



Annual Report

2022

Asia Nanotechnology Leaders

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

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

AUSTRIA



INDIA



INDIA



IRAN



JAPAN



JAPAN



JAPAN



KOREA



MALAYSIA



MALAYSIA



THE PHILIPPINES



TAIWAN



THAILAND



VIETNAM



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Preface

With my sincere appreciation, I am so grateful for the help of all representatives from 14 organizations of 10 ANF member economies who always support valuable information and sharing the experiences on nanotechnology in our Annual Report. Moreover, I appreciated the contribution of ANF Working Groups Coordinators who help making ANF visible by various nanotechnology activity initiatives.

In the past two years, the coronavirus (COVID-19) pandemic persists greatly challenged all of us. However, it will take more than pandemic of global proportions to slow down or distract our incredible team at ANF member economies, as we have joined forces with the public and private sectors to develop the nanotechnology for industry in such an adaptive manner in accordance with the current situation. Continuous operations became virtual and hybrid events, enabled ANF activities to be organized throughout the year. Each member economy also collaborated with their international alliances to maintain relationships on the global ANF stage.

As WHO announced that COVID-19 will remain a global emergency, but pandemic could near its end in 2023, therefore we will have an opportunity to have face-to-face events such as ANF ExCo Meeting 2023 and related activities in conjunction with nano tech 2023 in Japan. Moreover, I would like to thank Korea Nanotechnology Research Society (KoNTRS) who accepted the invitation to host the 20th ANF Summit Meeting which will be held during 5-6 July 2023 in Korea. It goes without saying that active participation from every ANF members is necessary to maintain the ANF's success.

Finally, tremendous applause and appreciation need to be showered upon the ANF Office Bearers and ANF member economies who always took part in successfully maintaining nanotechnology activities. I am indebted to you for your partnership, your passion, and your steadfast commitment to this organization. ANF offers one-of-a-kind platform for collaboration in a variety of nanotechnology activities. I hope that each member organization can continue to contribute to this expansion. These impactful achievements aside, progress still further, much accomplished, still some works to do to continue to further success.



Wannee Chinsirikul

President
Asia Nano Forum

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.

Asia Nano Forum (ANF) has 4 Working Groups which consist of Standardization, User-Facility Network, Nano Safety and Risk Network, and Commercialization. The detail of each working group is shown as follows.

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)

Prof. Ruslinda RAHIM (NNC, Malaysia)

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)

ANF has currently 14 organization members from 10 countries including Austria, India, Iran, Japan, Korea, Malaysia, The Philippines, Taiwan, Thailand, and Vietnam. The list of member organizations is shown below.

- 1) Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK), Austria
- 2) The Energy and Resources Institute (TERI), India
- 3) National Institute of Technology Srinagar (NIT), India
- 4) Iran Nanotechnology Innovation Council (INIC), Iran
- 5) National Institute of Advanced Industrial Science and Technology (AIST), Japan
- 6) Japan Science and Technology Agency (JST), Japan
- 7) National Institute for Materials Science (NIMS), Japan
- 8) Korea Nano Technology Research Society (KoNTRS), Korea
- 9) NanoMalaysia Berhad, Malaysia
- 10) National Nanotechnology Centre (NNC), Malaysia
- 11) Industrial Technology Development Institute (ITDI), Department of Science and Technology (DOST), Philippines
- 12) Institute of Physics, Academia Sinica, Taiwan
- 13) National Nanotechnology Center (NANOTEC), Thailand
- 14) Vietnam Academy of Science and Technology (VAST), Vietnam



Wannee CHINSIRIKUL
President
NANOTEC, THAILAND



Annabelle V. BRIONES
Vice President
DOST-ITDI, PHILIPPINES



Rezal Khairi AHMAD
Vice President
NanoMalaysia Berhad,
MALAYSIA



Shuhei NUMAZAWA
Treasurer
JST, JAPAN



Pavadee AUNGKAVATTANA
Secretary
NANOTEC, THAILAND



Jason CHANG
Secretary
Academia Sinica, TAIWAN

About Asia Nano Forum

Alexander POGÁNY

BMK, Austria

Dr. M. A. Shah

NIT, India

Pushplata SINGH

TERI, India

Ali BEITOLLAHI

INIC, Iran

Toshihiko KANAYAMA

AIST, Japan

Junichi SONE

JST, Japan

Yasuo KOIDE

NIMS, Japan

Byung-ki CHEONG

KoNTRS, Korea

Rezal Khairi AHMAD

NanoMalaysia, Malaysia

Ruslinda RAHIM

NNC, Malaysia

Annabelle V. BRIONES

DOST-ITDI, Philippines

Maw-Kuen WU

Academia Sinica, Taiwan

Wannee CHINSIRIKUL

NANOTEC, Thailand

Tran Dai LAM

VAST, Vietnam

| Executive Committee

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



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



Sirirurg SONGSIVILAI
President 2014-2015
NANOTEC, Thailand



Ramam AKKIPEDDI
President 2016-2017
IMRE-A*STAR, Singapore



Toshihiko KANAYAMA
President 2018-2019
AIST, Japan



Ting-Kuo LEE
President 2020-2021
NSYSU, Taiwan



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



Khiangwee LIM
Founding Vice President 2007-2010
NRF, Singapore



**Venkatesh Rao
AIYAGARI**
India



Jane NIAL
Australia



Hong Khoi PHAN
Vietnam



Wiwut TANTHAPANICHAKOON
Thailand



Halimaton HAMDAN
Malaysia

Coordinators:

Dr. Tsing-Tang SONG (ITRI, Taiwan)

Prof. Ali BEITOLLAHI (INIC, Iran)

The objective of standardization working group is to promote and coordinate the standardization of nanotechnology concepts and measurements. As an external liaison member, ANF participates in the ISO/TC 229 (nanotechnologies) and IEC/TC 113 (nanotechnologies) meetings to maintain close links with the latest development in nanotechnology standardization. It is expected to further facilitate harmonized standards among ANF members. We also encourage and promote common interests and benefits in mutual recognition of nanoproduct certification. The following are brief reports on events related to nanotechnology standards and the status of ANF in ISO/TC 229 as well as IEC/TC 113.

Activities in IEC/TC 113

In IEC/TC 113 WG3 (Performance Assessment), two projects, including IEC TS 62607-4-4 and IEC TS 62844, are proposed by ANF. These two standards had been published by IEC in 2016. The project leader is Dr. Bin-Cheng Yao (Taiwan) who is ANF's liaison officer in IEC/TC 113.

Activities in ISO/TC 229

ANF is leading a project ISO/TS 4971 entitled "Nanotechnologies – Performance evaluation of nanosuspensions containing clay nanoplates for quorum quenching" at ISO/TC 229 WG5 (Products and Applications), project leader Dr. Tsing-Tang Song and Prof. Jiang-Jen Lin come from Taiwan. Currently, this project is advanced to the DTS ballot stage. This standard would provide measurement methods for quality control for the clay nanoplate which could be applied to inhibit the growth of pathogenic bacteria for crop protection from diseases. The liaison officer of ANF to ISO/TC 229 is Prof. Ali Beitollahi from Iran. Iran led four developing standards in ISO/TC 229 in 2022. Additionally, many developing standards listed in the table below are under the leadership of ANF members in ISO/TC 229, these ongoing projects are proposed by Taiwan, Iran, Japan, Korea, and Malaysia respectively in 2022.

Document	Title	Proposer
ISO/TS 4971	Performance evaluation of nanosuspension containing clay nanoplates for quorum quenching	ANF (Taiwan)
ISO/TS 10818	Textiles containing nanomaterials and nanostructures — superhydrophobic characteristics and durability assessment	Iran
ISO/TS 10689	Superhydrophobic surfaces and coatings: characteristics and performance assessment	Iran
ISO/TS 10689	Superhydrophobic surfaces and coatings: characteristics and performance assessment	Iran
ISO/TS 11353	Test method for detection of nano-object release from respiratory masks media under different working conditions	Iran

Document	Title	Proposer
ISO/TS 23366	Performance Evaluation Requirements for Quantifying Biomolecules Using Fluorescent Nanoparticles in Immunohistochemistry	Japan
ISO/TS 19337	Characteristics of working suspensions of nano-objects for in vitro assays to evaluate inherent nano-object toxicity	Japan (IS revision)
ISO/TS 23878	Positron annihilation lifetime measurement for nanopore evaluation in materials	Japan
ISO/TS 22298	Silica nanomaterials — Specifications of characteristics and measurement methods for nanostructured porous silica samples with ordered nanopore array	Japan
ISO/PWI 12948	Nanocomposite materials for insulating - Specification of characteristics and measurement methods	Japan
ISO/PWI 7666	Evaluation method for chronic inhalation toxicity based on lung burden of nanomaterials	Japan
ISO/TS 23367-1	Performance characteristics of nanosensors for chemical and biomolecule detection	Korea (published)
ISO/TR 23652	Considerations for radiolabeling methods of nanomaterials for performance evaluation	Korea
ISO/PWI 23653	Experimental considerations when evaluating nanoparticle performance of cellular uptake	Korea
ISO/TS 7833	Extraction method of nanomaterials from lung tissue by the proteinase K digestion	Korea
ISO/TS 5387	Lung burden measurement of nanomaterials for inhalation toxicity studies	Korea/USA
ISO/TS 7833	Extraction method of nanomaterials from lung tissue by the proteinase K digestion	Korea
ISO/PWI 4961	Determination of size and size distribution of nano-objects in liquid using aerosolization differential electron mobility analysing system	Korea
ISO/AWI 4962	In vitro nanoparticle phototoxicity assay	Korea
ISO/PWI 4963	Radiotelemetry-spectral-echocardiography based real-time surveillance protocol for in vivo toxicity detection and monitoring of engineered nanomaterials (ENM)	Malaysia
ISO/TS 12901-2	Occupational risk management applied to engineered nanomaterials -- Part 2: Use of the control banding approach	Malaysia/ Colombia (IS revision)

ISO/TC 229 Standards adopted by the ANF members

We study the ISO/TC 229 standards which were adopted as national standards by the ANF members from the year 2021 to July 2022. The statistics result of the standards adopted numbers and rate in ANF members are listed as follows.

Document	Title	Adopted #	Adopted rate
ISO 21363:2020	Measurements of particle size and shape distributions by transmission electron microscopy	4	40%
ISO/TS 22082:2020	Assessment of nanomaterial toxicity using dechorionated zebrafish embryo	4	40%
ISO/TS 20787:2017	Aquatic toxicity assessment of manufactured nanomaterials in saltwater lakes using Artemia sp. Nauplii	3	30%
ISO/TS 19807-1:2019	Magnetic nanomaterials — Part 1: Specification of characteristics and measurements for magnetic nanosuspensions	3	30%
ISO/TS 80004-3:2020	Vocabulary — Part 3: Carbon nano-objects	3	30%
ISO/TS 12025:2012	Nanomaterials — Quantification of nano-object release from powders by generation of aerosols	2	20%
ISO/TS 13278:2011	Determination of elemental impurities in samples of carbon nanotubes using inductively coupled plasma mass spectrometry	2	20%
ISO/TS 17200:2013	Nanoparticles in powder form — Characteristics and measurements	2	20%
ISO/TS 13278:2017	Determination of elemental impurities in samples of carbon nanotubes using inductively coupled plasma mass spectrometry	2	20%
ISO/TS 14101:2012	Surface characterization of gold nanoparticles for nanomaterial specific toxicity screening: FT-IR method	2	20%
ISO/TS 18827:2017	Electron spin resonance (ESR) as a method for measuring reactive oxygen species (ROS) generated by metal oxide nanomaterials	2	20%
ISO/TS 80004-13:2017	Vocabulary — Part 13: Graphene and related two-dimensional (2D) materials	2	20%
ISO/TS 21361:2019	Method to quantify air concentrations of carbon black and amorphous silica in the nanoparticle size range in a mixed dust manufacturing environment	2	20%
ISO/TS 12025:2021	Nanomaterials — Quantification of nano-object release from powders by generation of aerosols	2	20%
ISO 17200:2020	Nanoparticles in powder form — Characteristics and measurements	2	20%

Document	Title	Adopted #	Adopted rate
ISO 19007:2018	In vitro MTS assay for measuring the cytotoxic effect of nanoparticles	2	20%
ISO/TR 19601:2017	Aerosol generation for air exposure studies of nano-objects and their aggregates and agglomerates (NOAA)	2	20%
ISO/TR 19733:2019	Matrix of properties and measurement techniques for graphene and related two-dimensional (2D) materials	2	20%
ISO 20814:2019	Testing the photocatalytic activity of nanoparticles for NADH oxidation	2	20%
ISO/TS 21346:2021	Characterization of individualized cellulose nanofibril samples	2	20%
ISO/TS 21356-1:2021	Structural characterization of graphene — Part 1: Graphene from powders and dispersions	2	20%
ISO/TR 21386:2019	Considerations for the measurement of nano-objects and their aggregates and agglomerates (NOAA) in environmental matrices	2	20%
ISO/TS 21975:2020	Polymeric nanocomposite films for food packaging with barrier properties — Specification of characteristics and measurement methods	2	20%
ISO/TR 22019:2019	Considerations for performing toxicokinetic studies with nanomaterials	2	20%
ISO/TS 80004-8:2020	Vocabulary — Part 8: Nanomanufacturing processes	2	20%
ISO/TS 10867:2010	Characterization of single-wall carbon nanotubes using near infrared photoluminescence spectroscopy	1	10%
ISO/TS 11251:2010	Characterization of volatile components in single-wall carbon nanotube samples using evolved gas analysis/gas chromatograph-mass spectrometry	1	10%
ISO/TS 11308:2011	Characterization of single-wall carbon nanotubes using thermogravimetric analysis	1	10%
ISO/TS 11888:2011	Characterization of multiwall carbon nanotubes — Mesoscopic shape factors	1	10%
ISO/TR 12885:2008	Health and safety practices in occupational settings relevant to nanotechnologies	1	10%
ISO/TS 16195:2013	Guidance for developing representative test materials consisting of nano-objects in dry powder form	1	10%
ISO/TS 10797:2012	Characterization of single-wall carbon nanotubes using transmission electron microscopy	1	10%
ISO 10808:2010	Characterization of nanoparticles in inhalation exposure chambers for inhalation toxicity testing	1	10%

Document	Title	Adopted #	Adopted rate
ISO/TS 11888:2017	Characterization of multiwall carbon nanotubes — Mesoscopic shape factors	1	10%
ISO/TS 16195:2018	Specification for developing representative test materials consisting of nano-objects in dry powder form	1	10%
ISO/TS 16550:2014	Determination of silver nanoparticles potency by release of muramic acid from Staphylococcus aureus	1	10%
ISO/TS 19006:2016	5-(and 6)-Chloromethyl-2',7' Dichloro-dihydrofluorescein diacetate (CM-H2DCF-DA) assay for evaluating nanoparticle-induced intracellular reactive oxygen species (ROS) production in RAW 264.7 macrophage cell line	1	10%
ISO 29701:2010	Endotoxin test on nanomaterial samples for in vitro systems — Limulus amoebocyte lysate (LAL) test	1	10%
ISO/TR 13329:2012	Preparation of material safety data sheet (MSDS)	1	10%
ISO/TR 18196:2016	Measurement technique matrix for the characterization of nano-objects	1	10%
ISO/TS 19590:2017	Size distribution and concentration of inorganic nanoparticles in aqueous media via single particle inductively coupled plasma mass spectrometry	1	10%
ISO/TS 21362:2018	Analysis of nano-objects using asymmetrical-flow and centrifugal field-flow fractionation	1	10%
ISO/TS 80004-1:2015	Vocabulary — Part 1: Core terms	1	10%
ISO/TS 11251:2019	Characterization of volatile components in single-wall carbon nanotube samples using evolved gas analysis/gas chromatograph-mass spectrometry	1	10%
ISO/TS 10867:2019	Characterization of single-wall carbon nanotubes using near infrared photoluminescence spectroscopy	1	10%
ISO/TR 10929:2012	Characterization of multiwall carbon nanotube (MWCNT) samples	1	10%
ISO/TS 11308:2020	Characterization of carbon nanotube samples using thermogravimetric analysis	1	10%
ISO/TR 12885:2018	Health and safety practices in occupational settings	1	10%
ISO/TR 13014:2012	Guidance on physico-chemical characterization of engineered nanoscale materials for toxicologic assessment	1	10%

Document	Title	Adopted #	Adopted rate
ISO/TR 13014:2012/Cor 1:2012	Guidance on physico-chemical characterization of engineered nanoscale materials for toxicologic assessment — Technical Corrigendum 1	1	10%
ISO/TR 19057:2017	Use and application of acellular in vitro tests and methodologies to assess nanomaterial biodurability	1	10%
ISO 19749:2021	Measurements of particle size and shape distributions by scanning electron microscopy	1	10%
ISO/TS 19808:2020	Carbon nanotube suspensions — Specification of characteristics and measurement methods	1	10%
ISO/TR 20489:2018	Sample preparation for the characterization of metal and metal-oxide nano-objects in water samples	1	10%
ISO/TS 21236-2:2021	Clay nanomaterials — Part 2: Specification of characteristics and measurements for clay nanoplates used for gas-barrier film applications	1	10%
ISO/TS 21237:2020	Air filter media containing polymeric nanofibres — Specification of characteristics and measurement methods	1	10%
ISO/TS 21412:2020	Nano-object-assembled layers for electrochemical bio-sensing applications — Specification of characteristics and measurement methods	1	10%
ISO/TR 21624:2020	Considerations for in vitro studies of airborne nano-objects and their aggregates and agglomerates (NOAA)	1	10%
ISO/TS 22292:2021	3D image reconstruction of rod-supported nano-objects using transmission electron microscopy	1	10%
ISO/TS 23302:2021	Requirements and recommendations for the identification of measurands that characterise nano-objects and materials that contain them	1	10%
ISO/TS 80004-6:2021	Vocabulary — Part 6: Nano-object characterization	1	10%

Voluntary Certification System

In ANF, four members which include Taiwan (nanoMark, 2004), Iran (nano-meghyas, 2009), Thailand (Nano Q, 2011), and Malaysia (NanoVerify, 2015) have implemented the voluntary certification system to manage their nanoproducts in the market. A collaboration platform was implemented between Taiwan nanoMark and Malaysia NanoVerify for mutual recognition of nanoproduct certification in 2018, this is an important role to promote and harmonize standards to accelerate good nanoproduct development. The No. of Iranian nanoproducts that received “nano-meghyas” certificate reached to more than 1400 in Jan. 2023. In 2022, 1456 products made by 14 firms received nanoMark in Taiwan, and 10 firms received NanoVerify in Malaysia.

