material design under such complex conditions, materials informatics will become a powerful tool, which have already revealed their effectiveness in various application. In the material process design, it is important to understand the chemical reaction process under various process conditions and their reaction route in the thermodynamic energy landscape. Even when there is a strong tendency for undesired stable phases to appear preferentially during the chemical reaction process, we need to explore reaction route for reaching the target stable phase and develop the appropriate process condition which avoids the route to reach the undesired stable phases. In these situations, process informatics will be needed with massive accumulated process data. In order to acquire the massive process data, process simulation from molecular scale to macro scale to make clear the chemical reaction route, high-throughput experiments using combinatorial chemistry and intelligent robots to conduct a large amount of process experiments efficiently, and operand measurements to monitor chemical reaction dynamically during the process are needed to be developed. (JST)



Expanding Material Search Space for Future Materials

A platform for open innovation

TIA is an open innovation hub operated by six public organizations: the National Institute of

Advanced Industrial Science and Technology (AIST), National Institute for Materials Science (NIMS), University of Tsukuba, High Energy Accelerator Research Organization (KEK), University of Tokyo, and Tohoku University as shown in Fig. 1. It is supported by these institutions and the Japan Business Federation. To drive innovation in Japan, these six stellar organizations of TIA collaborate and compile their resources for R&D (e.g., researchers, facilities, and intellectual property) and support the creation of knowledge and its application in industry. TIA also fosters next-generation scientists and engineers. TIA was first named the Tsukuba Innovation Arena for Nanotechnology (TIA-nano) in 2009, and then renamed to TIA in 2016. Since then, TIA has expanded its research focus from nanotechnology to biotechnology, healthcare, computer science, and the internet of things (IoT). In the same year, the TIA unique collaborative research program “Kakehashi” was commenced. Kakehashi plays a role in fostering the seeds of research with the potential to spark innovation through close cooperation among the core organizations and matching these seeds to needs, and then developing the latter into large-scale R&D projects or enabling commercialization. From 2020, TIA 3rd period started under the new vision “TIA to open up the future by expansion and deepening”.



Fig.1 Structure of TIA

Platform activities

■ Research and development platforms

TIA provides organizations and companies both inside and outside TIA with an environment for R&D at the TIA platforms. At the core of these platforms are the Super Cleanrooms (SCR), the MEMS foundry, and the power electronics production lines among others. TIA projects and consortiums are the major R&D activities, including Nanoelectronics, Power electronics, MEMS, Nano-GREEN, Carbon nanotubes, Light/quantum measurement, and Biotechnology and medical treatment.

■ Open research facilities

The six core organizations make their advanced research devices and facilities, including electron microscopes and synchrotron radiation facilities, available for shared use.

■ Human resource development

TIA fosters excellent researchers and engineers by offering intensive summer school sessions and degree programs, taking advantage of outstanding TIA researchers and facilities.

■ Kakehashi program to create technology seeds and innovation acceleration

TIA provides venues for gathering researchers with different affiliations or expertise and

accelerates innovation by conducting workshops, technical meetings, and other events, where technology seeds are created, fused, and matched with business needs. (NIMS)

TIA Symposium, 2019

2019 was the 10th anniversary of TIA, and the TIA symposium was held as the memorial symposium of 10th anniversary, on October 15th, 2019, at Iino Hall & Conference Center, Tokyo. The details have been already reported in the previous ANF NEWSLETTER, Issue:36 [1] (NIMS)

[1] https://www.asia-anf.org/wp-content/uploads/2020/04/ANF-NewsLetter_Winter_2019_V2%E2%BC%BF20191227.pdf

“Nanotechnology Platform Japan” program

“Nanotechnology Platform Japan” program [2] is based on a nation-wide alliance of selected universities and national institutes in Japan, and is providing public share-use of cutting edge equipment to strengthen the future development of nanotechnology. The "Nanotechnology Platform Japan (NTPJ)" is the project by the Minister of Education, Culture, Sports, Science and Technology (MEXT). The mission is to establish a reliable research infrastructure (Platform) for scientific innovation by the alliance of the institutes which have cutting edge equipment and research know-how. Through this program, it is promoted for any of researchers from young to industrial one to do the share-use of the equipment, and to provide the shortest way to solve the urgent problems in science and technology. Therefore, all of scientists are invited to participate in this project to share equipment beyond the barrier of scientific communities and research organizations. In this program, 37 groups from 25 institutes and universities are joined and establish one single structure for "Share-Use Cutting-Edge Facility for Nanotechnology", which will be supported by MEXT for 10 years from 2012. In this program, interactive researches and their integration are promoted through the coordination by the Platform Center which is located at National Institute of Materials Science (NIMS).

Since the present project period will end in two years, the framework of the new project period is being discussed in Japanese government. An important direction of the discussion is the combination of the user facility network with the materials data platform. It is aimed that the new data platform center should be established, and the novel, broad, high quality data should be produced by cutting edge equipment of the user facility network, and then stored and accumulated in the data platform center. Progress of the data driven materials development is strongly expected through the utilization of the high quality data, accumulated in the data platform center. (NIMS)

[2] <https://www.nanonet.go.jp/ntj/english/>

12th TIA Symposium was held on line, November 19th.

The symposium started with an opening address by the chair of TIA managing committee, Mr. Tetsuro Higashi, followed by greetings from Cabinet Office, Ministry of Economy, Trade and Industry, and Ministry of Education, Culture, Sports Science and Technology.



Then Dr. Kanemaru, the Vice President of AIST briefly introduced the activities and outcomes of TIA, and a new vision of TIA, third phase of activities.



Then there was a discussion between Prof. Yoshino, a winner of Nobel Chemistry Prize, 2019 and Mr. Higashi, the chair of TIA. The discussion was delivered in two parts. In the first part, they discussed on personnel and organization, based on the experience to utilize personnel to achieve innovation in an organization. In the second part, they discussed on the balance of fundamental research and application oriented research, and problems that hinder development of new technology and their solutions.

Next, video messages were delivered from Prof. Ohno, the president of Tohoku University and Prof. Iijima, the tenured professor of Meijo University, entitled “Findings from Professionals” to young audience.



Next, there were two achievement presentations from research fields of power electronics and quantum and optical measurements, followed by three presentations from TIA Collaborative Research Promotion Programs “Kakehashi”, 2020.

Finally, there held a panel discussion, entitled “Industry-Academia collaborations and expectations for TIA as an open innovation center.” Four panelists from, New Energy and Industrial Technology Development Organization, Japan Science and Technology Agency, NEC Corporation, and Tohoku University gave a hot discussion on the topic. They also discussed problems that hinder good circulation of personnel, infrastructure, and funds, necessary to accelerate the development of new technology.



About 350 audience joined the online symposium.

Major Activities and R&D Highlights

KOREA

NANO KOREA 2020

NANO KOREA, the largest international event in the field of nanotechnology in Korea was held in July 2020 with the slogans 'NANO! A Quantum Leap Innovator for Human'.

Name of event	NANO KOREA 2020 - The 18 th International Nanotech Symposium & Exhibition
Slogan	NANO! A Quantum Leap Innovator for Human
Date	July 1 st (Wed) ~ 3 rd (Fri), 2020
Venue	Goyang KINTEX Exhibition Centre I, South Korea & Online
Registered participants	944
Presentations	657 presentations (including 109 invited lectures) from 12 nations



Due to 'COVID-19' pandemic situation, NANO KOREA 2020 Symposium was held in a new format combining online symposium with offline one. The opening day programs consisting of opening ceremony, invited lectures (pre-recorded video lectures) and special sessions, were administered as offline in accordance with Korean government's guidelines of preventing epidemics. All the rest symposium programs were operated as online, including technical

sessions, poster sessions, and public sessions.



Technical sessions were organized to cover the important issues in nanoscience and nanotechnology and to comprise 6 different technical divisions with 2 to 3 sessions of specific topics for each division. As in recent years, public sessions were also introduced in the program for the increased exposure of nanotechnology to the teenagers and to offer short hands-on experience on nanotechnology experiments. Especially this year, public sessions were operated virtually and all the lectures of the sessions were on display in the NANO KOREA 2020 Symposium website during the symposium for open access to anyone who visited the website.

NANO KOREA will continue to serve as a leading national platform for disseminating and exchanging the latest research achievements and promoting the industrialization of nanotech-based products. The organizing committee plans to make the event more appealing with increased nano-convergence industrial contents, as the nano-based technology finds growing applications in the 4th Industrial Revolution.

BM : COVID-19 related Special Session

NANO KOREA 2020 hosted 'COVID-19' Special Session to handle the issues of the pandemic disease in regard to nanoscience and nanotechnology. During the session, 5 invited lectures were responded with active participation of the audience to review and discuss how nanotechnology is actually being applied to overcome covid-19 and how it will be potentially valuable to prevent and overcome similar epidemic diseases in the future.