Standardization Activities

Standardization activities in ANF were performed in several different members as the following list in 2022.

- The 19th Asia Nano Forum Summit (hybrid) was held on 19 Aug 2022 in Kuala Lumpur, Malaysia.
- The 5th EU-ASIA Dialogue on Nanosafety was held on 19 Aug 2022 as part of the Asia Nano Forum Summit 2022.
- IRAN national committee of nanotechnology standards approved the national standard "Nanotechnology - A method for determining the concentrations of Carbon black and amorphous Silica in the nanoparticle size range in the atmosphere of a mixed powder production" in Nov. 2021.
- IRAN national committee of nanotechnology standards approved the national standard "Nanotechnology - Evaluation of secondary structure of protein interacting with nanomaterials using UV-CD" in January 2022. The total No. of Iran 's published national standards reached to 150 in Jan. 2023.
- The general standard for nanotechnology industrial products "Black ginger extract nano-encapsulated particles" was published by the Thai Industrial Standards Institute (TISI) in the Thai government gazette announcement on May 5, 2022.

Coordinators:

Dr. Yasuo Koide (NIMS, Japan)

Prof. Ruslinda RAHIM (NNC, Malaysia)

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. Unfortunately, the exchange plan has been still stopped due to the CORONA virus pandemic. The second plan was to hold the workshop on “User-Facility Network in Asia” in nanotech 2022 which was held on Jan. 26-28, 2022, in Tokyo as explained in the next section.

2. Report on 2022 Symposium on User-Facility Network in Asia

The purpose is to share information on user-facility activities and advanced nanofab, nanobio, and nano-characterization technologies in Asia. This first symposium was held on January 27 (Thu.) 2022 and was the hybrid online/onsite event on Day 2, nanotech 2022, Tokyo. The venue was the room 802, Conference Tower at Tokyo Big Sight. The program was as follows, and 8 speakers in 6 different countries, Korea, Japan, Thailand, Malaysia, Austria, and Taiwan, in ANF members presented.

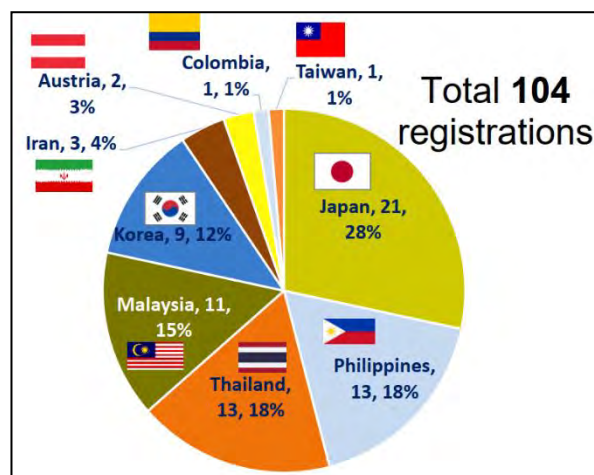


2022 Symposium on User-Facility Network in Asia

UFN-WG

Date: January 27 (Thu.), 2022. online and onsite
Day 2, nanotech 2022, Tokyo
Venue: Room 802, Conference Tower, Tokyo Big Sight, Japan
Objective: The purpose is to share information on user-facility activities and advanced nanofab, nanobio, and nano-characterization technologies in Asia
Chair: Yasuo Koide (NIMS), Co-chair: Daisuke Fujita (NIMS)

13:00 Greeting, Y. Koide
 13:05 "National NanoFab Center Activity (tentative)" (NNFC, Korea)
 13:30 "Overviews of Nanotechnology Platform Japan" Y. Koide (NIMS, Japan)
 13:55 "Introduction of Advanced Research Infrastructure for Materials and Nanotechnology in Japan" J. Sone (JST, Japan)
 14:20 "User Facility and Nanotechnology Support in NANOTECH (tentative)" W. Chinsirikul (NANOTECH, Thailand)
 Break (15 min)
 15:00 "Malaysia Nanotechnology Laboratory Network" R. A. Rahim, (NNC, Malaysia)
 15:25 "Open research facilities of TIA Japan (tentative)" (AIST, Japan)
 15:50 "under consideration" (Austria)
 16:15 "Nano-fabrication technology and facility in Taiwan" T-T. Miao (Academia Sinica, Taiwan)
 16:40 Concluding, D. Fujita



The numbers of attendees and percentage of countries which join the symposium by online. As much as 104 people which shows a variety of countries, such as Japan of 28%, Philippines of 1%, Thailand 13%, Malaysia of 15%, Korea of 12%, Iran of 4%, Austria of 2%, Colombia of 1%, and Taiwan of 1%, attended the symposium, and the registration was made by 125 people.

Dr. Koide made greeting with an objective explanation. Dr. J-W. Lee, President of NNFC, comprehensively explained Korea Sibase nanofabrication technology in government project. Dr. Koide, NIMS, reviewed Nanotechnology Platform Japan (NPJ) project for ten years from 2012 to 2021, and Dr. Sone, JST, summarized the next ten-year user-facility & data project in Japan. Dr. Wannee Chinsirikul, Director of NANOTEC Thailand, summarized the NANOTEC reviews and user-facility status in Thailand. Dr. Rahim, MOSTI Malaysia, presented summarizing nanotechnology project and the plan for user-facility network project in Malaysia. Dr. Tada, AIST Japan, explained the open research facility network in TIA Japan. Dr. Uhrmann, EV Group GmbH Austria, summarized the heterogeneous integration technology in Si and other semiconductors with his company's concept. Dr. Miao, Academia Sinica Taiwan, summarized the nano-fabrication technology and facility in Taiwan. Finally, Dr. Fujita, Director of Advanced Characterization Nanotechnology PF in NPJ project, made the concluding remark. The fruitful discussion along Q&A were made by speakers and attending audiences. The photos of the first greeting and an online shot by speakers are shown below.



3. Future activity plans

The 2023 Symposium on User-Facility Network in Asia will be held as joint-event at ExCo meeting in nano tech 2023, Tokyo, on Feb. 1-3, 2023. Dr. Ruslinda Rahim, MOSTI Malaysia, was selected as result of recruiting coordinators, and Dr. Koide and Dr. Rahim will be organized the second symposium.

4. Report on look east policy 2.0 training program between Malaysia and Japan.

The training program, “Technical and Expertise Sharing on Nanotechnology Platform Japan (NTPJ) and Tsukuba Innovation Arena in Nanotechnology (TIA-Nano) for the Development of National Nanotechnology Laboratory Network,” was held on May 26 2022 as an online event by organizing of NNC MOSTI, Malaysia, and cooperation of NIMS and AIST, Japan, and support of JICA in Japan. The detailed report will be summarized below.



LOOK EAST POLICY 2.0 TRAINING PROGRAMME REPORT

“Technical and Expertise Sharing on Nanotechnology Platform Japan (NTPJ) and Tsukuba Innovation Arena in Nanotechnology (TIA-Nano) for the Development of National Nanotechnology Laboratory Network”



CIVIL SERVICES
DEPARTMENT

NATIONAL
NANOTECHNOLOGY
CENTRE



国立研究開発法人 物質・材料研究機構
National Institute for Materials Science



REPORT DETAILS

4.1 Training Program Title:

“Application for Technical and Expertise Sharing on Nanotechnology Platform Japan (NTPJ) and Tsukuba Innovation Arena in Nanotechnology (TIA-Nano) for the Development of National Nanotechnology Laboratory Network”.

4.2 Organizer:

The National Nanotechnology Centre (NNC), Ministry of Science, Technology and Innovation (MOSTI) Malaysia together with Japan International Cooperation Agency (JICA) Malaysia and Department of Public Services (JPA) Malaysia. (Details in **Attachment 1**)

4.3 Implementer:

National Institute of Advance Materials (NIMS) Japan and Tsukuba Innovation Arena in Nanotechnology (TIA-Nano), Japan. (Details in **Attachment 1**)

4.4 Date and Duration: 26th May 2022 (Thursday), 8.30am to 12.00pm (Malaysia Time)

4.5 Venue: Physical Mode at NNC MOSTI Meeting Room, Level 4, Block C7 and Online Mode Via Zoom Platform

4.6 Background

Organizer is the coordinator of Malaysia’s National Nanotechnology Laboratory Network (NNLN) program. The program requires applicant to seek and gain knowledge on the infrastructure and operational of other Nanotechnology Lab Network for benchmarking, capacity building; and build international network and contacts. This is because NNLN is still at development stage where experience and knowledge sharing from NIMS in operating Nanotechnology Platform Japan (NPJ) /Tsukuba Innovation Arena (TIA) / Advanced Research Infrastructure for Materials and Nanotechnology (ARIM) program will be helpful for NNLN future improvement. Future plan to be done after this training/seminar is to plan for 2023 physical visit for training, building collaboration and further benchmarking to NIMS Japan that cannot be done virtually. Future plan for NNLN and NPJ/TIA/ARIM Program is to cement a MOU for future technical experts’ exchange and R&D collaboration programs.

4.7 Training Objective:

To seek and gain knowledge on the infrastructure and operational of Nanotechnology Lab Network in Japan for benchmarking, capacity building; and building international network and contacts.

4.8 Expectation and Future Plan of Actions

Technical and knowledge sharing during the program by applicants will be used to enhance NNLN operational and further develop working procedures for sharing of resources, facilities and expertise efficiently. Current operational and working procedure of NNLN is still in development stage. Also, the knowledge gained by applicant on how collaboration project conducted within NPJ/TIA/ARIM platform will be used as a guideline to create collaboration projects within NNLN institution for development of specific technical improvement in the current nanotechnology available.

4.9 Training Agenda:

8.30am	Participants and Speakers Entering Zoom Online Platform.
8.45am	Opening Remarks by Dr. Ruslinda A Rahim, Director of National Nanotechnology Centre, MOSTI.
8.50am	Opening Remarks by Prof. Dr. Yasuo Koide, Director ARIM Project, Japan.
9.00am	Presentation Part 1: Introduction of Nanotechnology Platform Japan (NPJ) by Dr. Masanori Mitome, Office Chief Coordination Office, ARIM NIMS.
	Presentation Part 2: Introduction of Advanced Research Infrastructure for Materials and Nanotechnology (ARIM), Prof. Dr. Yasuo Koide, Director ARIM Japan.
10.00am	Introduction of Tsukuba Innovation Arena Nanotechnology (TIA-NANO) and Operational Model by Dr. Tetsuya Tada, Director Platform Innovation Unit, TIA.
11.00am	Discussions for future collaboration between NPJ/ARIM, TIA and NNLN Malaysia (Dr. Tetsuya Tada, Prof. Dr. Yasuo Koide, Dr. Masanori Mitome and all participants).
12.00pm	Certificate Presentation Session by Mr. Takizawa Masahiko , Chief Representative JICA Malaysia and Group Photograph Session.
12.10pm	Training concluded.

4.10 Training Participants:

This program was attended by 19 candidates from National Nanotechnology Centre, Ministry of Science, Technology and Innovation (MOSTI), Malaysian Nuclear Agency (MNA), Forest Research Institute of Malaysia (FRIM), Malaysian Rubber Board (IGM), Universiti Kebangsaan Malaysia (UKM), University Science Malaysia (USM), Universiti Sains Islam Malaysia (USIM), Universiti Malaysia Pahang (UMP), MARA University of Technology (UiTM), International Islamic University Malaysia (IIUM) and Universiti Malaysia Terengganu (UMT). (Details on Attachment 2).

4.11 Conclusion

The training and sharing session meet its objective through the knowledges that was shared on the infrastructure and operational of Nanotechnology Lab Network in Japan where benchmarking, capacity building; and building international network and contacts had been achieved and established.

List of Organizers and Speakers/ Trainers for LEP2.0 Training Technical & Expertise Sharing on Nanotechnology Platform Japan (NPJ) and Tsukuba Innovation Arena in Nanotechnology (TIA-Nano) for the Development of National Nanotechnology Laboratory Network (NNLN), Malaysia.

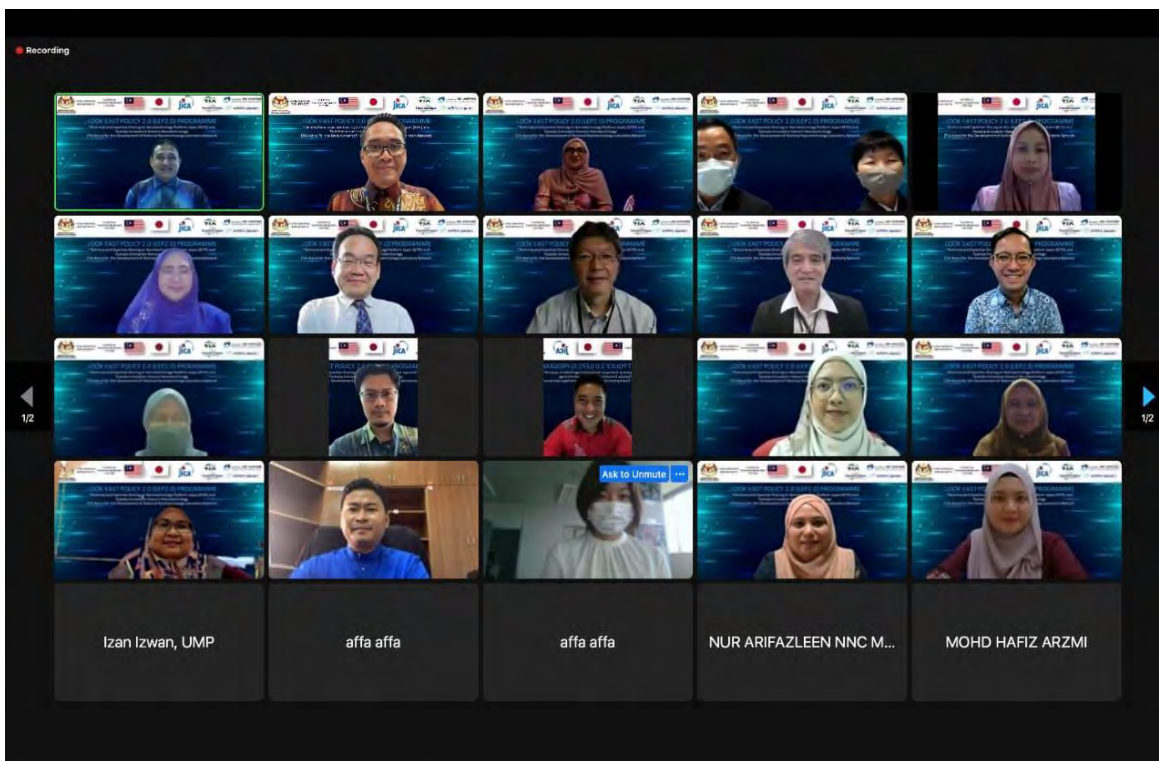
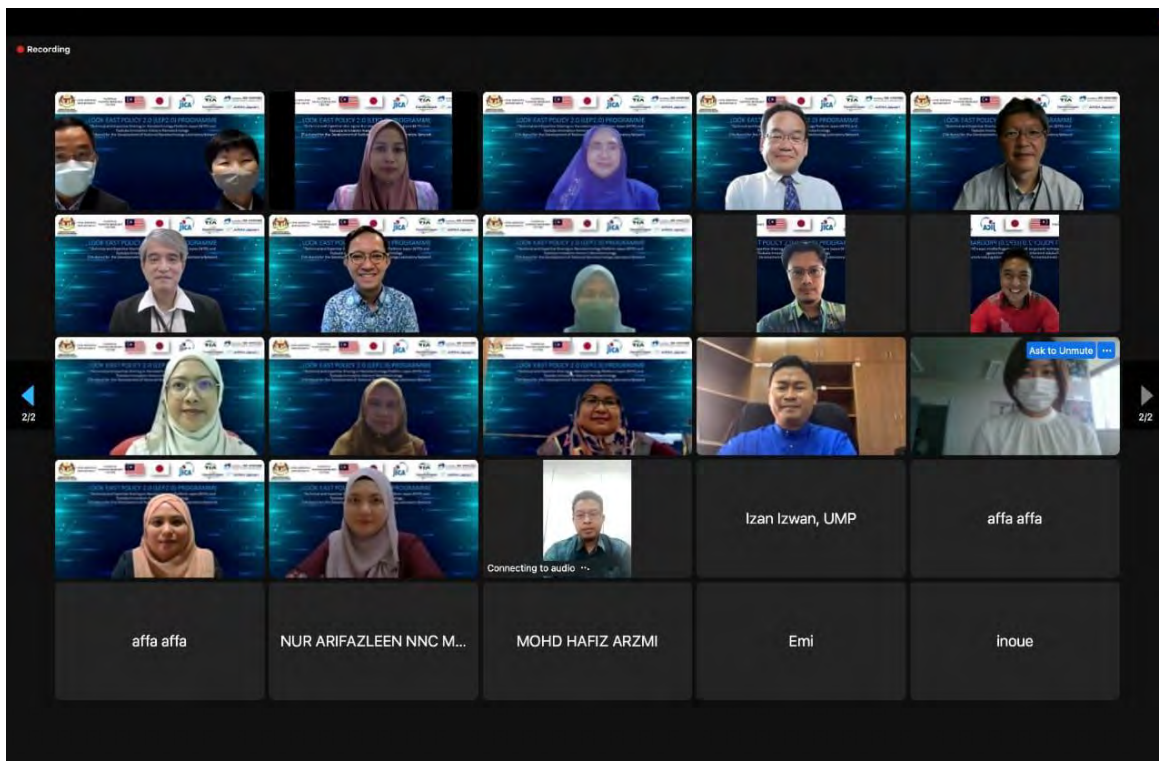
Keynote Speaker	1. Dr. Ruslinda A Rahim <i>Director of National Nanotechnology Centre, MOSTI.</i> 2. Prof. Dr. Yasuo Koide <i>Director ARIM Project, Japan.</i>
Speaker / Trainer	1. Dr. Masanori Mitome <i>Office Chief Coordination Office, ARIM NIMS. (Introduction of Nanotechnology Platform Japan (NPJ)).</i> 2. Prof. Dr. Yasuo Koide <i>Director ARIM Japan. (Introduction of Advanced Research Infrastructure for Materials and Nanotechnology (ARIM)).</i> 3. Dr. Tetsuya Tada <i>Director Platform Innovation Unit, TIA. (Introduction of Tsukuba Innovation Arena Nanotechnology (TIA-NANO) and Operational Model).</i>
Moderator	1. Mr. Ismarul Nizam Ismail <i>NNC, MOSTI.</i>
Representative of JICA Malaysia	1. Mr. Takizawa Masahiko <i>Chief Representative JICA Malaysia</i> 2. Mr. Tan Siew Chan 3. Mrs. Akaishi Fumiko
Representative from NNC, MOSTI	1. Dr. Yusrizam Sharifuddin 2. Mohd Helme Mohd Helan 3. Dr. Nurul Asyikin Kamaruzaman 4. Nur Arifazleen Aris 5. Dominic Geruka

List of Participants and Details for LEP2.0 Training Technical & Expertise Sharing on Nanotechnology Platform Japan (NPJ) and Tsukuba Innovation Arena in Nanotechnology (TIA-Nano) for the Development of National Nanotechnology Laboratory Network (NNLN), Malaysia.

No.	Title	Name	Position	Agency	Tel.	Mobile No.	Email
1	Dr.	Yusrizam Bin Sharifuddin	Principal Assistant Director	National Nanotechnology Center (NNC), Ministry of Science, Technology & Innovation (MOSTI), Malaysia	03.8885 8662	019.243 8458	yusrizam@mosti.gov.my
2	Mr.	Ismarul Nizam Bin Ismail	Principal Assistant Director	Research Development, National Nanotechnology Center (NNC), Ministry of Science, Technology & Innovation (MOSTI), Malaysia	03.8885 8665	012.541 9401	ismarul@mosti.gov.my
3	Mr.	Mohd Helme Bin Mohd Helan	Principal Assistant Director	National Nanotechnology Center (NNC), Ministry of Science, Technology & Innovation (MOSTI), Malaysia	03.8885 8663	019.332 2276	helme11270@yahoo.com/ helme@mosti.gov.my
4	Mr.	Dominic Anak Geruka	Assistant Director	National Nanotechnology Center (NNC), Ministry of Science, Technology & Innovation (MOSTI), Malaysia	03.8885 8671	016.447 7976	domic@mosti.gov.my
5	Dr.	Nurul Asyikin Binti Kamaruzaman	Assistant Director	National Nanotechnology Center (NNC), Ministry of Science, Technology & Innovation (MOSTI), Malaysia	03.8885 8670	013.782 1883	nasyikin@mosti.gov.my
6	Ms.	Nur Arifazleen Binti Aris	Assistant Director	National Nanotechnology Center (NNC), Ministry of Science, Technology & Innovation (MOSTI), Malaysia	03.8885 8669	014.813 5137	nurarifazleen.a@gmail.com/ nurarifazleen@mosti.gov.my
7	Dr.	Cik Rohaida Binti Che Hak	Senior Research Officer	Industrial Technology Division, Malaysian Nuclear Agency (MNA)	03.8911 2000	018.278 7006	crohaida@gmail.com/ @nuclearmalaysia.gov.my
8	Dr.	Rafeadah Binti Rusli	Senior Research Officer	Forest Products Division, Forest Research Institute of Malaysia (FRIM)	03.6279 7287	018.369 4798	rafeadah@gmail.com/ rafeadah@frim.gov.my
9	Dr.	Azira Binti Abd Aziz	Senior Research Officer	Science & Technology Latex Unit, Technology & Engineering Division, Malaysian Rubber Board (IGM)	03.6145 4435	019.230 2660	Azira.aziz@gmail.com/ azira@lgm.gov.my
10	Assoc. Prof. Dr.	Mohd Ambri Bin Mohamed	Research Fellow & Senior Lecturer	Institute of Microengineering and Nanoelectronics (IMEN), Universiti Kebangsaan Malaysia (UKM)	03.8911 8020	013.377 1320	ambrimohd@gmail.com/ ambri@ukm.edu.my

11	Prof. Dr.	Zainovia Binti Lockman	Director	Research Creativity & Management Office (RCMO), Research & Innovation Division, University Science Malaysia (USM)	04.653 6532	017.400 9194	zainovia@usm.my
12	Dr.	Wan Maisarah Binti Mukhtar	Senior Lecturer	Faculty of Science & Technology, Universiti Sains Islam Malaysia (USIM)	06.798 8780	018.777 9169	wmaisarahmukhtar@gmail.com /wmaisarah@usim.edu.my
13	Dr.	Ernie Suzana Binti Ali	Senior Lecturer	Faculty of Science & Technology, Universiti Sains Islam Malaysia (USIM)	06.798 6425	019.664 4481	ernie@usim.edu.my
14	Dr.	Syahida Binti Suhaimi	Senior Lecturer	Faculty of Science & Technology, Universiti Sains Islam Malaysia (USIM)	06.798 8451	012.989 2703	syahida@usim.edu.my
15	Dr.	Affa Rozana Binti Abdul Rashid	Senior Lecturer	Faculty of Science & Technology, Universiti Sains Islam Malaysia (USIM)	06.798 6425	012.663 7808	affarozana@usim.edu.my
16	Dr.	Izan Izwan Bin Misnon	Director & Senior Lecturer	Center for Advanced Intelligent Materials, Universiti Malaysia Pahang (UMP)	09.549 2386	013.922 1487	izan.izwan@gmail.com / iezwan@ump.edu.my
17	Mr.	Salifairus Bin Mohammad Jafar	Senior Science Officer	Institute of Science, MARA University of Technology (UiTM)	03.5544 3875	012.290 0212	salifairus@uitm.gov.my
18	Ts. Dr.	Mohd Hafiz Bin Arzmi	Deputy Dean	Department of Fundamental Dental & Medical Sciences, Destistry College, International Islamic University Malaysia (IIUM), Kuantan Campus	09.570 5457	013.260 1445	hafizarzmi@gmail.com / hafizarzmi@iium.edu.my
19	Assoc. Prof. Dr.	Noor Aniza Binti Harun	Lecturer	Department of Chemical Science, Universiti Malaysia Terengganu (UMT)	09.668 3317	016.447 1410	nooraniza@umt.edu.my

The photos of the training program are shown below.



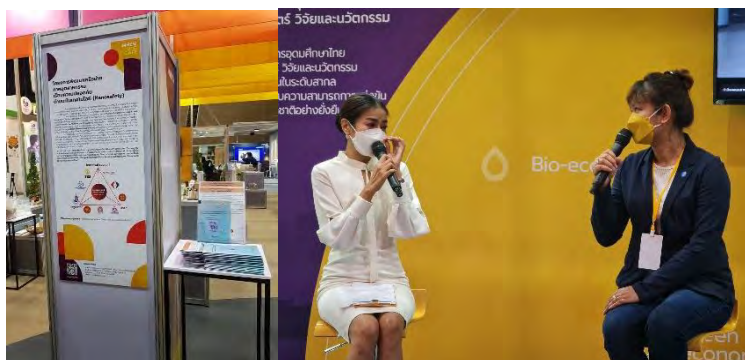
Coordinators:

Dr. Wannee CHINSIRIKUL (NANOTEC, Thailand)

Dr. Paul WRIGHT (RMIT, Australia)

1. Nanosafety exhibition and brief discussion on Nanosafety and Sustainability at FIT EXPO 2022

On 1 July 2022 Nano-Safety Network for Industry join the FTI EXPO 2022: SHAPING FUTURE INDUSTRIES at Chiang Mai International Exhibition and Convention Center. The Federation of Thai Industries (FTI), in collaboration with leading corporate partners, host FTI Expo 2022. In the event, Nanosafety network participated in the exhibition and gave a brief talk about how Nanosafety supports Nanotechnology development and sustainability, as well as the Nanosafety network in Thailand and internationally.



2. Thailand Nanosafety and Nanotechnology Ethic implementation.

On 5 August 2022 in The third international conference on science and technology of emerging materials (STEMa2022) host by King Mongkut's Institute of Technology Ladkrabang. NANOTEC join the talk in Nanomaterials session on the topic Thailand Nanosafety and Nanotechnology Ethics implementation. Nanotechnology is one of the technologies that drive the world to the future especially on the alternative energy and energy sector. However, the nanosafety is the important part of the technology development. It is critical that all stakeholders are aware of nanosafety from the beginning of the supply chain to the end products, as well as how to apply nanosafety from upstream to downstream production.



3. Seminar on Nanosafety for Industry and environment

On September 16, 2022, the Department of Industrial Works (DIW) and NANOTEC organizer seminar on the topic of Nanosafety for industry and environment in the Annual Conference on Thailand Green Industries for Safety and Sustainability at the Queen Sirikit National Convention Centre in Bangkok. The seminar on Nanosafety for Industry and the Environment topic is divided into three parts. To begin, nanotechnology is a solution for carbon capture and utilization in order to combat the global crisis. Second, how can nanotechnology be used safely for the producer, worker, and user? Finally, there is legislation and regulation concerning emerging technology for industry.



4. 12th GLOBAL SUMMIT ON REGULATORY SCIENCE (GSR22) October 2022

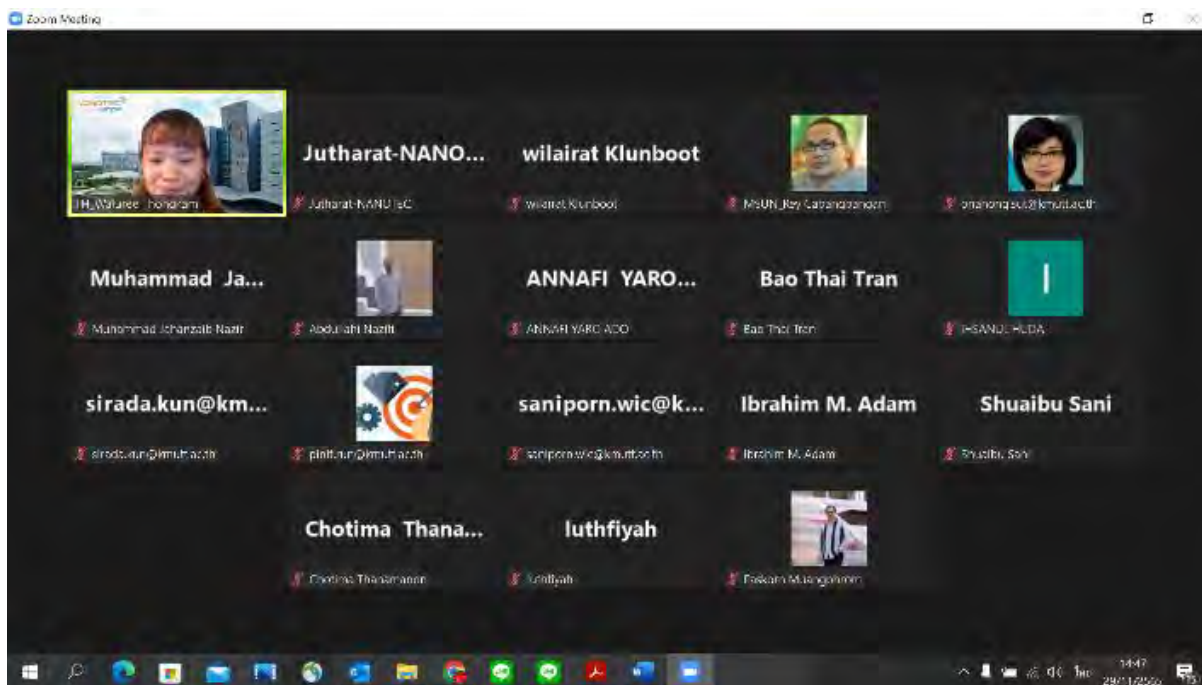
The 12th annual Global Summit on Regulatory Science (GSR22) held in Singapore from October 19-21, 2022. The Singapore Food Agency (SFA) and the Global Coalition of Regulatory Science and Research co-hosted the event (GCRSR). GSR22: Nanotechnology Advances for Food and Medical Products: Innovations, Safety, and Standards There are nine sessions and three workshops. Dr. Wannee Chinsirikul and Dr. George Kass co-chaired Session 8: Nanotechnology in Agri-products and Feed, and Dr. Waluree Thongkam spoke in Session 5: Progress in Nanotechnology Standards about the development of national nanotechnology standards and guidelines in Thailand. The purpose of the conference is to discuss and exchange perspectives on the development of nanosafety and nanotechnology standards, as well as to facilitate cross-stakeholder dialogue.