Name of event	BM : COVID-19 related Special Session
Date	July 1 st (Wed), 2020
Venue	Goyang KINTEX Centre I, South Korea
The number of participants	48
Presentation	5 invited lectures - Dr. Seok Jae Lee, National Nanofab Center <i>"Nano-Bio chip platforms of NNFC for diagnosis of infectious diseases using modular chip and dPCR technologies"</i> - Prof. Sungsu Park, Sungkyunkwan Univ. <i>"Towards automation of microfluidic system enabling preconcentration of pathogen and extraction of their genomic materials in clinical samples"</i> - Prof. Jungho Hwang, Yonsei Univ. <i>"Real-time bio-aerosol collection, enrichment and detection via enhanced electrostatic aerosol-to-hydrosol sampling technique"</i>

	<ul style="list-style-type: none"> - CEO Do Young Lee, OPTOLANE Technologies Inc. <i>"Global Health Surveillance Systems for the public healthcare security during the pandemic COVID-19"</i> - Prof. Junhong Min, Chung-Ang Univ. <i>"Sample preparation automation for In situ nucleic acid-based detection of the pathogen from the enlarged surface"</i>
	

Major Activities and R&D Highlights

■ MALAYSIA

National Nanotechnology Centre (NNC), a division under the Ministry of Science, Technology and Innovation (MOSTI), previously known as MESTECC, are responsible for the coordination of research, development and all related activities of nanotechnology such as awareness programme in Malaysia. NNC has participated / conducted a few prominent programmes in 2020 such as:

The National Survey on National Nanotechnology Capabilities (January- June 2020)

NNC has conducted The National Survey on National Nanotechnology Capabilities from the month of January 2020 to June 2020 to identify the capabilities and capacity of existing nanotechnology laboratories at all institutions, agencies and universities in Malaysia. The survey methodology are conducted through face-face briefing and interview and through virtual meeting via SKYPE during the COVID 19 movement control order. This capability will be measured from four aspects namely Institutional Expertise, Technical Capability, Human Resource, Finance and R&D Achievement. In addition, the survey also seeks information and to promote co-sharing and access to critical equipment, facilities and expertise for rapid prototype development as well as to research and identify new technology development to a higher degree of Technology Readiness (TRL). The survey was also conducted by NNC to update on the national nanotechnology capability from 2015 to 2020. Surveys in the year 2020 were conducted in The University of Nottingham Malaysia Campus, Semenyih, University of Islamic Science Malaysia (USIM), International Islamic University Malaysia (IIUM), University of Malaysia Sabah (UMS), Malaysia Nuclear Agency (ANM), Institute of Micro-engineering and Nano-electronic (IMEN), National University Malaysia (UKM), University of Malaysia Sarawak (UNIMAS), Malacca Technical University of Malaysia (UTeM) and Sultan Idris Educational University (UPSI).

Results from the survey will be analysed and NNC will propose a National Nanotechnology Laboratory Network.



Malaysia Technology Expo (MTE) 2020 @ World Trade Center (WTC) Kuala Lumpur (20th to 22nd February 2020)

NNC MESTECC had participated in the 19th Malaysia Technology Expo 2020 on the 20th to 22nd February 2020 held at World Trade Centre (WTC), Kuala Lumpur organized by the

Malaysia Association of Research Scientist and Pro Temps Event. NNC conducted public survey and feedback on the National Nanotechnology Inter-laboratory Network Initiative and National Roadmap on Nano Product and Technology 2020. NNC also promotes nanotechnology awareness program such as the Nanotechnology Essay Writing (PENT) Competition and Adiwira Nano (Nano Superheroes Short Video) Competition. NNC also co-supported the Nanotechnology Symposium 2020 Seminar where MESTEC's Deputy Secretary General (Science), Dr Mohd Nor Azman Hassan officiated the event and delivered the keynote talk.



Workshop On The Development Of National Nanotechnology Roadmaps And Analysis Of Survey On The National Nanotechnology Interlaboratory Network (25th February 2020)

NNC organized the workshop on the Development of National Nanotechnology Roadmap and Analysis of Survey Findings on the National Nanotechnology Inter-laboratory Network on the 25th February 2020 at Ministry of Science, Technology and Innovation Hall. The workshops was attended by various stakeholders from the other Ministries, Institute of Higher Learnings, Research Institutes, Government Link Companies and Nanotechnology Industries. The workshop was officiated by NNC Director, Associate Professor Dr Ruslinda A Rahim and the sessions was moderated by Mr. Kamarulzaman Kamaruddin and Mr. Ismarul Nizam Ismail.





Malaysia-Japan International Conference (MJIC) on Nanoscience, Nanotechnology and Nanoengineering 2020 (29th February 2020)

The Director of National Nanotechnology Centre (NNC), MESTECC, Associate Professor Dr Ruslinda A Rahim was invited to deliver the keynote talk during MJIC 2020 in Mara University of Technology (UiTM), Shah Alam Malaysia on the 29th February 2020. She delivered the talk on “Nanotechnology Enabled Innovation; Technology Development and Commercialization Challenges in Malaysia”.



Workshop on Refinement of Nanotechnology Action Plan and Roadmap of Nano Product / Technology 2020 (6th & 13th March 2020)

2 series of workshops were conducted on 6th and 13th March 2020 at National Institute of Biotechnology Malaysia (NIBM) and were attended by senior officers and staff of the Application and Strategic Technology Division (TSA), National Nanotechnology Centre (NNC) and NanoMalaysia Berhad (NMB). Brainstorming and mind mapping sessions was moderated by Mr Kamarulzaman Kamaruddin for the development of National Nanotechnology Action Plan and Roadmap of Nano Product & Technology in preparation for the 12th Malaysian Development Plan 2021-2025.



ISO/TC 229 Interim Meeting (13-22 May 2020)

NNC participated in the series of virtual meetings via Zoom, 13-22 May 2020. Malaysia presented a Preliminary Work Item (ISO/PWI 4963) titled 'Radiotelemetry-spectral-echocardiography Based Real-time Surveillance Protocol for In Vivo Toxicity Detection and Monitoring of Engineered Nanomaterials' and welcomed participation of Experts in this project. A draft Technical Report will be presented during the ISO/TC229 Plenary Meeting later this year.

Development Project on Benchmarking Study for the Safety Risk of Nano-Based Products (23rd June 2020)

NNC's Standard and Regulatory Section held a kick-off project meeting at SIRIM Berhad, Shah Alam on 23rd June 2020. SIRIM Berhad has been appointed to carry out a study titled 'Risk Assessment Benchmarking of Nano-based Products'. This 36-month national study hopes to establish a local nano-based product inventory with safety and the life cycle assessment data. Project is expected to end on 30th June 2023.



National Nanotechnology Centre Workshop (July – August 2020)

NNC MOSTI organised the 3 series of National Nanotechnology Centre Workshop on National Nanotechnology Policy and Strategy 2021-2030 on the 8th to 9th July 2020, 21st to 22nd July 2020 and 18th to 19th August 2020 at Concorde Hotel, Shah Alam, Selangor. This workshops was officiated Deputy Secretary General (Technology) MOSTI, Dr Mohd Nor Azman Bin Hassan. This engagement session discussed the matters related to the direction and action plan of the country's nano technology policy involving representatives of various organizations from other ministries, research institutions, public and private universities and nanotechnology related industries. Proper standard operating procedures was implemented by Concorde Hotel to keep the participants safe from the spread of COVID-19 pandemic.





Nanotechnology Awareness Programme (January- December 2020)

Earlier this year, NNC manage to visit 5 rural schools in Sarawak and 3 schools in Pahang. The total number of students who joined the programme was 2,170 students.



NanoQuiz

When the Coronavirus Disease was announced pandemic and Malaysia underwent Movement Control Order (MCO), programmes were on halt and NNC have changed the method to conducting awareness activities through online platform such as media social. NNC have been conducting Nano Quiz since 22nd June 2020 until December 2020. The quiz is running every week and it is open for primary students and secondary students.



Major Activities and R&D Highlights

PHILIPPINES

The Industrial Technology Development Institute – Department of Science and Technology Spearheads the Philippines’ Development of National Standards on Nanotechnology

The DOST-Industrial Technology Development Institute (DOST-ITDI), is at the forefront of developing the country’s standards for nanotechnologies. DOST-ITDI, together with the Department of Trade and Industry’s Bureau of Philippine Standards (DTI-BPS), already endorsed 25 Philippine National Standards (PNS) as of July 2020 through the BPS Technical Committee (TC) 85 on Nanotechnologies (Fig. 1).



Fig. 1. Technical committee meetings on Nanotechnologies, Bureau of Philippine Standard/TC-85 on Nanotechnologies (January 20, February 17, and June 1, 2020, virtual meeting) for the establishment of the EHS guiding principles and regulations.

As the influx of nanotechnology-related products in the country continue to increase especially in medicine, materials and manufacturing, consumer products, and household domains, the lack of information on the possible adverse health effects caused by exposure to these nanomaterials remains a major concern. The development of safety guidelines for various nanotechnology industries including manufacturing, monitoring of worker exposure, the ambient release of nanoparticles, and risk evaluations must, therefore, be ensured.

To answer this need, the BPS Technical Committee (TC) 85 on Nanotechnologies was created in October 2018 to develop the Philippine National Standards on Nanotechnology, through the DOST GIA-funded project on “Environmental, Health and Safety Research in the Risk Assessment of Nanomaterials”. The committee is chaired by Dr. Blessie A. Basilia, the Chief of ITDI’s Materials Science Division, and vice-chaired by Dr. Milagros Peralta of the University of the Philippines-Los Baños. The Technical Committee is composed of subcommittees, which are mirrored to ISO/TC 229 Working Groups such as measurement and characterization, health, safety, and environmental aspects of nanotechnologies, and materials specifications. As a participating member (P-member) of ISO/TC 229 Nanotechnologies, the Philippines has the opportunity of creating world-class standards through participation in

various activities of the international organization.

Various stakeholders from the academe, government, consumer, testing institutions, research institutions, and industries, meet every month at the Advanced Device and Materials Testing Laboratory (ADMATEL) in DOST to continuously work on the different standards on Nanotechnology. The committee's efforts on the responsible use of nanotechnology will help not only the government's regulatory bodies but also the local nanotechnology industries and various stakeholders to maximize nanotechnology's potentials while practicing the necessary safety protocols in delivering globally-competitive products and services.

The Philippines' Develop Nanocomposites for 3D Printing Applications

The novel characteristics of nanomaterials have made their way into the world of 3D Printing. Headed by Dr. Blessie A. Basilia, a group of researchers from the Development of Multiple Materials Platform for Additive Manufacturing Project (MATDEV) of the Department of Science and Technology's Industrial Technology Development Institute (DOST-ITDI) develops various nanocomposite filaments for Fused Deposition Modelling (FDM) (Fig.2).