5. NANOTEC –KMUTT Nanosafety online workshop

On November 29, 2022, the National Nanotechnology Center (NANOTEC), the National Science and Technology Development Agency (NSTDA), and the College of Nanotechnology at King Mongkut's University of Technology Thonburi (KMUTT) will hold nanosafety workshops to assist international students and researchers in understanding and being aware of nanotechnology safety issues. Nanotechnology and engineered nanomaterials have recently had a huge impact on industries ranging from electronics, construction, coating, to food and medical technologies. Nonetheless, nanosafety must evolve alongside nanotechnology to ensure the technology's long-term viability as well as society's trust.



6.Seminar on NanoQ and consumer trust & NanoQ Certificate Awarding Ceremony

The Nanotechnology Association of Thailand, in collaboration with NANOTEC and the Nanosafety Network for Industry, host a seminar on NanoQ and consumer trust on December 2, 2022, followed by a certificated awarding ceremony at The Sukosol Hotel in Bangkok. The event begins with an opening remake by Dr. Wannee Chinsirikul, followed by the chairman of the NanoQ working group introducing three new Nanolabels in the NanoQ series (raw materials, intermediate, and encapsulation). The second presentation is about nanotechnology reference materials and the importance of measurement. Representatives from the Consumer Protection Board, the Thai Industrial Standard Institute, and six companies attend the seminar session to share their knowledge and experience about consumer trust and public perception of NanoQ. To qualify for NanoQ, companies must submit the results of nanomaterial testing as well as worker safety practices during the manufacturing process. At the conclusion of the event, representatives from six companies were awarded NanoQ certificates.



Coordinators:

Dr. Rezal Khairi AHMAD (NanoMalaysia, Malaysia)

Mr. Alexander POGANY (BMK, Austria)

Dr. Jun'ichi SONE (JST, Japan)

ANF Commercialization Working Group was formed at ANF Summit 2015 in Singapore. To facilitate realization of economic value of Nanotechnology Research & Development through

- Commercializing demand driven and technology push initiatives.
- Partnering industry and society for sustainable development of ANF member economies.

Commercialization Workshops were organized as follows.

- ANF Summit 2017 (Malaysia) – Pilot
- At Nanotech 2018 (Japan)
- ANF Summit 2018 (Taiwan)
- At Nanotech 2019 (Japan)
- ANF Summit 2019 (The Philippines)
- At Nanotech 2020
- ANF Summit 2020 (Austria – Virtual)
- ANF Summit 2021 (Thailand – Virtual)
- ANF Summit 2022 (Malaysia – Hybrid)

Asia Nano Forum (ANF) Summit 2022 Commercialization Workshop

The Asia Nano Forum (ANF) Workshop on Commercialization 2022 was organized during the 19th Asian Nano Forum Summit 2022 (ANFoS2022) on 19 July 2022 hosted by National Nanotechnology Centre, MOSTI and NanoMalaysia (MALAYSIA). The Workshop was co-organized by NanoMalaysia and National Nanotechnology Centre, in collaboration with the ANF Commercialization Working Group.

The program of the ANF Workshop on Commercialization and the result of this workshop are shown below.

The Program of the ANF Workshop on Commercialization

COMMERCIALIZATION WORKSHOP at ANFoS2022, Kuala Lumpur			
Malaysia Time GMT+8	Program for ANF Workshop on Commercialisation (Malaysia Time 10.00am-12.30pm)		
10.00am – 10.10am	Welcome Remark by Dr. Rezaal Khairi Ahmad, ANF Vice President and CEO of NanoMalaysia	11.00am – 11.10am	6. Datin Ts. Dr Rozzeta Dohah, MIT (Malaysia) – Physical Topic: Nanotechnopreneur: The New Paradigm Of Research-to-Revenue
	Session 1 – Policy Presentations by Members, Business/Tech Presentation, IP Presentation (Each Presentation at 10 mins each)	11.10am – 11.20am	7. Mr. Chor Chee Hoe, Qarbo Tech (Malaysia) – Physical Topic: Harnessing Light Using Sustainable Technologies To Combat Climate Crisis
10.10am – 10.20am	1. Mr. Sharizal Shaarani, NanoMalaysia Berhad (Malaysia) – Physical Topic: Climate Tech Venture Building - Challenges & Opportunities	11.20am – 11.30am	8. Dr. Jerome Palaganas, Nanotronics (Philippines) – Virtual Topic: Commercializing Nanotechnology Materials: A Case Of A Philippine Start Up
10.20am – 10.30am	2. Prof. Nurul Taufiq Rochman, Nano Center Indonesia (Indonesia) – Physical Topic: Commercialization Nanotechnology In Indonesia	11.30am – 11.40am	9. Ahmad Rizal, National Technology & Innovation Sandbox (Malaysia) – Physical Topic: TBC
10.30am – 10.40am	3. Mr. Khairul Effendi B Khairul Amal, Floraponics Farm Malaysia (Malaysia) – Physical Topic: Aquaponic Smart Farming	11.40pm – 12.20pm	Discussion and Q&A
10.40am – 10.50am	4. Dr. Palsan Khanchairit, National Nanotechnology Center (NANOTEC) (Thailand) – Physical Topic: Microspike Technology for cosmetics products and medical devices	12.20pm – 12.30pm	Closing Remark by Dr. Rezaal Khairi Ahmad, ANF Vice President and CEO of NanoMalaysia
10.50am – 11.00am	5. Mr. Tee Lin Yik, Valuing IP (Malaysia) – Virtual Topic: Managing and Valuing Intangible assets	12.30pm	Session Ends



The result and the photo of the ANF Workshop on Commercialization

Attendance: 50

On-Site Presenters:

- Thailand
- Indonesia
- Malaysia

Virtual:

- The Philippines

Micro-Nanoneedle (Thailand)
- Vaccine, Beauty Mask (Malaysia)

Quantum Dot (Malaysia)
Nanobubble (Indonesia)
- Aquaponic (Malaysia)

ANF IP Exchange Platform

Start-ups and SMEs to form consortium

ANF Summit Report

| ANFoS2022 at Malaysia



Minutes of the 15th Annual General Meeting

The 19th Asia Nano Forum Summit (ANFoS2022)

in conjunction with

The 5th EU-Asia Dialogue on Nanosafety

“International Network Initiative on Safe & Sustainable Nanotechnology (INISS-NANO)”

OFFICE BEARERS

(by designation and alphabetical order of name)

President

Wannee CHINSIRIKUL (NANOTEC, Thailand)

Vice Presidents

Annabelle V. BRIONES (ITDI, The Philippines)

Rezal Khairi AHMAD (NanoMalaysia, Malaysia)

Treasurer

Shuhei NUMAZAWA (JST, Japan)

Secretaries

Jason C.S. CHANG (Academia Sinica, Taiwan)

Pavadee AUNGKAVATTANA (NANOTEC, Thailand)

EXECUTIVE COMMITTEE

(by alphabetical order of economies, one from each organization)

Alexander POGANY (BMK, Austria)

M.A. SHAH (NIT, India)

Pushplata SINGH (TERI, India)

Ali BEITOLLAHI (INIC, Iran)

Toshihiko KANAYAMA (AIST, Japan)

Jun'ichi SONE (JST, Japan)

Yasuo KOIDE (NIMS, Japan)

Byung-ki CHEONG (GTCK, Korea)

Rezal Khairi AHMAD (NanoMalaysia, Malaysia)

Ruslinda A. RAHIM (NNC, Malaysia)

Annabelle V. BRIONES (ITDI, The Philippines)

Ting-Kuo LEE (Academia Sinica, Taiwan)

Wannee CHINSIRIKUL (NANOTEC, Thailand)

Tran Dai LAM (VAST, Vietnam)

Date Tuesday, 19th July 2022

Time 14:30 – 17:30 (MYT, GMT+8:00)

Venue Hilton Kuala Lumpur, Malaysia and
online meetings via zoom

Chair Wannee CHINSIRIKUL, President

Prepared by Pavadee AUNGKAVATTANA, Secretary

Vetted by All members present

Approved by Wannee CHINSIRIKUL

Members present (by alphabetical order of economies)

Ali BEITOLLAHI (INIC, Iran)

Ali MARJOVI (INIC, Iran)

Toshihiko KANAYAMA (AIST, Japan)

Emi TAKENAKA (AIST, Japan)

Yukio KIMURA (AIST, Japan)

Jun'ichi SONE (JST, Japan)

Shuhei Numazawa (JST, Japan)

Yasuo KOIDE (NIMS, Japan)

Jiyeun JUNG (KoNTRS, Korea)

Rezal Khairi AHMAD (NanoMalaysia, Malaysia)

Ruslinda A. RAHIM (NNC, Malaysia)

Annabelle V. BRIONES (ITDI, The Philippines)

Jason C.S. CHANG (Academia Sinica, Taiwan)

Tsing-Tang SONG (ITRI, Taiwan)

Wannee CHINSIRIKUL (NANOTEC, Thailand)

Pavadee AUNGKAVATTANA (NANOTEC, Thailand)

Waluree THONGKAM (NANOTEC, Thailand)

Benyapa SUWAN (NANOTEC, Thailand)

Wipaporn EKAMORNTHANAKUL (NANOTEC, Thailand)

Khanittha SAENGMANEE (NANOTEC, Thailand)

Secretariat assistant

NANOTEC International Collaboration Section



Summary of Meeting

I. Welcome Remarks

Dr. Rezal Khairi AHMAD, ANF Vice President, as the host country, welcomed all ANF members and pleased to host the ANF Summit. The 5th EU-Asia Dialogue on Nanosafety and ANF Workshop on Commercialization were organized as part of ANF Summit 2022. There were 50 participants comprising local attendees and international companies to attend the events. Next year he hopes to have a face-to-face meeting in Japan at nano tech 2023.

II. Opening Remarks

Dr. Wannee CHINSIRIKUL, ANF President, welcomed all ANF members to the 19th ANF Summit Meeting (hybrid meeting). She expressed her gratitude to the host (Dr. Ruslinda A. RAHIM (NNC/MALAYSIA) and Dr. Rezal Khairi AHMAD (NanoMalaysia, MALAYSIA) for the kind arrangement. She also appreciated the support from Dr. Alexander POGANY (BMK, AUSTRIA) and EU delegates for “The 5th EU-Asia Dialogue on Nanosafety (INISS-Nano)” which was considered a successful event that reflected the benefit of collaborations by the spirit of “network of networks”. She also complimented Dr. Rezal for the success of ANF Workshop on Commercialization. She expected that the AGM and ANF Working Group Presentation would be discussed among ANF members to encourage ANF members more efficiently in this meeting.

III. Roll Call

A roll call was conducted. 10 member organizations out of 14 member organizations presented and introduced themselves.

IV. Annual General Meeting (AGM, by Secretariat)

1. Introduction of the Agenda for the 19th Annual General Meeting

Dr. Pavadee AUNGKAVATTANA, ANF secretary, introduced the Agenda for the 19th Annual General Meeting. There were 8 Agenda Topics proposed for adoption by the meeting members. All the agenda topics were adopted without any changes, which is detailed in the attached file, **Annex A**.

2. Adoption of 18th ANF Summit Meeting Minutes (ANFoS2021)

Minutes of the last AGM which was held online in Thailand on 6 August 2021 was sent to all the members on 27 August 2021. The minutes were accepted without any amendments. In the meeting, the acceptance was proposed by Dr. Rezal Khairi AHMAD and seconded by Dr. Ruslinda A. RAHIM. Minutes of the last AGM were circulated to all members prior to this meeting and are attached in **Annex B**.



3. Financial Statement of Year 2022 (January-July 2022)

Dr. Shuhei NUMAZAWA, ANF treasurer, reported the balance of all ANF bank accounts updated as of 14 July 2022, which consisted of SGD & USD accounts in Singapore and USD & JPY accounts in Japan. The total was 87,770.62 USD. The balance had increased since past years major activities were online during the COVID-19. The income in DBS accounts in Singapore came from the ANF membership fee. The expenses in SMBC account in Japan consisted of account fees and a budget for organizing the ANF Symposium on User-Facility Network in Asia in January 2022. Dr. Wannee CHINSIRIKUL mentioned that we should have more activities related to the new initiatives from ANF ExCo members next year. Dr. Wannee then proposed, and Dr. Jason CHANG seconded this agenda item.

4. ANF Membership Current Status

Dr. Pavadee AUNGKAVATTANA, ANF secretary, reported that currently ANF has 14 active members. She highlighted that ANF secretariat team has sent the invoices for membership fees 2022 since January to these economies (NIT/INDIA, TERI/INDIA, INIC/IRAN, NIMS/JAPAN, and KoNTRS/KOREA). Dr. Wannee CHINSIRIKUL gave a warm welcome to Dr. M.A. SHAH, NIT, INDIA, new ANF member joined in May 2, 2022.

5. Updating the proposed initiatives from ANF ExCo Members

Dr. Rezal Khairi AHMAD, presented on behalf of ANF Vice Presidents (Dr. Annabelle V. BRIONES and Dr. Rezal Khairi AHMAD), they would like to propose the initiative as follows.

- 1) Establish the dedicated portfolios to support the ANF president. Dr. Rezal Khairi AHMAD will be responsible for Commercialization working group, User-Facility Network working group and ANF Growth Strategy whereas Dr. Annabelle V. BRIONES will be responsible for Standardization working group, Nanosafety & Risk Management working group and ANF Organizational Excellence.
- 2) Review of the structure and members of the working groups.
- 3) Joint R&D among the ANF member countries
 - 3.1) ANF funding by providing matching seed fund which source from ANF membership fee.
 - 3.2) Aligning existing and new R&D projects with similar themes towards common goals.
- 4) Travel grant/sponsorship of members should be reviewed according to the existing criteria and the approval SOP. The new version of the existing criteria and the approval SOP are being drafted by ANF Vice Presidents.



5) Thesis Grant for PhD students working on Nanotechnology is to support a financial statement to PhD students on focus areas-common denominators in Asia. The criteria is being drafted and will present to ANF President at some stage. The updates of new initiatives will be presented at the ANF ExCo meeting in Japan next year. Dr. Ali BEITOLLAHI commented that ANF funding is limited while R&D projects have high expenses. Dr. Jun'ichi SONE commented that the new initiatives for items no. 3-5 are difficult to conduct spontaneously and to prioritize. Moreover, it might need some other funding support and the budget distributions are necessary to be considered. Dr. Rezal Khairi AHMAD responded that item no.3 would be the first priority beyond the ANF matching fund while aligning existing and new R&D projects with similar themes toward common goals on the topics such as hydrogeneration. Dr. Shuhei NUMAZAWA added that JST has the e-ASIA, international funding, that is related to item no.3. More comments will be discussed in the next ANF ExCo meeting.

6. ANF's participation in nano tech 2023, Japan

Dr. Jason CHANG, ANF secretary, presented that nano tech is an annual exhibition at Tokyo Big Sight, Japan. The event is held annually in January or February. In general, ANF members will meet at ANF ExCo meeting and usually, 2 booths are reserved to welcome the visitors and also exhibit showcase of ANF members at the Pavilion. In the next year, nano tech 2023 will be held on February 1 – 3, 2023 (3-days event). We must decide which ANF will participate physically or online in order to preserve the meeting room and the booth. The exhibition fee for 1 booth (raw space only) is ¥198,000/9m². Dr. Jason CHANG suggested that if ANF would like to reduce the cost, ANF should have only one booth. However, 50% payment of exhibition fee should be applied within 30 September 2022. Dr. Ali BEITOLLAHI questioned that how to enhance the efficiency of our participation in ANF activities. Dr. Rezal Khairi AHMAD commented that from his experience, there were not many visitors who visited the ANF booth. Therefore, we should have different models to promote ANF, for example, discussions, and workshops. Dr. Wannee CHINSIRIKUL summed up that during nano tech 2023, ANF might be able to have one or two booths, the ANF ExCo meeting, and some activities of two working groups (ANF User-Facility Network and ANF Commercialization). More details would be discussed in the next ANF Office Bearers meeting.

7. Call for application of Host Country for the ANFos2023

Dr. Pavadee AUNGKAVATTANA reported on the history and timeline of ANF Summit host countries since 2004. She informed that Japanese colleagues might not be able to organize the ANF Summit in 2023 as they have informed the secretariat team via email. Dr. Pavadee then proposed BMK/AUSTRIA (Mr. Alexander POGANY) to host ANFos2023



because the 6th EU-ASIA dialogue on Nanosafety will be held in Berlin, Germany in June 2023. Dr. Rezal Khairi AHMAD and Dr. Yasuo KOIDE agreed with Dr. Pavadee. Dr. Jun'ichi SONE suggested that NIT, INDIA who is the new ANF member might be interested to be the host. In addition, Dr. Wannee CHINSIRIKUL also mentioned that KoNTRS/KOREA could be the host of the ANF Summit 2023 as well. Miss Jiyun JUNG acknowledged the proposal of Dr. Wannee, and she will inform the authorized person from KoNTRS and come back to report the meeting accordingly.