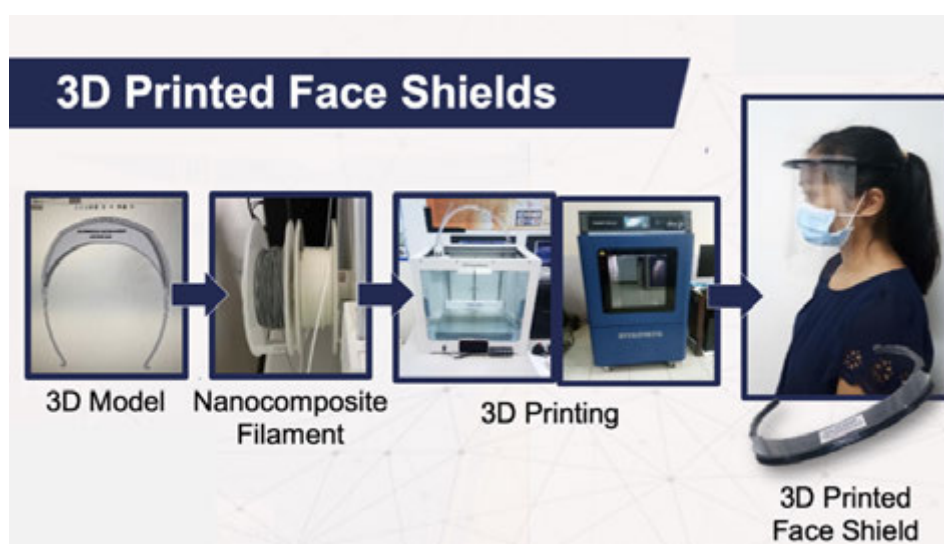


Fig. 2. Nanocomposite filaments used in 3D Printing Face Shields and other PPEs for the Covid19 Frontliners.

Nanomaterials such as the Nano Precipitated Calcium Carbonate (NPCC), Halloysite Nano Tubes (HNT), Carbon Nano Tubes (CNT), Nano Alumina, and Nanoclay were being studied as an additive to polymer matrices such as Polylactic Acid (PLA), Acrylonitrile Butadiene Styrene (ABS), Polypropylene (PP), and High-Density Polyethylene (HDPE) for FDM filament production. Through the addition of nanomaterials, promising results on the improvement of the properties of the polymer matrices were obtained.

As the institute strives to produce locally developed products, the country emerges towards global competitiveness and excellence in the field of Additive Manufacturing and Nanotechnology. DOST recently established the Advanced Manufacturing Center (AMCen), a national facility equipped with advanced laboratory and prototyping 3D printers for various

applications. The center aims to make an impact on the (i) fundamental understanding of Additive Manufacturing (AM) technologies, (ii) utilization of indigenous and non-proprietary materials development for use in 3D Additive Manufacturing systems and (iii) new process and applications for 3D AM technologies to complement or replace conventional manufacturing processes.

ITDI Conducted the Philippines' first Local Nanomaterials Interlaboratory Comparison

ITDI spearheaded the Local Interlaboratory Comparison on Nanomaterial Size Measurement. Standard Polystyrene samples were sent to various laboratories in the Philippines, which includes the academe, industry, private testing laboratories, and government research agencies (Fig. 3). Fourteen (14) participant laboratories analyzed 2 nano polystyrene reference samples using Dynamic Light Scattering (DLS), Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM) and Transmission Electron Microscopy (TEM). Training and workshop on MU Computation were provided to the personnel of participating laboratories. Results of the interlaboratory comparison were tabulated and interim reports were sent to the participant laboratories.



Fig. 3. Specimens and protocol manuals were given to the participating laboratories in the 1st Interlaboratory Comparison on Nanomaterials in the Philippines.

A webinar on the “Essential Components of Proficiency Testing or Interlaboratory Comparison” (ISO 17043 and ISO 13528), organized by the Industrial Technology Development Institute,

DOST was conducted on August 7, 2020. The objective of this webinar was to fully understand the requirements of Proficiency Testing or Interlaboratory Comparison and how data are used as a quality tool for the competence of the laboratory and for continual improvement. A total of ninety (90) participants registered in the webinar at this time of the new normal from various parts of the country.

The Industrial Technology Development Institute- Department of Science and Technology Spearheads the Philippines' Development of National Standards on Nanotechnologies

The DOST- Industrial Technology Development Institute, is at the forefront of developing the country's standards for nanotechnologies. DOST-ITDI, together with the Department of Trade and Industry's Bureau of Philippine Standards (DTI-BPS), spearheaded the establishment of the National policy/standards on Nanotechnologies by conducting monthly technical committee meetings on Nanotechnologies. As of December 2020, TC-85 on Nanotechnologies have reviewed, endorsed ISO standards, published and adapted forty (40) Philippine National Standards on Nanotechnologies.

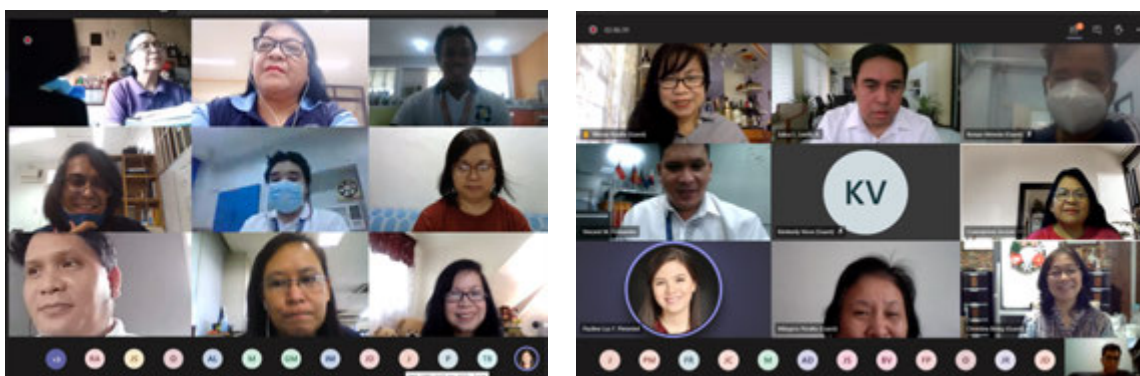


Figure 1. Screenshot of Technical Committee Meetings on Nanotechnologies (TC-85)

During the COVID 19 pandemic, the BPS Technical Committee (TC-85) on Nanotechnologies continuously work on the different standards on Nanotechnology and was able to publish a total of 21 Philippine National Standards(PNS) of which 6 PNS from subcommittee 1 (SC-1) on Measurement and Characterization, nine (9) PNS from subcommittee 2 (SC-2) on Health, Safety and Environmental Aspects of Nanotechnologies and six (6) PNS from subcommittee 3 (SC-3) on Materials Specifications.

Publication of Six (6) Manuals as Reference Materials developed by the Nanosafety Team of the Industrial Technology Development Institute (ITDI).

A series of manuals have been developed by the Department of Science and Technology (DOST) - Industrial Technology Development Institute (ITDI) to be available to the public at the National Library of the Philippines. The publication of these manuals as reference materials is one of the outputs of the project "Environmental, Health, and Safety Research on the Risk

Assessment of Nanomaterials in the Philippines”, sponsored by DOST-Grants-In-Aid. The series consists of six (6) manuals that are based on existing international standards, protocols, and guidelines as follows:



Figure 2. Six (6) Manuals developed by the Industrial Technology Development Institute (ITDI)

Inauguration of the Materials Development (MATDEV) Laboratory - Philippines' First 3D Printing Laboratory utilizing Nanocomposite Filaments

The Materials Development (MATDEV) laboratory was inaugurated last December 22, 2020. It consists of FDM laboratory, Post-processing laboratory, Chemistry laboratory, Materials Characterization laboratory, 3D Printing R & D Laboratories, and Spheroidizing Laboratory. MATDEV is ready to provide services to various stakeholders from the industry, academe, and government sectors. MATDEV's commitment to delivering innovative solutions to support manufacturing industries by the fusion of nanotechnology and additive manufacturing using our developed nanomaterials to produce filaments. The local materials developed were cheaper and had an improved property and performance as compared to the imported material. MATDEV will create different possibilities such as replacements of human parts, infrastructures that are custom-made, and others. The facility will greatly contribute to the progress of the country and to be the nation's leading R&D center for 3D printing.



Figure 3. Inauguration of the MATDEV Laboratory and ribbon cutting led by Dr. Annabelle V. Briones (ITDI Director), Dr. Blessie A. Basilia, Dr. Zorayda Ang, Engr. Reynaldo Esguerra and Fr. Reynaldo Reyes.



Figure 4. The unveiling of the MATDEV marker with DOST Undersecretary for R & D, Dr. Rowena Cristina L. Guevara and Program Leader, Dr. Blessie A. Basilia.

First Interlaboratory Comparison on Nanomaterial Size Measurement Highlights Competence of Philippine Nanotechnology

Commercially available nanosphere standards of polystyrene with NIST traceable mean

diameters were used as interlaboratory comparison samples for the first local interlaboratory comparison for nanomaterial size measurement in the Philippines. The local interlaboratory comparison was organized in accordance with ISO/IEC 17043:2010. This comparison was participated by various testing and research laboratories in the Philippine archipelago, from the academe, government, and private companies, which have the capabilities for dimensional analysis at the nanoscale. The instruments used by the participating laboratories were Atomic Force Microscope (AFM), Dynamic Light Scattering (DLS), Scanning Electron Microscope (SEM), and Transmission Electron Microscope (TEM). Two polystyrene samples were tested by the participating laboratories, with different nanomaterial size ranges, one at 7-54 nm, and the other at 32-95 nm. The reference values and standard deviations declared in the Certificate of Calibration and Traceability of the Nanosphere Size Standards were used to compute the z-scores of the participating laboratories. The results of the local interlaboratory comparison show both the competence of some laboratories in the Philippines in dimensional measurements at the nanoscale and at the same time the needed improvement in the methodologies used by the other laboratories. A post-interlaboratory comparison meeting was conducted using the virtual platform on October 27, 2020, wherein the results of the interlaboratory comparison were presented. The participant laboratories were made aware of their z-scores (performance) and they were also trained on the proper conduct of root cause analysis and corrective action so that those laboratories with unsatisfactory results are guided on what improvements are to be done to their methodologies and laboratory quality management system.