8. Summary of the 5th EU-ASIA Dialogue on Nanosafety and update for the upcoming events: 6th EU-ASIA Dialogue on Nanosafety

Dr. Ruslinda A. RAHIM reported on the 5th EU-ASIA dialogue on Nanosafety in the theme of “International Network Initiative on Safe & Sustainable Nanotechnology (INISS-Nano)” which was held on 18 July 2022 (hybrid event). Dr. Ruslinda further reported that there were 3 keynote speakers from the Netherlands, Thailand, and Malaysia. The 4 breakout sessions are Harmonization, Support Industrial Understanding, Sharing/Facilitate Sharing or Resources/ Infrastructure and Ethical Aspects. The summary of the 4 breakout sessions were as follows.

- 1) Funds for implementation for INISS-Nano: workshops and training regarding INISS-Nano might be assisted by ANF.
- 2) Sharing of technical data on nanomaterials: focusing on the registration with European Chemicals Agency (ECHA) account. Some suggestion that the study or testing of nanomaterial among SMEs in each economy is duplicated and could be better systematically.
- 3) Product Certification: this idea is voiced for the harmonization of regulatory, the guidance for nano product registration and certification. It should be one of the harmonization among the Asia countries.
- 4) Validated test method: EU offered Asia to participate in Malta initiative.

According to Dr. Ruslinda, the 6th EU-ASIA dialogue on Nanosafety will be held during 21-22 June 2023, in Berlin, Germany.

9. Others

1) Secretariat activities between January to July 2022

Dr. Pavadee AUNGKAVATTANA reported the secretariat activities between January to July 2022. There are 11 activities within 8 months. Dr. Wannee CHINSIRIKUL added that the 3rd ANF Office Bearers Meeting would be held in September 2022 to follow up on management of ANF Summit 2022.

2) ANF country experiences on Nano informatics and latest trends

Dr. Ali BEITOLLAHI proposed his idea to organize the ANF workshop on Nanoinformatics



as a hybrid event during ANF Summit 2023. This is because the role of informatics in both knowledge generation and knowledge management in nanoscience and nanotechnology are increasing. The event for experience exchange would be a good initial step for further collaboration in this emerging area in Asia. The scope of nano informatics is computational nanomaterial modeling and exploration, data-driven research, data & knowledge management. ANF member economies are contributors. Dr. Rezal fully supported this idea. Dr. Ruslinda suggested that Japan could be a role model for how to set the ARIMA model. Dr. SONE will discuss this workshop with Japanese members. Dr. Shuhei NUMAZAWA shared the recently e-ASIA Joint Research Program open call regarding nanoinformatics so he will share the useful information for ANF. Before the workshop, Dr. Wannee suggested Dr. Ali to keep communicating with Dr. SONE.

V. Working Group Activities

1) Standardization Working Group

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

3 main topics were reported by Dr. Tsing-Tang SONG as follow.

1.1 ISO/IEC Standards activities:

- Dr. Tsing-Tang SONG updated ANF members on ANF Standards activities at ISO and IEC. There are two external liaisons from ANF. One is Prof. Ali BEITOLLAHI (Iran), who is the Type-A Liaison of ISO/TC 229 (International Organization for Standardization TC229 Nanotechnologies). The Type-A liaisons can suggest and comment on the new work items but cannot vote. Another one is Dr. Bin-Cheng YAO (Taiwan), who is the Type-C Liaison of IEC/TC 113 WG3 (International Electrotechnical Commission TC 113 Nanotechnology for electrotechnical products and systems WG3). The Type-C liaisons mean they can only be an observer.
- Dr. Tsing-Tang SONG also presented the status of the new project in ISO/TC 229 WG5 to ANF members that he and Dr. Jiang-Jen Lin (Taiwan) submitted a proposal to ISO/TC 229 to the ISO in January 2020. The project was approved for registration as TS 4971 in April 2021 with the title "Performance Evaluation of Nanosuspension Containing Clay Nanoplates for Quorum Quenching." This document was specific performance evaluation of nanosuspension containing clay nanoplates for quorum quenching in crop production but did not cover safety and environmental aspects. The project proposed two measurement methods which were the measurement of the characteristics of clay nanoplate and the



performance of quorum quenching. The International Standard of ISO/TS 4971 are expected to be published on 9 April 2024. The benefits/ impacts of the standard for quality control for the clay nanoplate were as follows.

- The antimicrobial efficacy of clay nanoplates could be measured and predicted.
- Apply to inhibit the growth of pathogenic bacteria for crop protection from diseases.
- Plant environmentally friendly crops, reduce the use of chemicals, and increase the harvest yield.
- Dr. SONG further reported that Dr. Bin-Cheng Yao and himself attended IEC/TC 113 WG3 interim meeting 2022 on 20 April 2022 and he and Prof. Ali and attended ISO/TC 229 WG5 interim meeting 2022 during 9-13 May 2022.

1.2 Ongoing ISO/TC 229 standards under the leadership of ANF members

Dr. SONG summarized the list of ongoing ISO/TC 229 standards which were proposed by Taiwan, Iran, Japan, Korea and Malaysia.

1.3 Published National Standards in ANF member (2021-present)

19 published standards in Austria, 15 published standards in Iran, 8 published standards in India, 2 published standards in Japan, 15 published standards in Korea, 2 published standards in Malaysia, and 40 published standards in The Philippines. 15 draft standards which will be approved by the Industrial Product Standards Council in 2022.

- Dr. SONG said that he is willing to continue to work with ANF experts to develop nanotechnology standards in ISO/TC 229 and IEC/TC 113. He planned to promote the potential of the harmonized standards in ANF. He also mentioned that ISO/TC 229 meeting is expected to be held annually in November.
- Prof. Ali BEITOLLAHI expressed gratitude to Dr. SONG for his kindness and hard work on ANF Standardization Working Group. He requested all ANF members to gather the data related to ISO/TC 229 to Dr. SONG for making ANF annual report and report to the ISO meeting.
- Dr. Pavadee mentioned that the ANF secretariat would post the list of ongoing ISO/TC 229 standards under the leadership of ANF members and all published National Standards in ANF member countries from 2021 until the present on the ANF website.
- Dr. Wannee stated that the ANF secretariat would remind all ANF members to report any activities of their countries related to ISO/TC 229 to Dr. SONG within 30 September 2022. She also agreed with Dr. Pavadee to publish the information



on the ANF website because it is the way to stimulate ANF members to see the progress of ANF working group and hoped ANF members to have more engagement.

2) User-Facility Network

Coordinators: Dr. Yasuo KOIDE (NIMS, Japan)

- Dr. Yasuo KOIDE reported on the 2022 Symposium on User-Facility Network in Asia at Tokyo Big Site (hybrid symposium) on 27 January 2022. The event was organized by User-Facility Network Working Group. The summary of the program and all attendees are as follows.

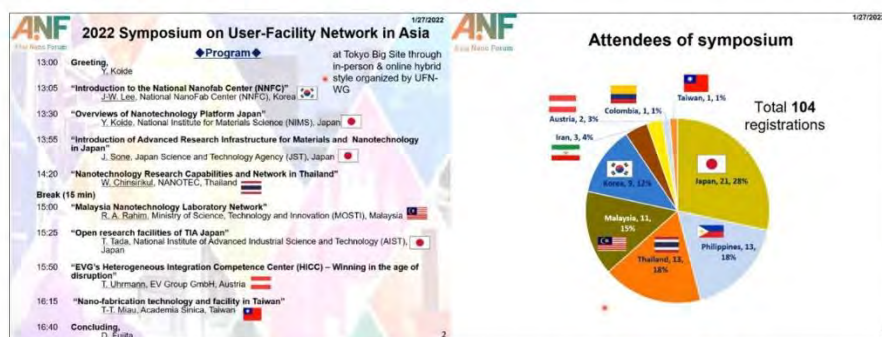


Figure 1 The summary of the program and all attendees participated in the 2022 Symposium on User-Facility Network in Asia

- Dr. KOIDE informed that he agreed to organize the 2023 Symposium on User-Facility Network in Asia. Dr. Wansee expressed her gratitude to Dr. KOIDE for his report on User-Facility Network Working Group. She stated that it was a productive symposium, we could clearly see from the attendee's statistic. She also thanked Dr. KOIDE for accepting to organize the 2023 Symposium on User-Facility Network in Asia.
- In addition, Dr. KOIDE would like to recruit more coordinators for User-Facility Network Working Group because he is the only coordinator in this working group. He invited Dr. Ruslinda A. RAHIM to be one of the coordinators of the User-Facility Network Working Group.
- Dr. Ruslinda accepted to be one of the coordinators of the User-Facility Network Working Group. She mentioned that it would be great to work with Dr. KOIDE in this working group. She also suggested that in the next coming years of this working group, we could focus on R&D projects. She believed that the exchange of the researcher and scientists are a bit difficult, but we could exchange the technologies among the researchers.



- Dr. Ali BEITOLLAHI thanked Dr. KOIDE for his great work on User-Facility Network. He also suggested that if we could move to more specific areas, such as nanosafety, material characterization, and crystal characterization, this would give a lot of possibility for the experts who work in the same area to exchange their experience with the challenges, and the standard. It could link to some standardization activities. Fortunately, Japan is acting as a convener of the characterization group of ISO/TC 229. There were some possibilities of joining activities toward standards development in the long term. We could have much more focused topics and specific players in this area to work with each other in the 2023 Symposium on User-Facility Network.
- Dr. KOIDE thanked Dr. Ali for his comments. He mentioned that the characterization technique was very importance for such kind of user-facility, and he agreed with the idea of wide range of characterization and nanosafety.
- Dr. Wannee thanked both Dr. KOIDE and Dr. Ali. She also stated that in the 2023 Symposium on User-Facility Network, we could combine this workshop/symposium if we could drive toward more specific topics. This could be combined with the initiative which conducted by Dr. Rezal Khairi AHMAD and Dr. Annabelle V. BRIONES. We could talk about the exchange, sharing, and funds from ANF to help our R&D. In addition, we could explore more on how we can combine these two initiatives with the User-Facility Network Working Group in more specific topics. Dr. Rezal agreed with Dr. Wannee for her comments and would discuss more in the next ANF Office Bearers meeting.

3) Nanosafety and Risk Management

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

- On behalf of the working group's coordinators, Dr. Waluree THONGKAM (NANOTEC, Thailand) presented a report on the objectives and previous activities related to Nano Safety & Risk Management. The objectives of this working group are as follows.
 1. Coordinate nanosafety activities in the region through the Asia Nano Safety networks
 2. Training on nanosafety
 3. Design approach to nanotechnology development and translational nano research to the marketplace.
 4. Coordinate and engage with nanosafety and risk management issues.

The previous working group activities are as follows.

 - "Nanosafety Forum on country experiences and predictive model development



for safety guidelines and standardization" organized by NANOTEC (Thailand) in conjunction with the 18th Asia Nano Forum Summit in August 2021.

- "NANOFORAGRI 2021: Technology readiness and overcoming regulatory barriers to implement nanotechnology-enabled agriculture for sustainable future". The event was organized by TERI/INDIA in December 2021. Dr. Waluree was invited as one of speakers in this seminar.
- "The 3rd virtual International Network Initiative (INISS) meeting" was held in November 2021. The event was led by Dr. Alexander POGANY (BMK, Austria). According to the network of networks concept, the concept paper prepared the ecosystem for global collaboration in selected fields of action which consist of 4 pillars:
 - 1) Harmonization (Standardization efforts and Transfer of science into policy and regulation)
 - 2) Support industrial understanding
 - 3) Sharing Facilitate/infrastructures and
 - 4) Ethical aspects
- "Nanotechnology: Bioactive compound and safety testing model" in conjunction with the 7th Thailand International Nanotechnology Conference was organized by NANOTEC (Thailand) and Nanotechnology Association of Thailand in December 2021.
- Dr. Waluree updated that since NANOTEC became the Standard Developing Organization (SDOs), NANOTEC worked closely with the Thai Industrial Standards Institute (TISI) to develop National Nanotechnology Standard for the industry, especially the Nano-encapsulated particles (Herbal extraction), such as the Black Galingale Extract Nano-Encapsulated Particles standard in 2021. The Plai Extract Nano-Encapsulated Particles and Capsicum Extract Nano-Encapsulated Particles standards are in process in 2022. After TISI announces these two standards, Dr. Waluree will send the information to Dr. SONG as soon as possible. In addition, NANOTEC has industrial network development projects in nanosafety, seminars/training courses, and guidelines for the industry.
- Dr. Waluree stated that the committee of SDOs for reviewing the national standards comprises of three stakeholders at least namely technical & academic, regulator, and user (Industry). Their role is to review national standards. She stated that the goal of the Industrial Network Development Project in Nanosafety is to create a trusting environment in which regulators, academics, and users can express their ideas about the standards. We need to set up the standard which is good to make it happen. Moreover, it is essential to convince many stakeholders



understand its benefits.

- Dr. Waluree further updated on activities related to nanosafety network for the industry in Thailand which are as follows.
 - "Seminar on Guideline to reduce nanomaterial exposure during production process" which was organized on 14 October 2021.
 - "Nanosafety: Small dust and Covid-19 situation" which was organized on 18 November 2021.
 - "Seminar: Federation of Thailand Industries" which was organized on 28 October 2021.
 - "Nanosafety Lecture in King Mongkut's Institute of Technology Ladkrabang" which was organized on 15 March 2022.
 - "NSTDA Annual Conference (NAC 2022) Guidance on specifying manufactured nanomaterials, Guidance on nanomaterial risk evaluation and How to apply for volunteer industrial standard" which was organized on 29 March 2022.
 - "Nanosafety Lecture in NRH Princess Chulabhorn College of Medical Science under PSMC program" which was organized on 17 May 2022.
 - "Federation of Thailand Industries visit Nanoparticles and Cosmetic Production Plant (ASEAN GMP) at NANOTEC and NSTDA Characterization and Testing Service Center (NCTC) at NSTDA" which was organized on 30 May 2022.
 - "Online Seminar on NanoQ and Nanosafety for King Mongkut's University of Technology Thonburi" which organized on 31 May 2022.
 - "Promote Nanosafety Guidelines and Standards in FTI EXPO 2022" which was organized during 30 June to 1 July 2022.
 - The handbook (Easy to read version) and mobile application have been developed by NANOTEC and Department of Industrial Works, Thailand.
 - The video record for an e-learning course on the Federation of Thai Industries Academy platform have been developed under the cooperation of the nanosafety network for the industry in Thailand.
- Dr. Waluree also informed the upcoming events related to nanosafety network for the industry in Thailand which are as follows.
 - Department of Industrial works annual conference 2022 in September on "Nanosafety: Industry and environmental."
 - Nano Thailand 2023 event is the future plan which NANOTEC will invite speakers form ANF countries to participate in Nanosafety session.
- Dr. Wannee expressed her gratitude to Dr. Waluree for serving as a representative



of the Nanosafety and Risk Management Working Group coordinators in presenting all activities.

- Dr. Ali BEITOLLAHI complimented Dr. Wannee on her excellent work. He stated that it is critical to educate the industry on the advantages of nanosafety. It is a good model for other ANF countries.

4) Commercialization

Coordinators: Dr. Rezal Khairi AHMAD (NanoMalaysia, Malaysia),

Mr. Alexander POGANY (BMK, Austria), and Dr. Jun'ichi SONE (JST, Japan)

- Dr. Rezal Khairi AHMAD introduced the background of ANF commercialization Working Group and summarized some activities. ANF Commercialization Working Group was formed at ANF Summit 2015 in Singapore to facilitate realization of economic value of Nanotechnology Research and Development. The working group organized the pilot workshop in 2017 in association with ANF Summit in Malaysia. There are a series of workshops at nano tech 2018 (Japan), ANF Summit 2018 (Taiwan), nano tech 2019 (Japan), ANF Summit 2019 (The Philippines), nano tech 2020 (Japan), ANF Summit 2020 (Austria, virtual), ANF Summit 2021 (Thailand, virtual), and ANF Summit 2022 (Malaysia, hybrid).
- According to Dr. Rezal, the Asia Nano Forum (ANF) Workshop on Commercialization 2022 (hybrid) was organized in conjunction with the 19th Asian Nano Forum Summit 2022 on 19 July 2022. The workshop was co-organized by National Nanotechnology Centre, MOSTI, and NanoMalaysia (Malaysia) in collaboration with the ANF Commercialization Working Group. The speakers were representatives from companies and research institutes from Indonesia (Nano Center Indonesia), the Philippines (Nanotronics), Malaysia (NanoMalaysia Berhad, Floraponics Farm Malaysia, Valuing IP, MIT, Qarbo Tech and National Technology & Innovation Sandbox), and Thailand (National Nanotechnology Center). There were about 50 attendees.
- Dr. Rezal mentioned the following technologies and projects as being highlighted.
 - Micro-Nanoneedle (Thailand) integrated with Vaccine, Beauty Mask (Malaysia)
 - Quantum Dot (Malaysia) integrated with Nanobubble (Indonesia) and Aquaponic Smart Farming (Malaysia)
 - ANF IP Exchange Platform
 - Start-ups and SMEs to form consortium
- Dr. Rezal stated that the commercialization workshop 2023 will be held at nano tech Japan 2023, Tokyo which co-organized by Dr. SONE.
- Dr. Ali expressed gratitude to Dr. Rezal Khairi AHMAD for his continue efforts



and great energy. He had one suggestion about industrial challenges program. ANF should invite all companies among the ANF members economies to send the challenges problems that nanotechnology can serve to be the solution. Then, ANF can persuade the young researchers or students who can find solution of those challenges by some reward from companies. ANF should send the message to the active Asian Industries in nanotechnology area that ANF could facilitate companies and transfer of know how to these young talented researchers or students. We can set up the committee for validating the solution.

- Dr. Rezal thanked Dr. Ali for his comments. He also mentioned that the comment was very similar to the initiative proposal that he proposed to the ANF Office Bearers meeting. Therefore, ANF Office Bearers will discuss further in the details.

VI. Thank You Remarks

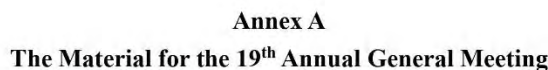
Dr. Annabelle V. BRIONES, Vice President of ANF, congratulated the National Nanotechnology Centre, MOSTI, and NanoMalaysia (Malaysia), the organizer of the 5th EU-Asia Dialogue on Nanosafety for a very successful event which was attended by many speakers from Europe and Asia. She also expressed gratitude to the ANF Office Bearers and coordinators of each working group.

VII. Closing Remarks

Dr. Rezal Khairi AHMAD thanked Dr. Wannee CHINSIRIKUL, Dr. Pavadee AUNGKAVATTANA, and all ANF members for participating in this 19th Asia Nano Forum Summit. He also complimented Dr. Ruslinda A. RAHIM for her contribution to the successful 5th EU-Asia Dialogue on Nanosafety and for arranging the Gala Dinner to all attendees. Dr. Rezal hoped that he and Dr. SONE would be able to host the commercialization workshop at Tokyo Big Sight next year. He thanked everyone for participating, both online and on-site event, and wished all the very best, safe, and hopefully, all members could meet again.

Dr. Wannee CHINSIRIKUL delivered her message to all ANF members and praised Malaysia for being the host country, especially our ANF colleagues, Dr. Rezal Khairi AHMAD and Dr. Ruslinda A. RAHIM, for the tremendous efforts to organize a great meeting. She also praised the ANF executive committees and members, as well as all participants, for their contributions to make this event a reality and a success. She expressed gratitude and appreciation for the valuable information in this AGM Summit meeting. She wished everyone and their family safe and good health.

There being no further proposal or other business to discuss, the meeting was adjourned at 17:30 Malaysia time (MYT, GMT+8:00).



19 July 2022, 14.00-17.30 hrs. (Malaysia Time, GMT+8)
Hilton Kuala Lumpur, Malaysia and ZOOM platform

++ Country Report will be presented in the ANF Annual Report due to the time limitation ++



End





Annex A (Cont'd)
The Material for the 19th Annual General Meeting

ANF
Asia Nano Forum

Welcome Remarks

Dr. Rezal Khairi Ahmad
ANF Vice President (Host Country)

3

ANF
Asia Nano Forum

Opening Remarks

Dr. Wannee Chinsirikul
ANF President

4



Annex A (Cont'd)
The Material for the 19th Annual General Meeting

Annual General Meeting

- A. Adoption of 18th ANF Summit Meeting Minutes (ANFoS2021)
- B. Financial Statement of Year 2022 (January – July 2022)
- C. ANF Membership Current Status
- D. Updating the proposed initiatives from ANF ExCo Members
- E. ANF's participation in nano tech 2023, Japan
- F. Call for application of Host Country for the ANFoS2023
- G. Summary of the 5th EU-ASIA Dialogue and update for the upcoming events:
6th EU-ASIA Dialogue on Nanosafety
- H. Others

A. Adoption of 18th ANF Summit Meeting Minutes (ANFoS2021)

Presented by Dr. Pavadee AUNGKAVATTANA

ANF Secretary



Annex A (Cont'd)
The Material for the 19th Annual General Meeting

**Minutes of the 18th Asia Nano Forum Summit
(The 14th Annual General Meeting)**

in conjunction with
"Nanosafety Forum on Country Experiences and Predictive Model
Development for Safety Guidelines and Standardization" and
"Asia Nano Forum Commercialization Workshop"

Date	Friday, 6 th August 2021
Time	13:10–16:00 (ICT, GMT+7:00)
Venue	Online meeting due to COVID-19 pandemic
Chair	Ting-Kuo LEE, President
Prepared by	Jason C.S. CHANG, Secretary
Vetted by	All members present
Approved by	Ting-Kuo LEE, President

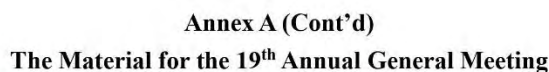


***ANF Secretariat 2020 – 2021
has circulated the draft minutes
of the 18th Asia Nano Forum
Summit to ANF members on
27 August 2021.***



**B. Financial Statement of Year 2022
(January – July 2022)**
Presented by Dr. Shuhei NUMAZAWA
ANF Treasurer



Accounts DBS & SMBC
Singapore Japan

	USD	SGD	JPY
1 USD	1.0000	1.3929	135.7900
1 SGD	0.7179	1.0000	97.0120
1 JPY	0.0074	0.0103	1.0000

* Av. Exchange Rates July 2022: (<https://eservices.mas.gov.sg/Statistics/msb/ExchangeRates.aspx>)



ANF@DBS	SGD Account #003-906884-0			USD Account #0003-004243-01-3			Remarks	Remarks+
	Withdrawal	Deposit	Balance	Withdrawal	Deposit	Balance		
January	40.00	4,000.00	36,034.81	7.35	2,951.00	33,097.49		
2022/1/12				1900/1/7	1908/1/29	1990/8/12	Membership Fee 2022 & Account Fee	Taiwan \ Academia Sinica
2022/1/21		1910/12/13	1998/10/6				Membership Fee 2022 & Account Fee	Japan \ AIST
2022/1/31	1900/2/9		1998/8/27				Advice Account Fee	
February	0.00	0.00	0.00	7.35	2,910.50	36,000.64		
2022/2/24				1900/1/7	1907/12/19	1998/7/24	Membership Fee 2022 & Account Fee	Austria \ BMK
March	0.00	0.00	0.00	14.59	1,969.00	37,995.05		
2022/3/15				7.26	501.00	36,494.38	Membership Fee 2022 & Account Fee	Philippines \ DOST ITDI
2022/3/30				7.33	1,468.00	37,995.05	Membership Fee 2022 & Account Fee	Thailand \ NANOEC
April	0.00	2,000.00	38,034.81	7.33	1,475.00	39,430.50		
2022/4/22				7.33	1,475.00	38,430.50	Membership Fee 2022 & Account Fee	Malaysia \
2022/4/28		2,000.00					Membership Fee 2022 & Account Fee	WANGMALAYSIA BERHAD
May	0.00	4,000.00	42,034.81	0.00	0.00	39,430.50		
2022/5/13		4,000.00	42,034.81				Membership Fee 2022 & Account Fee	Malaysia \ MOSTI
June	0.00	0.00	42,034.81	0.00	516.00	39,946.05		
2022/6/21					516.00	39,946.05	Membership Fee 2022 & Account Fee	Japan \ Japan Science and Technology Agency
								Japan \ Japan Science and Technology Agency
								Vietnam \ Institute of Space Technology

* Av. Exchange Rates July 1 2022: 1 SGD = 0.7179 USD (<https://eservices.mas.gov.sg/Statistics/msb/ExchangeRates.aspx>)





Annex A (Cont'd)
The Material for the 19th Annual General Meeting

B. Financial Statement of Year 2022 (January – July 2022) (cont'd)

Account Detail of SMBC (Japan)



ANF@SMBC		USD Account #000-xxxxxx-x (please fill the account number)			JPY Account #000-xxxxxx-x (please fill the account number)			Remarks	Remarks+
		Withdrawal	Deposit	Balance	Withdrawal	Deposit	Balance		
	January	0.00	0.00	0.00	0.00	0.00	0.00		
	February	0.00	0.73	16,737.80	0.00	2.00	478,003.00		
	2022/2/21					2.00	478,003.00	Mitsui Interest	
	2022/2/21		0.73	16,737.80					
2022	March	0.00	0.00	16,737.80	440.00	353,925.00	123,638.00		
	2022/3/9				440.00	353,925.00	123,638.00	2022 ANF Symposium on User-Facility Network in Asia & Handling Charge Fee	nano tech executive committee c/o JTB Communication Design, Inc.

* Av. Exchange Rates July,1 2022: 1 SGD =97.012 JPY (<https://eservices.mas.gov.sg/Statistics/msb/ExchangeRates.aspx>)



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C. ANF Membership Current Status
Presented by Dr. Pavadee AUNGKAVATTANA
ANF Secretary



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Annex A (Cont'd) The Material for the 19th Annual General Meeting

C. ANF Membership Current Status



ANN / Australian Nanotechnology Network, Australia (~2020)

BMK / Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, AUSTRIA

NIT/ National Institute of Technology Srinagar, INDIA (2022-)

TERI / The Energy and Resources Institute, INDIA (2021-)

INIC / Iran Nanotechnology Initiative Council, IRAN

AIST / National Institute of Advanced Industrial Science and Technology, JAPAN

JST / Japan Science and Technology Agency, JAPAN

NIMS / National Institute for Materials Science, JAPAN

KoNTRS / Korea Nano Technology Research Society, KOREA

NanoMalaysia Berhad, MALAYSIA

NNC / National Nanotechnology Centre, MOSTI, MALAYSIA

ITDI / Industrial Technology Development Institute, DOST, PHILIPPINES

Academia Sinica, TAIWAN

KMUTT / King Mongkut's University of Technology Thonburi, Thailand (~2020)

NANOTEC / National Nanotechnology Center, THAILAND

VAST / Vietnam Academy of Science and Technology, VIETNAM



C. ANF Membership Current Status (cont'd)



No.	ANF Member	Country	ATTN/Invoice*
1	BMK	Austria	Mr. Alexander POGANY
2	NIT	India	Dr. M. A. Shar
3	TERI	India	Prof. Pushpata SINGH
4	INIC	Iran	Prof. Ali BEITOLLAHI
5	AIST	Japan	Mr. Yukio KIMURA
6	JST	Japan	Dr. Junichi SONE
7	NIMS	Japan	Dr. Yasuo KOIDE
8	KoNTRS	Korea	Ms. Jiyun JUNG
9	NanoMalaysia	Malaysia	Dr. Reza Khairi AHMAD
10	NNC	Malaysia	Dr. Ruslinda RAHIM
11	ITDI	Philippines	Dr. Annabelle V. BRIONES
12	Academia	Taiwan	Mr. Randy CHANG
13	NANOTEC	Thailand	Miss Benyapa SUWAN
14	VAST	Vietnam	Dr. Tran Dai LAM

ANF Secretariat has sent the invoices to all ANF Members since January 2022.





Annex A (Cont'd)
The Material for the 19th Annual General Meeting



**D. Updating the proposed initiatives
from ANF ExCo Members**
*Presented by ANF Vice President
Dr. Annabelle V. BRIONES
Dr. Rezal Khairi AHMAD*



D. Updating the proposed initiatives from ANF ExCo Members



1. Assigning the two Vice-Presidents with dedicated portfolios to oversee the activities of the working groups

Dr. Rezal Khairi Ahmad

1. Commercialization WG
2. USER Facility Network WG
3. ANF Growth Strategy

Dr. Annabelle V. Briones

1. Standardization WG
2. Nanosafety & Risk Management WG
3. ANF Organizational Excellence

2. Review of the structure and members of the working groups
3. Joint R&D among the member countries
 - a. ANF Funding (Matching Seed Fund)
 - b. Aligning existing and new R&D projects with similar themes towards common goals
4. Travel grant/sponsorship of members
 - a. Review existing criteria and Approval SOP
 - b. New version shall be drafted
5. Thesis Grant for PhD students working on Nanotechnology
 - a. Focus Areas – Common Denominators in Asia
 - b. Criteria shall be drafted





Annex A (Cont'd)
The Material for the 19th Annual General Meeting



E. ANF's participation in nano tech 2023, Japan

**Presented by ANF Secretary
Dr. Jason CHANG
Dr. Pavadee AUNGKAVATTANA**



E. ANF's participation in nano tech 2023, Japan

Discussion topic related to ANF Exhibition in nano tech 2023



nano tech 2023
International Nanotechnology Exhibition & Conference



Outline	
Name	nano tech 2023 The 22 nd International Nanotechnology Exhibition & Conference
Main Theme	Social Transformation through Nanotechnology
Date & Time	Onsite: February 1 (Wed.)-3 (Fri.), 2023 Venue: East Halls & Conference Tower, Tokyo Big Sight, Japan Online: December 1 (Thr.), 2022 - February 28 (Tue.), 2023
Deadline for application	30 September 2022 <i>(From Aug. 1 – Sep.30, 50% of the invoiced amount (including taxes))</i>





Annex A (Cont'd) The Material for the 19th Annual General Meeting

E. ANF's participation in nano tech 2023, Japan (cont'd)

ANF Exhibition

Exhibit Category

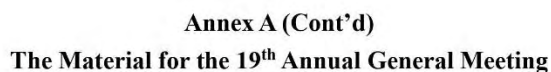
Nano Materials zone nano particles, composite materials, nano cellulose, carbon nanotubes, nanofibers, nano coatings, nano composite materials, graphene, nano inks, biocompatible materials, photonics materials, Fullerenes, nano colloids, high-performance magnetic materials, highly-pure materials, Cellulose nanofibers (CNF), cellulose nanocrystals (CNC), cellulose filaments, bacterial cellulose (BC), microfibrillated cellulose (MFC), cellulose fibrils, nanocellulose composites, and other nanocellulosic materials, Application technologies for ceramics, electrodes, and nanocomposites	Nano Analytics zone electron microscope (SEM / TEM), analysis equipment, evaluation measurement and designing tool, ultra precision measuring instrument, high efficiency / high sensitive sensor, contact evaluation / measurement / analysis service, molecular imaging, simulation / molecular design software, near-field optical, piezo stage, SPM / AFM, micro TAs, Materials Informatics, Simulation and Molecular Design Software, Grain Size and Distribution Measurement, Opened Measurement, Cryomicroscope, Support Tools for Research, Three-Dimensional Measurement, X-ray CT, In-Site Nano Analysis, High Time Decomposition Measurement
Nano Fabrication zone thin film manufacturing technology, nanoimprint, ultra precision surface processing technology, laser processing, inkjet printing, mixing / stirring / dispersing / grinding techniques, precision pattern printing technology, etching, next-generation lithography, electron beam/ion beam processing, contract processing service, nano transistor technology, priming charge processing, fusion/bonding technology, embossification, adhesion and bonding technology, microdischarge processing, microtransistor technology, cellulose nanofiber processing	Nano Innovation zone Automotive ■ Secondary battery ■ Fuel cell ■ Solar battery Advanced sensors ■ Advanced semiconductor Artificial intelligence / Deep learning MEMS / Micromachine ■ Lightweight material ■ Cosmetic materials Regenerative medicine ■ Wearables ■ Aerospace ■ Agriculture Biomimetics ■ Quantum technology ■ venture company Multilayer ceramic capacitors ■ noise elimination ■ flexible platforms Thermal management technology ■ total solid-state batteries Lithium-ion batteries ■ Next-generation batteries
Public Organizations / Academia Academia (university, laboratory, industry-academia collaboration) Country professionals, national pavilions, academic societies and associations, public institutions, TLOs, local governments, commerce and industry associations, SME support organizations, international organizations and organizations	International Pavilion National Pavilion ■ Public Organizations ■ Universities etc...