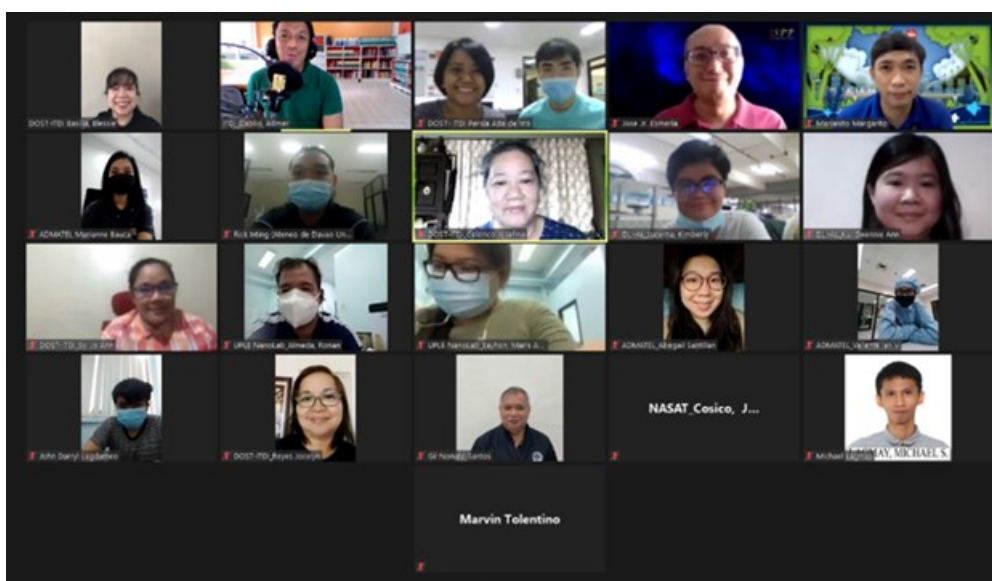


Figure 5. Screenshot of Participants during the Post Interlaboratory Comparison Meeting

Philippines' Young Scientist, Engr. Mar Christian Que of the Industrial Technology Development Institute (ITDI) presented in the 4th EU-Asia Dialogue on Nanosafety

The 4th EU-Asia Dialogue on Nanosafety, from Discussions to Implementation, was virtually held on the 7th of October 2020. This workshop was focused on more synergy between Asian and European countries with respect to safe nanomaterials including standardization and test

guideline development. Engr. Mar Christian Que of the Materials Science Division of the Industrial Technology Development Institute (MSD-ITDI) presented “An Evaluation of Acute Toxicity and Aquatic Toxicity of Titanium Dioxide Nanoparticles”.

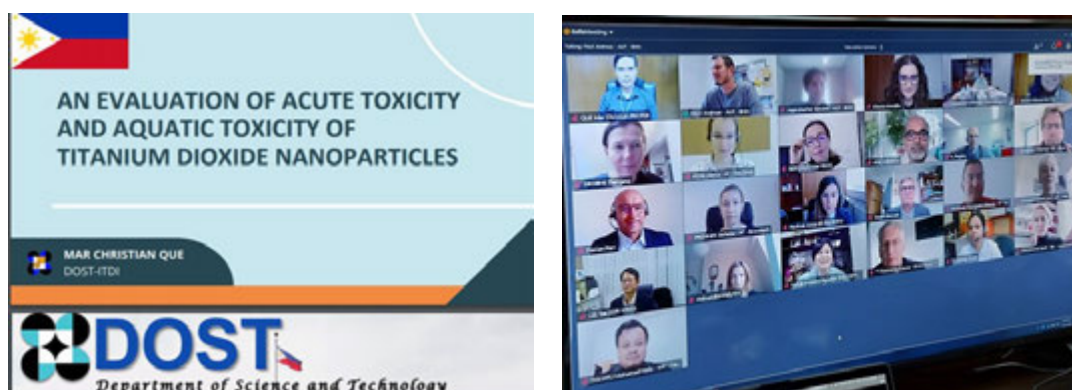


Figure 6. Screenshot of Participants during the 4th EU-Asia Dialogue on Nanosafety

Series of WEBINARS on the Philippines' Nanotechnology Initiatives were conducted during the Covid-19 Pandemic

1. Mini-Colloquium on Biological and Biomedical Technologies and Materials

Mapúa University, together with the Chung Yuan Christian University of Taiwan had their Mini-Colloquium on Biological and Biomedical Technologies and Materials last January 13, 2021. Dr. Blessie Basilia under the “Environmental, Health and Safety Research in the Risk Assessment of Nanomaterials presented a paper entitled “ An Evaluation of Acute Toxicity and Aquatic Toxicity of Nanoclay”.



Figure 7. Speakers for the Mini-Colloquium on Biological and Biomedical Technologies and Materials

2. 15th Chemical Engineering Week of the Philippine Institute of Chemical Engineers (PIChE)

The Philippine Institute of Chemical Engineers, Inc. (PIChE), the national organization of chemical engineers founded in 1939, duly accredited and recognized by the Board of Chemical Engineering and the Professional Regulation Commission (PRC) lead in the nationwide observance of Chemical Engineering Week. This year, PIChE celebrated the 15th Chemical Engineering Week on September 13 – 19, 2020 with the theme “Chemical Engineers at the Forefront of Disaster Resilience and Economic Recovery.” ITDI, through

Dr. Blessie A. Basilia, presented the research work entitled “Risk Assessment of Using Nanomaterials to Human Health”.

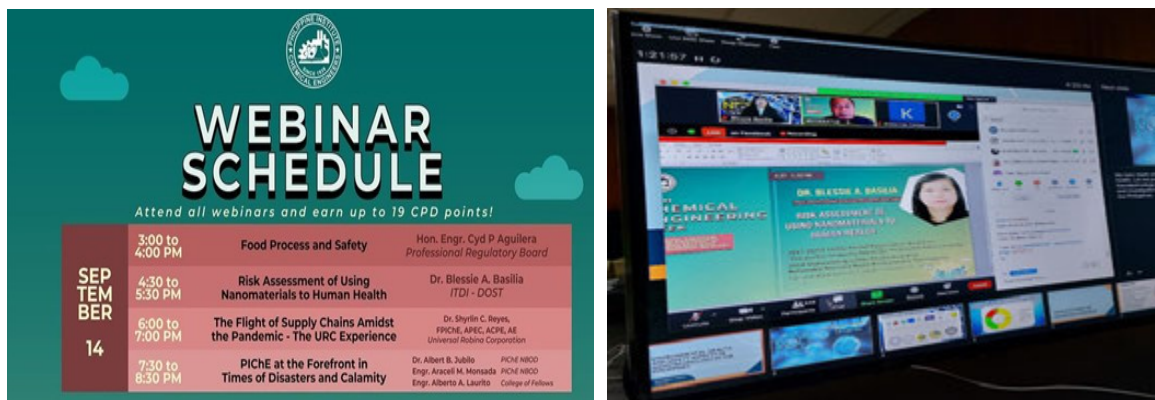


Figure 8. Screenshot Presentation of Dr. Blessie A. Basilia for the 15th Chemical Engineering Week

3. Training on the Latest Characterization Techniques of Nanomaterials at the CARAGA State University
Scientists and professors around the globe virtually gathered on a historic training on September 16, 2020, on the latest characterization techniques on nanomaterials which were spearheaded by Dr. Rey Y. Capangpangan of Caraga State University's (CSU's) NanoCeNTRE.

ITDI, represented by Dr. Blessie A. Basilia, discussed the **“Characterization of Manufactured Nanomaterials in the Philippines”** while Dr. Drexel A. Camacho of the Chemistry Department of De La Salle University made a thorough discussion on the **“Visualizing the Nano World”**.



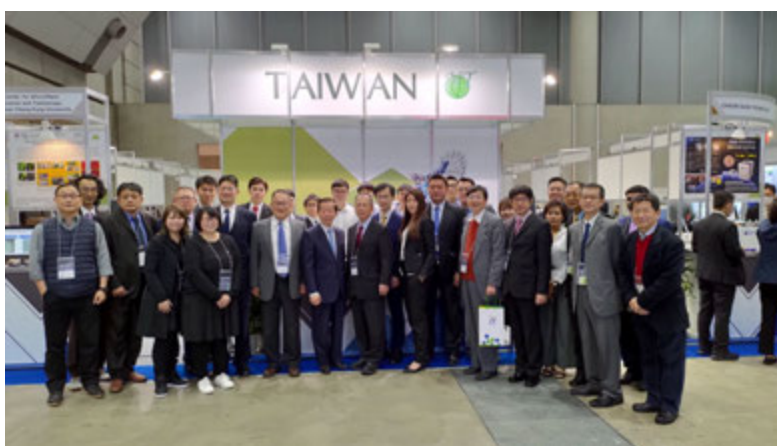
Figure 9. Screenshot Presentation of Dr. Blessie A. Basilia for the Training on the Latest Characterization Techniques of Nanomaterials

Major Activities and R&D Highlights

TAIWAN

Taiwan in nano tech 2020, Japan

“nano tech 2020 – the 19th International Nanotechnology Exhibition & Conference” was held on 29-31 January in Tokyo. Taiwan Pavilion has been participating in this event for 16 consecutive years. A total of 28 new novel nano-materials, devices and techniques focusing on “*Medicine*”, “*Energy*”, “*Electronics/Optoelectronics*”, “*Materials*” and “*Characterization/Fabrication*” from 22 Taiwan’s institutions/companies were selected to demonstrate Taiwan’s latest nanotechnology status and offer visitors a better understanding of market opportunity in furthering business networking with Taiwan. In conjunction with nano tech 2020, representatives from ANF, Canada (Nano Canada), Germany (Fraunhofer), Japan (Cabinet Office, JST, AIST, and NBCI), the Netherlands (NanoNexNL), Taiwan (TANIDA), and USA (NNI) also gathered at the “12th Nanotechnology Association Conference” hosted by NBCI (Nanotechnology Business Creation Initiative) to exchange each other’s current practices and experiences.