E. ANF's participation in nano tech 2023, Japan (cont'd)

ANF Exhibition

Exhibition Fees

• Raw Space Only (booth not included) *Side panels are provided when the space borders on neighboring booths. Corner booth spaces include only one side wall. *The below exhibition fee does not cover costs for booths' installation, dismantling, decoration, cleaning, or waste disposal, nor charges for electricity/water supply and drainage or internet fees. Company ¥374,000 (tax included) /9m² Public Organizations / Overseas Pavilions / University Labs Area ¥198,000 (tax included) /9m²	• Digital Exhibit Premium ¥1,650,000 (tax included) • To maximize the effects of exhibiting, promotion activities by organizer. • Logo on official Exhibition Website • WEB Banner on Exhibitor Search Page • Text Advertisement in Official Newsletter (header) 2 times • Advertisement on Official Guidebook 1/4 (H65xW190mm) • Contents • Upload Information Product: 10 Items • Upload the products' brochure (PDF): 10 Items • Upload promotion or demonstration video: 10 Items • Download viewers profile list • Business Matching Systems (Online) Standard ¥660,000 (tax included) • Contents Please refer to Premium's Contents Light ¥220,000 (tax included) • Contents • Upload Information Product: 1 Item • Download viewers profile list • Business Matching Systems (Online)
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- 1) **Exhibition**
- 2) **ANF ExCo Meeting**
- 3) **ANF Activity** ex. ANF Symposium on User Facility Networking in ASIA

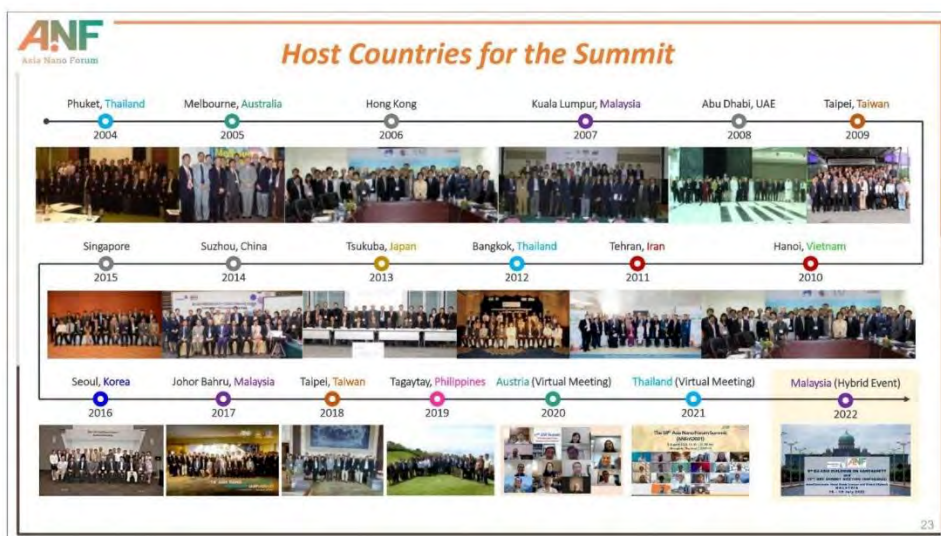


***Presented by Dr. Pavadee AUNGKAVATTANA
ANF Secretary***





Annex A (Cont'd)
The Material for the 19th Annual General Meeting



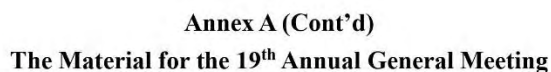
**G. Summary of the 5th EU-ASIA Dialogue
and update for the upcoming events:
6th EU-ASIA Dialogue on Nanosafety
*Presented by Dr. Ruslinda A. Rahim, NNC and
Mr. Alexander Pogany, BMK***





Annex A (Cont'd)
The Material for the 19th Annual General Meeting





- **Objective:** Due to increasing role of informatics on both knowledge generation and knowledge management in nano-science and nanotechnology, an event for experience exchange would be useful and good initial step for furthering collaboration in Asia in this emerging area.
- **Scope:** Computational nanomaterial modeling and exploration, Data driven research, Data and knowledge management
- **Contributors:** ANF member economies
- **Executive committee:**
- **Mode:** Virtual/hybrid
- **Time:** Next ANF annual meeting 2023



We will be back at 4.10 p.m. (MYT, GMT+8)





Annex A (Cont'd)
The Material for the 19th Annual General Meeting

ANF Working Groups



1. Standardization

Dr. Tsing-Tang SONG (ITRI, Taiwan)

Dr. Ali BEITOLLAHI (INIC, Iran)

2. User-Facility Network

Dr. Yasuo KOIDE (NIMS, Japan)

3. Nano Safety & Risk Management

Dr. Wannee CHINSIRIKUL (NANOTEC, Thailand)

Dr. Paul WRIGHT (RMIT, Australia)

4. Commercialization

Dr. Rezal Khairi AHMAD (NanoMalaysia, Malaysia)

Dr. Alexander POGANY (BMK, Austria)

Dr. Jun'ichi SONE (JST, Japan)



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ANF WG: Standardization

Dr. Tsing-Tang SONG (ITRI, Taiwan)

Dr. Ali BEITOLLAHI (INIC, Iran)



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Annex A (Cont'd)
The Material for the 19th Annual General Meeting



ANF WG: User-Facility Network
Dr. Yasuo KOIDE (NIMS, Japan)

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ANF WG: Nano Safety & Risk Management
Dr. Wannee CHINSIRIKUL (NANOTEC, Thailand)
Dr. Paul WRIGHT (RMIT, Australia)

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Annex A (Cont'd)
The Material for the 19th Annual General Meeting



ANF WG: Commercialization
Dr. Rezal Khairi AHMAD (NanoMalaysia Berhad, Malaysia)
Dr. Alexander POGANY (BMK, Austria)
Dr. Jun'ichi SONE (JST, Japan)

ANF Asia Nano Forum

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Thank you Remarks
Dr. Annabelle V. Briones
ANF Vice President

ANF Asia Nano Forum

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Annex A (Cont'd)
The Material for the 19th Annual General Meeting



ANF
Asia Nano Forum

Closing Remarks by Host

Dr. Rezal Khairi Ahmad
ANF Vice President (Host Country)

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ANF
Asia Nano Forum

Thank You

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Annex B

The Minutes of 18th ANF Summit Meeting



Minutes of the 18th Asia Nano Forum Summit (The 14th Annual General Meeting)

in conjunction with
"Nanosafety Forum on Country Experiences and Predictive Model
Development for Safety Guidelines and Standardization" and
"Asia Nano Forum Commercialization Workshop"

OFFICE BEARERS

President

Ting-Kuo LEE (Academia Sinica, Taiwan)

Vice Presidents

Yasuo KOIDE (NIMS, Japan)

Wannee CHINSIRIKUL (NANOTEC, Thailand)

Treasurer

Rezal Khairi AHMAD (NanoMalaysia, Malaysia)

Secretaries

Jason C.S. CHANG (Academia Sinica, Taiwan)

Annabelle V. BRIONES (ITDI, Philippines)

EXECUTIVE COMMITTEE

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

Alexander POGANY (BMK, Austria)

Alok ADHOLEYA (TERI, India)

Ali BEITOLLAHI (INIC, Iran)

Toshihiko KANAYAMA (AIST, Japan)

Jun'ichi SONE (JST, Japan)

Yasuo KOIDE (NIMS, Japan)

Byung-ki CHEONG (GTCK, Korea)

RezaI Khairi AHMAD (NanoMalaysia, Malaysia)

Roslinda RAHIM (NNC, Malaysia)

Annabelle V. BRIONES (ITDI, Philippines)

Ting-Kuo LEE (Academia Sinica, Taiwan)

Wannee CHINSIRIKUL (NANOTEC, Thailand)

Date Friday, 6th August 2021

Time 13:10–16:00 (ICT, GMT+7:00)

Venue Online meeting due to COVID-19 pandemic

Chair Ting-Kuo LEE, President

Prepared by Jason C.S. CHANG, Secretary

Vetted by All members present

Approved by Ting-Kuo LEE, President

Members present (by alphabetical order of region)

Alexander POGANY (BMK, Austria)

Toshihiko KANAYAMA (AIST, Japan)

Yukio KIMURA (AIST, Japan)

Jun'ichi SONE (JST, Japan)

Shuhei Numazawa (JST, Japan)

Yasuo KOIDE (NIMS, Japan)

Jiyun JUNG (KoNTRS, Korea)

Rezal Khairi AHMAD (NanoMalaysia, Malaysia)

Roslinda RAHIM (NNC, Malaysia)

Annabelle V. BRIONES (ITDI, Philippines)

Ting-Kuo LEE (Academia Sinica, Taiwan)

Jason C.S. CHANG (Academia Sinica, Taiwan)

Dar-Bin SHIEH (NCKU, Taiwan)

Tsing-Tang SONG (ITRI, Taiwan)

Wannee CHINSIRIKUL (NANOTEC, Thailand)

Pavadee AUNGKAVATTANA (NANOTEC, Thailand)

Warulee THONGKAM (NANOTEC, Thailand)

Ramjitti INDARAPRASIRT (NANOTEC, Thailand)

Benyapa SUWAN (NANOTEC, Thailand)

Secretariat assistant

Huan-Chi TSENG (Academia Sinica, Taiwan)



Annex B (Cont'd)

The Minutes of 18th ANF Summit Meeting



Summary of Meeting

Due to COVID-19 pandemic, ANF members held the online Summit meeting at 13:10 Bangkok time (ICT, GMT+7:00) on 6th August 2021 via the Cisco Webex.

I. Opening Remarks

Dr. Ting-Kuo Lee, President of ANF, thanked Dr. Wannee Chinsirikul and her NANOTEC team for making this ANF Summit possible and extended a warm welcome to all representatives attending this year's online meeting. He also expressed thanks to his teammates including two Vice Presidents Dr. Yasuo Koide and Dr. Wannee Chinsirikul, two Secretaries Dr. Annabelle V. Briones and Dr. Jason Chang, and Treasurer Dr. Rezal Khairi Ahmad. They have been helping make decisions and get through the difficult time under COVID-19 pandemic. Dr. Lee mentioned that there will be a new term of ANF administration for the years of 2022-2023 after today's meeting. And without expenses on physical activities under pandemic, there are a lot of savings in the last two years. He wished more interesting activities in the future could make up all the lost time.

II. Welcome Remarks

On behalf of organizers of ANFoS2021 – NANOTEC, NSTDA and MHESI, Dr. Wannee Chinsirikul expressed her warm welcome to all members in the online 18th Summit under the severe COVID-19 pandemic. She also thanked all speakers, participants, and especially ANF colleagues like Dr. Paul Wright and Mr. Alexander Pogany for "*Nanosafety Forum on Country Experiences and Predictive Model Development for Safety Guidelines and Standardization*" and Dr. Rezal Khairi Ahmad for "*Asia Nano Forum Commercialization Workshop*" for making all the activities in conjunction with ANFoS2021 quite successful. Coming to this afternoon session including presentations of Working Groups and INISS-nano followed by the Annual General Meeting today, Dr. Wannee hoped this ANF Summit 2021 would serve as a catalyzed stage of ANF contributions and valuable outcome for nanotechnology community as well as for the society.

III. Working Group Presentations (15 minutes each WG)

1. Standardization

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

- Dr. Song updated members on ANF Standards activities at ISO and IEC. There are three ISO/IEC Nano Standards Led by ANF including IEC TS 62607-4-4:2016 (published), IEC TS 62844:2016 (published) and ISO TS 4971 (ongoing project). With regard to ISO TS 4971 "*Nanotechnologies – Performance evaluation of nanosuspensions containing clay nanoplates for quorum quenching*", it was registered as ISO PW1 4971 in November 2019 and approved for a new project registered ISO TS 4971 on 9 April 2021.



Annex B (Cont'd)

The Minutes of 18th ANF Summit Meeting



- The latest Liaison status of ANF at ISO/TC229 and IEC/TC113 are Liaison category A / TC level liaison (can propose new work items) at ISO TC 229 (active, 1 ongoing project) and Liaison category C / WG level liaison (cannot propose new work items) at IEC TC 113 (pending cancellation due to inactive), respectively. It's suggested to re-establish active liaison relation with IEC TC 113 to continue ANF's liaison. In addition, Dr. Song also reported on members' latest published standards and activities from Iran, Japan, Korea, Philippines, and India.

2. User-Facility Network

Coordinator: Dr. Yasuo KOIDE (NIMS, Japan)

- Dr. Koide made a brief introduction to the purpose of User-Facility Network and the pilot plan for mutual exchange of researchers / engineers between NIMS (Japan) and NANOTEC (Thailand). He gave some examples of training program established on NIMS's side including materials analysis course, observations course, nanofab course, and nanobio course. Unfortunately, the plan has been still stopped due to COVID-19 pandemic.
- Dr. Koide has also been organizing a workshop on the "2022 Symposium on User-Facility Network in Asia". This hybrid workshop is scheduled to be held online and on-site (Conference Tower, Tokyo Big Sight) on 27th January 2022 during nano tech 2022. In addition to the current tentative speakers including Dr. Wannee Chinsirikul (NANOTEC, Thailand), Dr. J-W Lee (National NanoFab Center, Korea), and Dr. Yasuo Koide and others (NIMS, AIST, and JST of Japan), Dr. Ruslinda Rahim (NNC, Malaysia) and Mr. Alexander Pogany would also like to take this opportunity to present the current progress with the user-facilities in Malaysia and in Europe and Austria, respectively.

3. Nano Safety & Risk Management

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

- On behalf of the Coordinators, Dr. Warulee Thongkam first gave a report on the objectives and previous activities related to Nano Safety & Risk Management, including "Forum on Nanosafety: From Lab to Society" organized by NANOTEC (Thailand) and NNC (Malaysia) in March 2021, "Symposium 8: 3Rs Alternatives for Regulatory Testing in the 11th Congress of Toxicology in Developing Countries (CTDC)" in Malaysia in June 2021, and "Nanosafety Forum on Country Experiences and Predictive Model Development for Safety Guidelines and Standardization" organized by NANOTEC and NSTDA (Thailand) this August.
- Dr. Warulee also introduced some ongoing activities, including Development of Nanosafety Network for Industry, Standard Developing Organizations (SDOs), Nanosafety issues collaborated with Department of Industrial Work (DIW) and The Federation of Thai Industries (FTI) of Thailand, and the "7th Thailand International nanotechnology Conference" in December.

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Annex B (Cont'd)

The Minutes of 18th ANF Summit Meeting



4. Commercialization

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

- Dr. Rezal Ahmad introduced the background of ANF commercialization WG and summarized some activities. ANF Commercialization Working Group was formed at ANF Summit 2015 in Singapore to facilitate realization of economic value of Nanotechnology Rresearch and Development, and organized the pilot workshop in 2017 in association with ANF Summit in Malaysia. There have 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 ANF Summit 2020 (Austria, online).
- With regard to the online "*Asia Nano Forum Commercialization Workshop*" in conjunction with this ANFoS2021, Dr. Rezal highlighted some presentations by participants from Thailand, The Philippines, Japan, Malaysia, India and Indonesia. Dr. Rezal would also like to plan a possible workshop concurrent with the nano tech 2022 in Japan in the case of a well-controlled pandemic.

IV. The International Network Initiative on Safe and Sustainable Nanotechnologies (INISS-nano)

- As a follow-up of the 4th EU-Asia Dialogue on Nanosafety in conjunction with the ANF Summit 2020 last October, a concept paper of INISS-nano authored by Andreas Falk et al. has been released in June and is open for comments until the 17th August 2021. Also, the 3rd virtual meeting of the INISS-nano-team is scheduled on 1st October.
- Mr. Alexander Pogany, the editor, first made the introductions to background, goals, added value, important action fields, organizational structure, and the next steps. He emphasized this international collaboration is crucial to success in nanotech research, commercialization, and regulation. Further interactions are planned to take place during the 5th EU-Asia Dialogue event in 2022 in Malaysia and the 6th Dialogue event in 2023 in Berlin.
- Following the introduction by Mr. Pogany, a video made by Mr. Andreas Falk from BNN of Austria was then played for further interpretation of the concept paper. Mr. Falk mentioned specially two names of key players in this initiative, Dr. George Katalagarianakis retiring from European Commission and Prof. Ali Beitollahi from Iran.
- With regard to the added value like data sharing and share of common infrastructure, Dr. Wannee suggested there may be a link activity with the User-Facility Network WG Dr. Koide just mentioned in order to synergize the efforts of both two programs or projects to get complementary results.