Taiwan participated in ISO/TC229 – Interim Meeting



The 2020 ISO/TC229 Nanotechnologies Interim Meeting was held on 20 May virtually (originally in Washington DC, USA) during COVID-19. Dr. Tsing-Tang Song from Taiwan has participated in this online event on behalf of

Asia Nano Forum (ANF), the Liaison member of ISO/TC229. As a follow-up to the agreement at the Hangzhou meeting last November in China, the Preliminary Working Item Proposal (registered as PWI 4971) “Nanotechnologies- Performance Evaluation of Nanosuspension Containing Clay Nanoplates for Quorum Quenching” at WG5 (Products and Applications) proposed by Dr. Tsing-Tang Song was tabled for discussion. The WG5 committee recommended that this document review should take 4 weeks in circulation for comments from WG5 experts and for commitment of participation. Then the document will be submitted to apply for a NWIP (New Work Item Proposal) for ballot at the coming online meeting in November (originally in London, UK).

Taiwan participated in ISO/TC229 – Plenary Meeting



The 2020 ISO/TC229 Nanotechnologies Plenary Meeting was held on 13 November virtually during COVID-19 (originally in London, UK). Dr. Tsing-Tang Song, on behalf of Asia Nano Forum (ANF), has presented a Preliminary Working Item Proposal (registered as PWI 4971) at WG5 (Products and Applications). ISO/TC229 agreed that this PWI 4971 “*Nanotechnologies - Performance Evaluation of Nanosuspension Containing Clay Nanoplates for Quorum Quenching*” should proceed to New Work Item Proposal (NWIP) ballot stage, and invited Liaison member ANF to submit the proposal by the end of December 2020, with Dr. Song proposed as Project Leader. This NWIP proposal has also been issued via the ISO/TC229 electronic balloting procedure. The voting will be closed on 5 April 2021.

Mutual Recognition between Taiwan’s nanoMark and Malaysia’s NANOVerify

As pioneer countries in promoting voluntary nano-enabled product certification systems in the world, Taiwan and Malaysia have built the documentary SOP and collaborated a new scheme for mutual recognition between Taiwan’s nanoMark and Malaysia’s NANOVerify since the pilot program of mutual application in 2018. Taiwan’s ITRI and Malaysia’s MIMOS 1-TEM laboratories were accepted and qualified for the testing laboratories for mutual TEM testing lab. Both mark systems are also open for foreign company application. JM Material Technology Inc (京程科技) with “*TiO₂/Ag Nanocomposite Aqueous Solution Coating*” from Taiwan is the first company to be authorized this April to be able to use the NANOVerified Mark through the mutual recognition.



TANIDA held The Role of Nanotechnology in the Post-Pandemic Era Workshop

Facing post-pandemic era, how COVID-19 has affected such as health care, psycho-social, economic and educational, among others? What is the role of nanotechnology? The workshop organized by Taiwan Nanotechnology Industry Development Association (TANIDA) was held on 10 December 2020 at National Taiwan University in Taipei. Speakers including President Kung-Yee Liang (梁賡義) of National Health Research Institutes, Dr. Gary Wang (王崇智), CEO at Taiwan



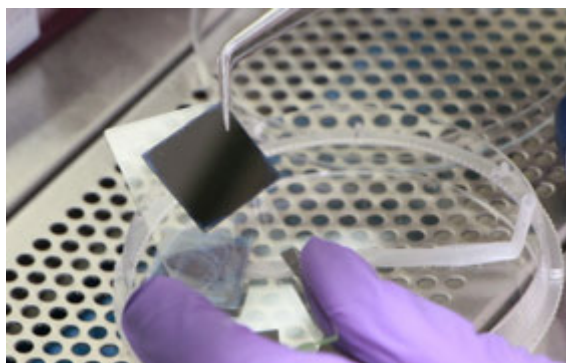
Accelerator Plus, Prof. Jiang-Jen Lin (林江珍), Honorary Professor at National Taiwan University, and Dr. Yin-Liang Tang (湯尹良) from Eternal Materials Co., Ltd, are invited to give presentations about the impacts on public health and responses, trend of entrepreneurship, applications of nanomaterials, and industrial progress with the rapid test reagent. There were about 80 domestic participants from academia and industry in this workshop. TANIDA was founded in 2004 and aims to facilitate the integration of R&D efforts at universities, research institutions and industry to accelerate the commercialization of nanotechnology and to meet industries' needs of developing high valued-added products and technology. Dr. Ting-Kuo Lee, current President of ANF, was elected the Chairman at the 2018 TANIDA Plenary Meeting in October 2018. In early 2017 Taiwan's nanoMark established in 2003, also the world's first nano-product certification system, was transferred to TANIDA for the professional and independent functionality after 14-year operation under the auspices of the government.

Nanoscale trap-based capture technology could be used to screen patients for COVID-19

Professor Jiunn-Der Liao's Virus Rapid Screening Test Selected for Ministry of Science Technology's Epidemic Prevention Technology Development Program (This article is reprinted from News Center of NCKU)

COVID-19 (SARS-CoV-2) has spread across the entire globe, and many countries are actively working to develop rapid screening techniques. Taking a material science and engineering approach, Professor Jiunn-Der Liao from the Department of Materials Science and Engineering at National Cheng Kung University (NCKU) and his team are developing nanoscale trap-based capture technology to catch antigen particles even if there is just one particle present. The test would relieve the need for repetitive nucleic acid or other serologic testing, and be able to detect the presence of the target virus simply by analyzing the chemical composition of the viral envelope. Coupled target virus with hot-spot test cluster has also been developed by Prof. Liao's team, the viral signals can be further identified to enable detection within a minute. This screening technology was selected to be part of the Ministry of Science and Technology's (MoST) development project for epidemic prevention technologies, and will be applied towards

developing COVID-19 test pieces. The technology is expected to contribute to ongoing efforts in epidemic prevention.

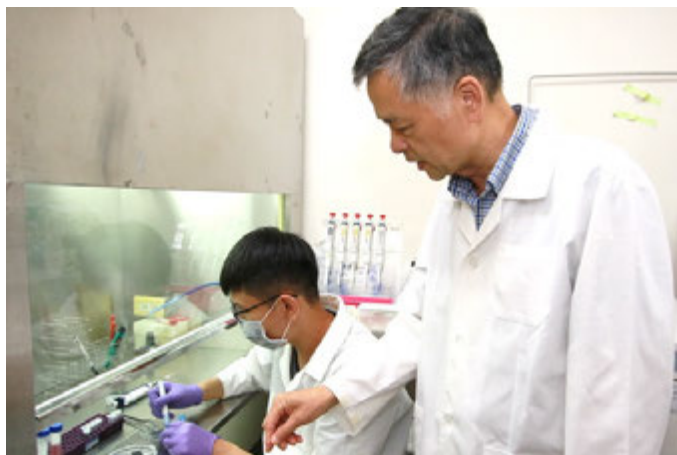


NCKU Professor
Jiunn-Der Liao's
Virus Rapid
Screening Test

Within then six months, Prof. Liao's team is aiming to finish building a mapping database for COVID-19 and as well as a prototype for a mobile testing facility that can offer on-site testing support anywhere. The team has already begun planning their collaborative efforts with the NCKU College of Medicine and the NCKU Hospital.

A viral particle is microscopic and is only around 100 nanometers in size. Between 2009 and 2012, Prof. Liao thought of the concept of “fighting (by finding) nano with nano” and applied it in his research to create nanoscale traps to capture viral particles. He developed a test piece with multiple nanoscale funnel-shaped cavities which could trap viral particles. The technique could detect a viral presence even if there is only one particle. To identify the virus species or strain, you would need only to analyze the chemical composition of the viral envelope. Moreover, the test could tell whether the virus was live, attenuated, dead, or even mutated. This test piece has experimented for seven types of viruses, including H1N1, SARS and influenza among other types of viruses. The technology was patented in 2012 and 2020, respectively.

The team has also considered the possibility of the viral particle missing its chance to be captured and landing outside of the nanocavity. In 2019, Prof. Liao led his students in developing an entirely new viral hot-spot test cluster that produce the effect of collective amplification. By applying lasers onto the test cluster, the strength and scope of the spectrometer would increase if any particle of the targeted virus is detected on the test cluster. By simultaneously using nanocavity and hot-spot test cluster, detection and confirmation can be achieved within one minute.



Professor Jiunn-Der Liao and his team are developing nanoscale trap-based capture technology to catch antigen particles even if there is just one particle present.

Current virus detection practices utilize multiple nucleic acid testing. The virus' ribonucleic acid can be read by leveraging nucleic acid sequencing and particle detection technologies. The entire process takes at least four hours, and the costly equipment used cannot be easily transported or moved. Within the next six months, Prof. Liao's team aims to build a Raman spectroscopy database for mapping COVID-19. The envelope of viral particles caught by nanoscale trap test pieces and hot-spot test cluster will be immediately experimented and compared against data in the database to achieve COVID-19 rapid screening and detection under one minute.

The COVID-19 pandemic has spread all around the world. Prof. Liao has expressed that installing testing facilities at airports and ports or moving mobile testing facilities closer to these areas will enhance surveillance efforts against the virus. Within the next six months, the team endeavors to build the prototype of the mobile emergency testing facility. The team hopes to receive further support in their efforts so that they can translate the fruits of their research and their concept of a mobile facility into reality.

Smart Q station improves the COVID-19 quarantine workflow

As COVID-19 became a pandemic, quarantine stations outside of emergency departments (EDs) at hospitals became necessary. It is a priority to simplify the workflow and decision-making process for physicians. We aim to demonstrate how the National Cheng Kung University Hospital artificial intelligence (AI) trilogy of diversion to a smart quarantine station, AI-assisted image interpretation, and a built-in clinical decision-making algorithm improves medical care and reduces quarantine processing times. This "AI trilogy" was applied to shorten the quarantine survey process and reduce processing time during the COVID-19 pandemic. The use of the AI trilogy facilitated the processing of suspected cases of COVID-19 with or without symptoms; also, travel, occupation, contact, and clustering histories were obtained with a tablet computer device. A separate AI-mode function that could quickly recognize pulmonary infiltrates on chest x-rays was merged into the smart clinical assisting system (SCAS), and this model was subsequently trained with COVID-19 pneumonia cases from the GitHub open source dataset. The SCAS algorithm was continuously adjusted based on updates to the Taiwan Centers for Disease Control public

safety guidelines for faster clinical decision making. Our ex vivo study demonstrated the efficiency of disinfecting the tablet computer surface by wiping it twice with 75% alcohol sanitizer. The use of the AI application in the quarantine station significantly reduced the survey time. Thus, we concluded that this AI trilogy improved our medical care workflow by shortening the quarantine survey procedure and reducing the processing time, which is especially important during an emerging infectious disease epidemic. (This article is reprinted from GASE-Taiwan Research Highlight, MOST)



Figure 1: The uncertainty in the air of COVID-19 quarantine station was above our imagination. With crowded staffs in a limited space, complexity of the decision strategy and judging whether the X-ray was reported as pneumonia or not made the whole story more high-pressured.

In December 2019, a local outbreak of pneumonia caused by a novel coronavirus, also called COVID-19, disrupted our lives. This coronavirus is considered to be extremely dangerous to human beings. Person-to-person transmission has been documented for COVID-19, and prevention of in-hospital outbreaks became a pertinent issue for crowded departments with highly-infectious regions, including emergency departments (ED), outpatient clinics and inpatient admission wards. With experience of SARS in 2003, Quarantine Stations (Q stations) outside of emergency departments at most hospital had developed a strategy to deal with the emerging disease. To prepare for the screen workload inside the Q station, most staff with medical licenses were required to support the working shift. Therefore, it is crucial to simplify the workflow and decision-making process for doctors from all subspecialist fields.

Furthermore, the dynamic situation changed every day with new CDC announcements, requiring a total of 53 immediate changing protocols. To fulfill the criteria and strategy for screening, and to shorten the process time in the COVID-19 Q station, National Cheng Kung University Hospital (NCKUH) designed an artificial intelligence (AI) system to solve these unmet clinical needs. The NCKUH AI team successfully developed a computer assisted technology device to accelerate medical decisions with their prior smart medicine research experience before the event. The goal was to reduce potentially dangerous SARS-CoV-2 exposure due to long duration times in the quarantine unit. In response to this increasing public health emergency, the NCKUH AI team developed a “smart Q station” outside of the NCKUH emergency room to facilitate the screening and survey procedure.

Trilogy of the smart Q station

The Trilogy included: 1) diversion via the Q station; 2) a tablet computer for TOCC; and 3) an AI-assisted image interpretation with clinical strategy decision-making algorithms at the smart Q station. These steps efficiently facilitated the screening and survey process for those

suspected cases at NCKUH.

For the expected high flow visit for this emerging infectious disease epidemic, NCKUH immediately decided to set up 8 temporary wartime quarantine tents for the Wuhan Pneumonia Quarantine Action. Simultaneously, a more permanent, structured house for long-term quarantine was initiated near the wartime tents. This effective diversion of patients from the ER to the quarantine tents relieved the crowded ER. On average, each medical staff member was estimated to have checked 35-50 quarantine patients per day.

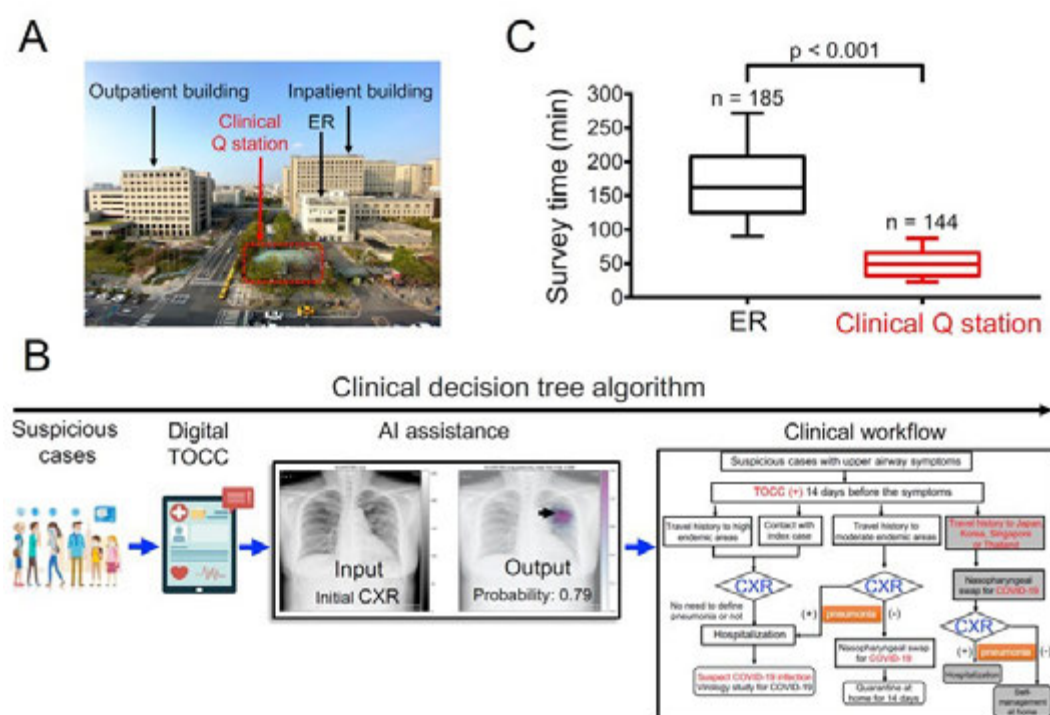


Figure 2: The trilogy of scientific prevention in National Cheng Kung University Hospital: A. First, we used the precious space of the hospital to design a quarantine station that avoids the crowds between the outpatient building and in-patient emergency building; B. We also used smart tablet computers to fill in medical records by patients and collect patients' travel, occupational, cluster and contract histories, and imbedded decision trees into the program to help doctors and nurses; furthermore, with the cooperative work from AI engineers and medical imaging physicians, we also implant a wonderful AI COVID-19 image interpretation system; C. The establishment of these processes finally reduced the time for patients at the quarantine station from 120 minutes to 20 minutes.

Development of AI models for chest x-ray analysis

Development of AI models for chest x-ray analysis can ease the burden of medical staff and promote rapid triaging. In order to detect the precise location of pneumonia sites, we adopted a segmentation model with a class attention map (CAM). The pneumonia segmentation model was based on U-Net.

We thus built a quarantine station with a smart clinical assisting system (SCAS) to accelerate

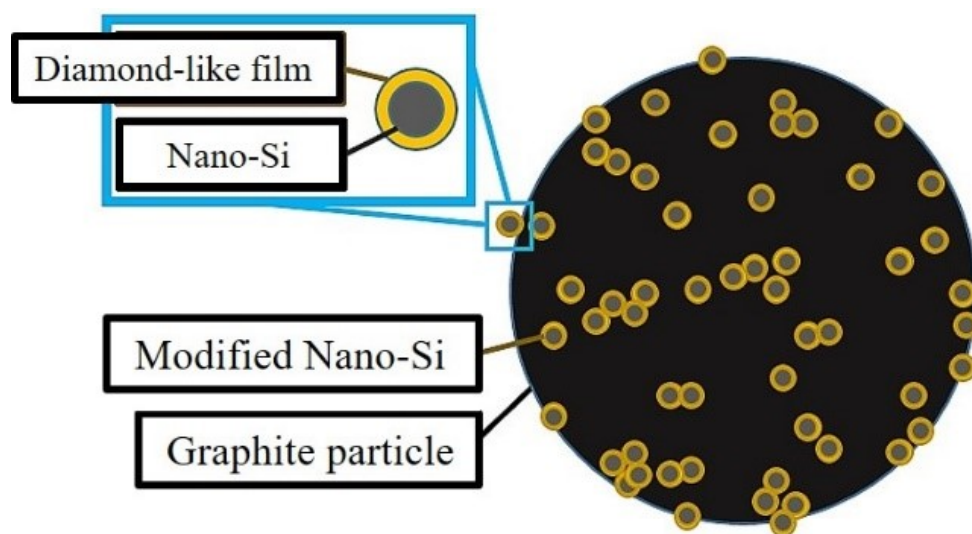
workflow. The SCAS is a clinical decision tree algorithm which integrates the structured format of TOCC history recordings, AI-assisted interpretation of chest X-rays, and the clinical recommended workflow. Suspected cases of COVID-19 at the quarantine station used the tablet computer for the SCAS questionnaires of TOCC history with adequate alcohol disinfection between the users. To avoid cross-infection between front-line medical staff and the patients, physicians and nurses all used independent computers.

We also retrospectively retrieved 4,000 chest x-rays from our picture archiving and communication system (PACS), and identified 682 chest posteroanterior (PA) x-rays with pneumonia and 692 of normal chest PA x-rays. Our AI mode for quickly recognizing pulmonary infiltrates on chest x-rays was merged into the SCAS, with sensitivity, specificity and accuracy of 94.1%, 95.1% and 94.6%, respectively using the training dataset. Furthermore, we used cases of COVID-19 pneumonia from one open source dataset in GitHub (<https://github.com/ieee8023/covid-chestxray-dataset>) including 59 PA and 11 AP chest x-rays to test the model. We achieved the detection rate of 93.2% in AP chest x-rays.

Compared with the conventional ED track, the survey time at the clinical Q station was significantly shortened. Furthermore, the use of the AI application in the Q station reduced the survey time in the Q station. In conclusion, we demonstrated a feasible, safe and scientific way to use a smart device with an in-built algorithm, combined with an AI image system to facilitate the survey procedure, avoid cross infection, and achieve less pressure for all team members. This should be very helpful and could be adapted into our strategies for emerging endemic infectious diseases in the future.

Green multifunctional nano silicon powders for green energy application

Silicon, as the most abundant material on earth, can perform multiple functions of nano-sizing and surface modification. Through several grants from MOST, our nano-sized silicon powders have been well developed with the potential to be the key material for several futuristic green energy technologies. First, as a high capacity anode material in lithium ion batteries, the core technology includes nano-size (<80nm) coating with diamond-like shells and granulation with graphite, resulting in 5 Taiwan and USA patents. Secondly, nano-Si can be made through recycling Si from waste as a reactant to produce hydrogen upon reaction with various kinds of water solution to benefit fuel cells. Finally, SiC, as a 3rd generation semiconductor, demands high quality raw materials. By incorporating purification technology, the purity of our nano-sized Si powders can reach > 99.999%, reacting into high pure α - or β -SiC powders. (This article is reprinted from GASE-Taiwan Research Highlight, MOST)



Numerous Nano-Si powders are attached on the surface of a graphite particle, where each Nano-Si particle is modified with diamond-like film coating as the protective layer

As the central issues in the whole world revolve around green energy and pollution, the abundant material of Silicon can be made greenish with multiple functions for miniaturizing into nano-sized silicon (Nano-Si) and surface modifications as green solutions. Better still, nano-Si can be derived from waste Si from the semiconductor and solar industries through recycling, and will not pollute the earth.

Through an international collaboration program funded by MOST in 2012, our mission to work on nano-Si was initiated in Argonne National Lab, where we learned that Si will become a strategic material in the next-generation anode material in lithium ion batteries. Si delivers the highest specific capacity, but suffers from the most serious volume expansion, which has become the most difficult issue to overcome. Supported by various MOST projects over recent years, we have been able to successfully develop nano-Si, including nano-sizing into $< 80\text{nm}$, conformal surface coating with a diamond-like film, granulation with graphite for a tunable surface area (as the figure), resulting in 5 Taiwan and USA patents. The most critical technology is the diamond-like surface coating, enabling nano-Si to have higher electrical conductance and higher mechanical strength for tolerating cracking through cycling compared to the most popular approach of carbon coating. The impressive results using a similar coating but on graphite have been published in *Nano Energy* 74, 104811 (2020). Ultimately, the pure nano-Si anode can provide a discharge capacity of up to 2500 mAhg^{-1} with the 1st cycle reversible capacity of 82% and retention of 90% over 200 cycles. For the Si/C composite anode with 8wt% Si, the specific capacity is $> 500\text{ mAhg}^{-1}$ with the 1st cycle reversible capacity of 90% and retention of 94% over 100 cycles, while reaching a practical packing density of $> 1.5\text{ gcm}^{-3}$. The best 3Ah full-cell reaches $> 80\%$ retention over 600 cycles, when paired with a NCM 532 cathode. The Nano-Si can be further made into $1\text{-}10\mu\text{m}$ SiO_x powders, by which the SiO_x/C composite anode with 5 wt% SiO reaches $> 420\text{ mAhg}^{-1}$ with the 1st cycle reversible capacity of 89% and 95% retention over 100 cycles. Apparently, our developed Nano-Si and SiO_x powders have reached a world-leading position.

Fuel cells, regarded as the cleanest green energy source, have been vigorously promoted; however, further advance is seriously plagued by the cost and safety of purification, storage and transportation of hydrogen. Our Nano-Si, derived from waste Si, is characterized by low coat, single crystallinity, uniform nano-size distribution, and safe handling, and can be reacted with various types of water solution with appropriate additives into high pure hydrogen. The in-situ hydrogen production without the need for storage and transportation make Nano-Si a potential way to promote the advancement of portable energy generators as well as stationary fuel cells. Besides, due to the fast-growing market in electric cars and micro-wave communications, there is high demand for SiC. Nevertheless, SiC crystal growth suffers from the need for high purity raw materials. Via the developed purification technology, single crystalline Nano-Si can be made ultra-pure with purity > 99.999%, resulting in unique features for enhancing surface reactions by lowering the melting temperature, and improving the purity and yield of SiC powders. The Nano-Si is a great choice for making low-cost and high-purity α - or β -SiC powders.

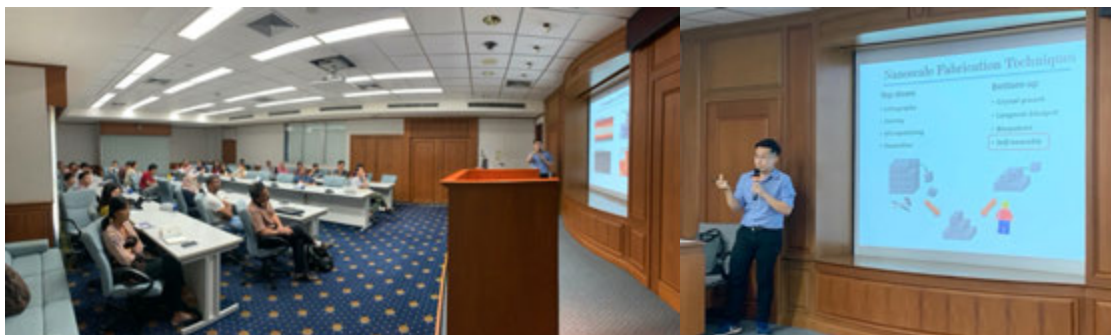
Major Activities and R&D Highlights

THAILAND

The National Nanotechnology Center (NANOTEC) is the leading agency on nanotechnology development in Thailand. Established on 13th August 2003, NANOTEC is one of four research agencies operating under the jurisdiction of the National Science and Technology Development Agency (NSTDA) and the Ministry of Higher Education, Science, Research and Innovation (MHESI). NANOTEC has participated and conducted various nanotechnology activities under ANF Nano Safety and Risk Management working group as following:

Special Seminar of the Nanoscience and Nanotechnology Program at KMUTT (Bangkok, Thailand)

KMUTT is very fortunate to welcome Dr. Songpol Chunchaiyakul from the Surface and Interface Science Laboratory, RIKEN, Japan for his special seminar entitled “2D Self-Assembled Monolayers of a 3D Molecular Framework”. Dr. Songpol showed us the applications of triptycenes moiety as a core structure to control surface functionalities by its 3D intermolecular interactions giving the flexibility in fine-tuning the self-assembled structure and the capability to add multiple functional groups to a single molecule on the surface. At the end of the talk, all participants including students, researchers, and staffs at Nano@KMUTT had the chance to join the intensive discussion session. Dr. Songpol’s talk did enlighten us a promising platform which can be used to create a nanoscale device with molecular-scale precision. (KMUTT)



NanoThailand 2020 Postponement

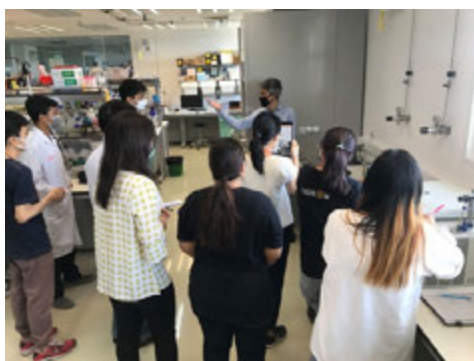
Due to the COVID-19 outbreaks worldwide, KMUTT and Nanotechnology Association of Thailand are really regret to postpone NanoThailand 2020 (The 7th Thailand International Nanotechnology Conference 2020). The exact dates for the conference will be officially announced later. (KMUTT)

Nano Thailand 2020 Postponement

Regarding the tremendous Coronavirus disease (COVID-19) outbreak in many countries worldwide, it is with great regret that our committee have decided to postpone Nano Thailand 2020 (The 7th Thailand International Nanotechnology Conference 2020) which originally scheduled on December 2 - 4, 2020. It is expected that the conference is **going to be held in 2021**. The exact dates will be officially announced later.

COVID-19 Outbreaks can't stop us from research.

Many people have to work from home during COVID-19 outbreaks. We were conducting a big task in the lab for the rapid diagnostic and highly sensitive sensor for this disease. Now we are ready for a large-scale diagnosis of COVID-19. (KMUTT)



Inter-Laboratory Comparison (ILC) 2019 Workshop



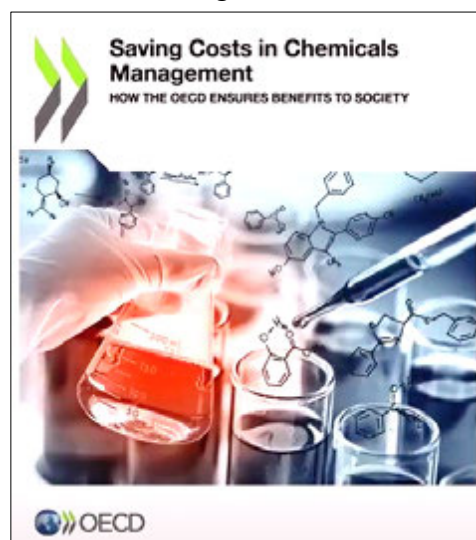
On 6 January 2020, NANOTEC with the support from Asia Nano Forum (ANF) organized the Inter-Laboratory Comparison (ILC) 2019 Workshop at Thailand Science Park, Pathum Thani, Thailand. The aim of this workshop is to discuss the result of analysis the gold nanoparticles

size measurement among participating laboratories. There were 14 participating laboratories from 5 nations: Indonesia, Iran, Malaysia, Philippines, and Thailand. The workshop offered on insight into the knowledge sharing on the topic of “Preparation and Characterization of Nanoparticles” along with the ILC 2019 results and discussion. This discussion focused on the harmonization of measurement capability for nanoparticle size among the participating laboratories due to the measurements and regulations of nanoparticle characterizations are necessary to be in harmony of nano-products development in order for utilizing the most advantages of the nanoparticles. The variety and result discussion sessions are an important steps to promote collaborations and strengthen the networking among peers countries.

For the first comparison initiative, it was conducted on 6 September 2017. A total of 17 laboratories (13 overseas laboratories and 4 Thai laboratories). The measurement results were submitted to NIMT on 31 May 2018 and a workshop to discuss the results was organized on 24 September 2018 at NANOTEC, Thailand. (NANOTEC)

Thailand joins OECD agreement on mutual acceptance of chemical safety data (MAD)

On 7th September 2020, Thailand has joined the OECD system for the Mutual Acceptance of Data (MAD) in the Assessment of Chemicals, ensuring that its non-clinical safety data related to the protection of human health and the environment will be accepted by all 44 countries adhering to MAD. The MAD system composited of a multilateral agreement that allows participating countries to share the results of various non-clinical safety tests done on chemicals and chemical products, such as industrial chemicals and pesticides. This collaboration saves governments and chemical producers around EUR 309 million annually. Participation in the MAD system requires that testing be carried out using OECD standards for test methods (OECD Test Guidelines) and data quality (OECD Principles of Good Laboratory Practice). Governments verify laboratory compliance using OECD procedures. At present, all 37 OECD countries, as well as Argentina, Brazil, India, Malaysia, Singapore, South Africa, and Thailand, adhere to the system.



Seminar on Protecting factory workers from potential risks of nanomaterials

On 23rd September 2020, The Nanosafety Network for Industry project initiated by NANOTEC organized a seminar on "Protecting factory workers from potential risks of nanomaterials exposure" to promote awareness of nanosafety and industrial standards. Speakers included representatives from NANOTEC, the Department of Industrial Works (DIWs), and IRPC Public Company Limited (IRPC). Attendees included participants from industry and research agencies.

The talk focuses on the potential risk associated with exposure of nanomaterials on workers. The risk factors are determined by the amount of exposure and toxicity. The seminar was held as part of the Department of Industrial Works Annual Conference 2020 in Bangkok.



Seminar on Protecting factory workers from potential risks of nanomaterials

New President of Nanotechnology Association of Thailand

On 26th September 2020, Dr. Wannee Chinsirikul, Executive Director of NANOTEC has been selected as the new president of the Nanotechnology Association of Thailand (NAT). Prof. Dr. Jumras Limtrakul, President of VISTEC who has been president for the past four years and now becomes an honorary advisor to the association. Dr. Wannee indicated that she is honored to be elected the new president of NAT and will follow in the footsteps of her distinguished colleagues. NAT was established in October 2010 with an aim to support and promote awareness of nanotech innovations. NAT is an important unit to issue NanoQ labels to interested local companies to help build consumers' confidence and set quality standards for products. Every 2 years, NAT will host an international conference on nanotechnology, namely “NanoThailand”.



President and Members of NAT Board, Year 2020 onwards

4th EU-Asia Dialogue on NanoSafety Advanced Materials and Emerging Issues Forum Commercialization Workshop

Due to the COVID-19 pandemic, the virtual meeting on “4th EU-Asia Dialogue on NanoSafety Advanced Materials and Emerging Issues Forum Commercialization Workshop” was held on 7th October 2020. The number of participants from more than 20 countries joined this workshop which focusing on connecting Asian and European countries with respect to safe nanomaterials including standardization and test guideline development. Two major themes were addressed which was “The Malta Initiative” and “The proposal developed under the collaboration between EU and Asian countries”. Dr. Wannee Chinsirikul, Executive Director of NANOTEC has been selected as Co-chairs of the Malta Initiative session and a part of the Steering Group that was set up for the collaboration between ANF and Nanosafety Cluster (NSC/EU) on nanosafety.



The 4th EU-Asia Dialogue on NanoSafety Online Workshop held in October 2020.

BCG economy towards the development of packaging technology and testing models for safety

Bio-Circular-Green Economic Model (BCG) was introduced and promoted by the Thai government as a new economic model for inclusive and sustainable growth. The BCG model capitalizes on the country's strengths in biological diversity and cultural richness and employs technology and innovation to transform Thailand into a value-based and innovation-driven economy. The BCG model will focus on four industries: agriculture and food; medical and wellness; bioenergy, biomaterial and biochemical; and tourism and creative economy.

On 21st October 2020, NANOTEC and Nanosafety Network for Industry with support from Council of Scientific and Technological Associations of Thailand (COSTAT), Informa Markets, and Ministry of Higher Education, Science, Research and Innovation (MHESI) organized a panel discussion on "Bio Circular Green (BCG) economy towards the development of packaging technology" and a technical presentation on "Testing models for food safety and food

contact materials" at Propak Asia 2020 in Bangkok. Panelists included Dr. Wannee Chinsinikul, Executive Director of NANOTEC, Assoc. Prof. Vane Chonhenchob, Associate Dean for Special Projects, Faculty of Agro-Industry, Kasetsart University, Dr. Bongkot Hararak, Senior Assistance Researcher of MTEC (moderator), and Dr. Waluree Thongkam, Senior Technical Officer, NANOTEC Nanosafety Alliance Section. On the technical side, NANOTEC researchers from Nano Environment, Health, and Safety Lab (EHS) presented the following talks: "In vitro models for food safety and food contact material testing" by Dr. Ratjika Wongwanakul, researcher from Nano Environment, Health, and Safety Lab (EHS) and "In vivo models for safety evaluation of food packaging materials" by Dr. Wittaya Pimtong researcher from Nano Environment, Health, and Safety Lab (EHS).



Event - BCG economy towards the development of Packaging Technology, Propak Asia, October 2020

OECD Global Forum on Environment: Towards cost-effective management systems for industrial and consumer chemicals

On 3rd November 2020, Mr. Angel Gurría, Secretary-General OECD gave the opening remarks at the OECD virtual event on "Global Forum on Environment: Towards cost-effective management systems for industrial and consumer chemicals" in Paris, France. Mr. Ramjitti Indaraprasit, Manager of Nanosafety Alliance Section represented NANOTEC as a panelist on the topic of "Challenges in risk management along the life-cycle of chemical (in) products: the Safe-by-design concept". His presentation focused on NANOTEC'S safety-by-design concept of promoting nanosafety awareness in parallel with technology development. Over 200 participants joined this virtual forum.

Bob Diderich, Head of Division, Environment Directorate at OECD indicated that when it comes to nanomaterials, Thailand has a dual approach from the beginning which is the promotion of innovation and the promotion of safety at the same time. The concepts and experiences in Thailand are unique and interesting for others to consider as a model. The Global Forum brings together leading actors in the field of chemicals management to promote effective engagement, collaboration, and action on the sound management of chemicals and waste.



OECD Global Forum, November 2020

Nanosafety Network for Industry announced collaborative agreement

On 9th December 2020, Nanosafety Network for Industry an initiative under NANOTEC announced the collaborative partnership agreement with nine agencies consisting of the Department of Industrial Works (DIWs), Consumer Protection Board (OCPB), Council of Scientific and Technological Associations of Thailand (COSTAT), Federation of Thai Industry (FTI), Food and Drug Agency (FDA), National Institute of Metrology Thailand (NIMT), Nanotechnology Association of Thailand (NAT), National Nanotechnology Center (NANOTEC) and Thai Industrial Standards Institute (TISI). According to Dr. Wannee Chinsirikul, Executive Director of NANOTEC, nanosafety is an integral part of nanotechnology development. The same can also be said when it comes to the safe use of nanomaterials in the industry. The safety of workers must be a priority.

The aim of this partnership is to drive the Nanosafety and Ethics Strategic Plan 2017-2021 to enhance industrial understanding and awareness of how new nano-enabled products can pose concerns regarding human health and environmental risks. In addition to use existing industrial standards related to nanotechnology, the network will also explore the implementation of other activities such as the production of industrial data base and easy to read safety publications/ manuals including participating in seminars and exhibitions.



MOU Signing Ceremony for Nanosafety Network for Industry, December 2020.

Acknowledgements

Contents of Annual Report are contributed by the following member organizations:

Australian Nanotechnology Network (ANN), Australia

Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK), Austria

The Energy and Resources Institute (TERI), India

Iran Nanotechnology Innovation Council (INIC), Iran

National Institute of Advanced Industrial Science and Technology (AIST), Japan

Japan Science and Technology Agency (JST), Japan

National Institute for Materials Science (NIMS), Japan

Korea Nano Technology Research Society (KoNTRS), Korea

NanoMalaysia Berhad, Malaysia

National Nanotechnology Centre (NNC), Malaysia

Industrial Technology Development Institute (ITDI), Department of Science and Technology (DOST), Philippines

Institute of Physics, Academia Sinica, Taiwan

National Nanotechnology Center (NANOTEC), Thailand

King Mongkut's University of Technology Thonburi (KMUTT), Thailand

Vietnam Academy of Science and Technology (VAST), Vietnam