V. Annual General Meeting (AGM, by Secretariat)

Secretariat's Report

1. Financial Statement of Year 2021

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Annex B (Cont'd)

The Minutes of 18th ANF Summit Meeting



- The balance on 30th July this year in all ANF bank accounts including SGD and USD accounts at DBS in Singapore, USD and JPY accounts at Sumitomo Mitsui in Japan is 95,577 SGD or 72,294 USD. We have incomes basically from membership fees and expenditure on service fees for use of registered office address and website maintenance.
- Regarding the membership fees, VAST of Vietnam cannot pay the membership fees for 202 and 2021 due to the complicated financial regulations and would like to skip this Summit. VAST will resume all activities ASAP in 2022 as COVID-19 restrictions ease and they could pay the membership fee. And INIC of Iran has been trying to transfer the membership fee to ANF account in Singapore. However, the payment process of INIC's membership fee has not been successful until now due to some difficulties. As for the membership fees from Korea and Philippines, the payment will be completed very soon.

2. Secretariat activities between October 2020 and July 2021

- Dr. Jason Chang, Secretary of ANF, highlighted Secretariat activities between October 2020 and July 2021, including last online Summit, publications of Newsletter Issue No. 38 and Annual Report 2020, Office-bearer telemeetings in May and July, and website update.

3. Amendment to the ANF Constitution

- According to the ANF bylaw, there should be 4 other Members in the 10-member Committee of administration besides the current 6 Office Bearers. Furthermore, all office bearers, except the Treasurer and Assistant Treasurer may be re-elected to the same or related post for a consecutive term of office.
- However, Treasurer in ANF is more like an independent auditor as the ANF financial management goes with the President. Considering the operational practices, a motion of changing the bylaw "Management and Committee" in the ANF Constitution with an approval was proposed to discussion and then had unanimous support at the Annual General Meeting.
- The differences between content in version 2013 and amended content this year in the ANF Constitution are as follows.

Content, v.2013	Amended Content, v.2021
8.1 The administration of the Society shall be entrusted to a Committee, made up of <u>ten (10)</u> members, to be elected at alternate Annual General Meetings: A President 2 Vice-President 2 Secretary A Treasurer	8.1 The administration of the Society shall be entrusted to a Committee, made up of <u>six (6) to ten (10)</u> members, to be elected at alternate Annual General Meetings: A President 2 Vice-President 2 Secretary A Treasurer



Annex B (Cont'd)

The Minutes of 18th ANF Summit Meeting



Four Ordinary Committee Members	Up to Four Ordinary Committee Members
8.2 Names for the above offices shall be proposed and seconded at the Annual General Meeting and election will follow on a simple majority vote of the members. <u>All office bearers, except the Treasurer and Assistant Treasurer may be re-elected to the same or related post for a consecutive term of office.</u> The term of office of the Committee is two years.	8.2 Names for the above offices shall be proposed and seconded at the Annual General Meeting and election will follow on a simple majority vote of the members. The term of office of the Committee is two years.

4. Election results of ANF Office Bearers for the years of 2022-2023

- In this Summit we're going to elect new ANF Office Bearers for the years of 2022-2023, including ONE President, TWO Vice Presidents, TWO Secretaries, and ONE Treasurer. According to the minutes of Office-bearer telemeeting on 2 July, the online ballots will be cast via an online voting software (i.e. Election Runner) confidentially. The deadline for nomination was 30 July, 2021 and the online ballot was open from 3 August 09:00 to 5 August 17:00 (Bangkok, GMT+7). Announcement of results will be made in the Annual General Meeting on 6 August, 2021.
- Nominees and electoral votes by 12 eligible voters (*):

Nominees	Votes
President: Wannee Chinsirikul, NANOTEC / Thailand (recommended by NIMS, NANOTEC and NanoMalaysia)	8
Vice Presidents: Annabelle V. Briones, ITDI / Philippines (recommended by NanoMalaysia)	7
Rezal Khairi Ahmad, NanoMalaysia / Malaysia (recommended by NANOTEC and NNC)	8
Secretaries: Jason Chang, Academia Sinica / Taiwan (recommended by NANOTEC)	7
Ruslinda A. Rahim, NNC / Malaysia (recommended by NanoMalaysia)	2
Pavadee Aungkavattana, NANOTEC / Thailand (recommended by Academia Sinica)	7
Treasurer: Shuhei Numazawa, JST / Japan (recommended by JST, NIMS and AIST)	6
Alexander Pogany, BMK / Austria (recommended by NANOTEC)	2

* There were 4 abstentions by Austria, India, Iran, and Korea.



Annex B (Cont'd)

The Minutes of 18th ANF Summit Meeting



- Elected ANF Office Bearers for the years of 2022-2023 are as follows.
President (1): Wannee Chinsirikul
Vice Presidents (2): Rezaal Khairi Ahmad and Annabelle V. Briones
Secretaries (2): Jason Chang and Pavadee Aungkavattana
Treasurer (1): Shuhei Numazawa
- The transition could probably start pretty soon and all information and paper work should be transferred to the new term of ANF administration by the end of this year.

5. ANF's participation in nano tech 2022, Japan

ANF Exhibition

- According to the resolution by Office-bearer telemeeting on 2 July, it is suggested that ANF would not join the Hybrid Exhibition for this nano tech 2022.

ANF ExCo Meeting & Commercialization Workshop

- It is suggested that the virtual ExCo Meeting & Commercialization Workshop could be detached from this nano tech 2022 and arranged with a flexible schedule.

2022 ANF Symposium on User-Facility Network in Asia

- Dr. Yasuo Koide gave a briefing on the "2022 Symposium on User-Facility Network in Asia" which is organized by UFN-WG of ANF and will be held online and on-site (Conference Tower, Tokyo Big Sight) on 27th January 2022 during nano tech 2022. As a part of ANF activities, financial support will cover the cost (est. 300,080 JPY) for the symposium.
- Topics would focus on user-facility system and open usage for young scientists or scholars. Speaker nominations are welcome. Current tentative speakers include Dr. Wannee Chinsirikul (Thailand), experts from Korea NanoFab, and Dr. Yasuo Koide and others (Japan).

6. Host country for the ANFoS2022

- On behalf of all member organizations from Japan, Dr. Koide gave a briefing on hosting the next Summit in Japan. The proposed venue would be AIST, Hotel, or International Center at Tsukuba, Japan. Tentative date is Feb. 2 or 3, 2023, just after nano tech 2023. Airport(s) nearby and other travel options are Narita or Haneda International Airport, and Limousine bus transportation services from Tokyo to Tsukuba, respectively. Organizers include Dr. Kanayama, Dr. Aoyagi, and Mr. Kimura (AIST), Dr. Sone and Mr. Numazawa (JST), Dr. Fujita and Dr. Koide (NIMS).
- Considering the Japan Summit planned to take place in 2023, there is a need for proposing an annual meeting (i.e. AGM) for 2022 to comply the constitution. Through the Summit meeting, members can also review the year's activities and discuss plans for the next year. It would be very welcome if there is any proposal or suggestion for Summit next year.

7. Events in Planning

5th EU-Asia Dialogue on NanoSafety



Annex B (Cont'd)
The Minutes of 18th ANF Summit Meeting



- The 5th EU-Asia Dialogue on NanoSafety, a physical and virtual event proposed by Dr. Ruslinda A. Rahim of NNC, is scheduled to be held in Putrajaya, Malaysia in June 2022. Mr. Alexander Pogany suggested that there could probably be a back-to-back Summit in 2021 in Malaysia. NanoMalaysia and NNC could collaborate on this tentative idea, Dr. Rezal Khairi Ahmad added.

2nd International Nanotechnology Olympiad

- Because of persistent uncertainty with regard to COVID-19 limitations, the 2nd International Nanotechnology Olympiad (INO) scheduled in January 2021 in Oman and then postponed to 2022, could be delayed again.

VI. Closing Remarks

Dr. Ting-Kuo Lee, President of ANF, thanked members for all their support and wished for everybody's safety and health under the pandemic.

There being no further proposals, the meeting upon motion adjourned at 16:00 Bangkok time (ICT, GMT+7:00).



Annex B (Cont'd)
The Minutes of 18th ANF Summit Meeting



Annex. Abbreviations and Acronyms

AIST	National Institute of Advanced Industrial Science and Technology, Japan
BMK	Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, Austria
BNN	BioNanoNet Forschungsgesellschaft mbH, Austria
GTCK	Green Technology Center Korea, Korea
IEC	International Electrotechnical Commission, Geneva, Switzerland
INIC	Iran Nanotechnology Initiative Council, Iran
ISO	International Organization for Standardization, Geneva, Switzerland
ITDI	Industrial Technology Development Institute, Department of Science and Technology, Philippines
ITRI	Industrial Technology Research Institute, Taiwan
JST	Japan Science and Technology Agency, Japan
KoNTRS	Korea Nano Technology Research Society, Korea
MHESI	Ministry of Higher Education, Science, Research and Innovation, Thailand
NANOTEC	National Nanotechnology Center, Thailand
NIMS	National Institute for Materials Science, Japan
NNC	National Nanotechnology Centre, Malaysia
NSTDA	National Science and Technology Development Agency, Thailand
RMIT	Royal Melbourne Institute of Technology, Australia
VAST	Vietnam Academy of Science and Technology, Vietnam



Annex C

Abbreviations and Acronyms

ANF	Asia Nano Forum
AIST	National Institute of Advanced Industrial Science and Technology, Japan
BMK	Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, Austria
GTCK	Green Technology Center Korea, Korea
IEC	International Electrotechnical Commission, Geneva, Switzerland
INIC	Iran Nanotechnology Initiative Council, Iran
ISO	International Organization for Standardization, Geneva, Switzerland
ITDI	Industrial Technology Development Institute, Department of Science and Technology, The Philippines
ITRI	Industrial Technology Research Institute, Taiwan
JST	Japan Science and Technology Agency, Japan
KoNTRS	Korea Nano Technology Research Society, Korea
NANOTEC	National Nanotechnology Center, Thailand
NIMS	National Institute for Materials Science, Japan
NIT	National Institutes of Technology Srinagar
NNC	National Nanotechnology Centre, Malaysia
RMIT	Royal Melbourne Institute of Technology, Australia
TERRI	The Energy and Resources Institute
VAST	Vietnam Academy of Science and Technology, Vietnam

National Institute of Technology, Srinagar is one of the premier Educational Institutes in the Northern Regions of the country. It was established in 1960 and has been one of the eighteen Regional Engineering Colleges sponsored by the Government of India during the 2nd Plan. The Institute acquired the status of National Institute of Technology with deemed to be University status during August 2003 and attained full autonomy in its Academics.

1. The Environmental Symposium on “Our Relation with Nature”

All the UN's Sustainable Development Goals (SDGs) have some connection to the environment and the Goal 6 (Clean Water and Sanitation), Goal 7 (Affordable and Clean Energy), Goal 11 (Sustainable Cities and Communities), Goal 12 (Responsible Consumption and Production), Goal 13 (Climate Action), Goal 14 (Life Below Water), and Goal 15, (Life on Land) are issues to be discussed on 5 June 2022. We at NIT Srinagar are committed to address all major issues related to SDGs in collaborations with prestigious institutions of the government and organizations.

The Environmental Symposium, entitled, “Our Relation with Nature” in collaboration with Government of UT and in association with NLCO aims to become the leading annual symposium at NIT Srinagar, the first of which was celebrated in 2021. The goal is to encourage students to take leading role in protecting the environment (which is hugely complex system that includes the air *WE* breathe, the land *WE* live on, the water *WE* drink and the climate around us) through knowledge, awareness, and consciousness. With kind support of Prof. Sehgal, Director, Shri Manzoor Wangnoo, Chairman NLCO, Shri G N Var, Chairman, PSA and under the Chairmanship of Dr. M A Shah, Professor and Head, PG Department of Physics, a marvelous one-day summit was organized for the School and College Children on 5 June 2022 with few themes as.

- (A) Unplanned urbanization: it leads to myriad problems - encroachment of land, poor runoff systems, water logging, unscientific waste dumping, minimum accessibility through roads, vulnerability of people and properly during natural calamities like floods and earthquakes.
- (B) Biodiversity loss: deforestation has led to a sharp decrease of biodiversity in our beautiful valley, humans have encroached in the wild forests to make industries, commercial and residential buildings, such areas need protection.
- (C) Untreated wastes dumped in water bodies: the hazardous bio-medical wastes from hospitals are dumped directly into the water bodies. This water is used by the local populations for various purposes, the intake of such water is carcinogenic and a health hazard.



Prof. M A Shah felicitating the Deans, Guests, Sponsors, Volunteers and Student winners for their excellent performance

2. Clean Soil and Sagar for peace & prosperity

Physics - Nature & Sustainability



Inculcate, Educate and Encourage students to take leading role in the protecting the environment, which is hugely complex system that includes the air *WE* breathe, the land *WE* live on, the water *WE* drink and the climate around us, through scientific knowledge, mass awareness and consciousness for sustainability. All most, all the United Nation's Sustainable Development Goals (SDGs) have connection to the environment and quality education. The issues related to the planet earth have been identified and the innovators need to come forward to find an amicable solution for the prosperity and peace.

To prevent soil pollution

1. Polythene suppliers/manufacturers should be given a deadline by the J&K Pollution Control Board and a complete ban on its manufacture, import and use should be forced and implemented. The suppliers should be encouraged for production of sustainable and eco-friendly alternatives such as cloth bags, Jute bags, paper bags.
2. Minimize the single use of plastics in homes and Government offices. An alternate approach like use of glass bottles/ jugs etc, can be used and reused.
3. Packing material for food items should be of non-plastic/food safe bags, which can be reused or recycled.
4. Limited use of pesticides and fertilizers should be permitted, in consultation with the Agriculture and Horticulture experts. Excessive use of agrichemicals by farmers should be banned and strictly monitored by the Agriculture/Horticulture Department. Organic farming and use of vermi-compost should be encouraged. Hon'ble LG (J&K) was first one to has launched, Nano-fertilizer, which will not only reduce pollution, but also will bring Green Revolution.
5. Effective e-waste management policy should be put in place and risks emerging from e-waste should be taken seriously.
6. Toxic metal and metalloid containing products should be banned. These persistent toxic chemical like Mercury (Hg), Arsenic (As), Cadmium (Cd), Lead (Pb) etc. contaminate air, soil and water and accumulate in different organism and entire ecosystems thereby causing severe toxicities to humans, plants and wildlife.
7. The forest acts need to be more stringent and uncompressing. The trees are natural oxygen banks and have ability to keep elevated global temperature in control, thus help in cope with climate change, which is of major concern.

Preventing air pollution:

1. Surface and Air Transport causes air pollution and is a significant contributor to global warming. Use of bicycles should be encouraged and promoted for shorter distances.
2. School transportation system should be minimized, by encouraging students to walk or use bicycles, for shorter distances within three kilometres. Government can consider providing free bicycles to children of poor families.
3. Electric vehicles, electric two wheelers should be promoted by Govt and subsidised. The necessary infrastructure for charging such vehicles should be put in place.

4. Outdated vehicles should be banned from plying on the roads and mechanism for buying back such vehicles should be explored both for commercial and private vehicles.
5. Industries such as Brick Kilns, Cement factories, Stone Crushers etc. which cause excessive air pollution, should be shifted to barren lands, in far-flung uninhabited areas and installed with pollution depressant devices to mitigate air pollution.
6. Green technologies should be promoted by the govt as it is cheap, environmentally benign and free from health hazards.
7. We need to install nano-sensors to guard the environment and our surroundings. Graphene sensors are revolutionizing construction, communication and air monitoring.

Preventing water pollution

1. A comprehensive policy for conservation of all water bodies including River Jhelum, Dal Lake, Wular Lake and other adjoining lakes should be enforced.
2. Rehabilitation Policy for inhabitants of Dal Lake, should be implemented on priority.
3. Rivers and channels be protected with strengthened embankments to avoid loss of water and prevent pollution.
4. The smaller channels in cities and villages should be restored, so that water is not polluted. The natural water supply should be used for multipurpose, including in construction.
5. Drinking water from PHE taps should not be allowed to be mis-used for construction purposes, washing of vehicles or gardening etc.
6. Municipal Corporations should make it mandatory to have bore well/ Hand pump before granting construction permission.
7. Rainwater recharge/ harvest should be implemented at Govt and house hold scale for irrigating lawns and gardens.

The bottom line is that:

- ✚ The Teachers need to teach the importance of water and soil conservation and assign projects of looking for alternate ways to save water in the home/ gardens. Teach them to grow plants and vegetables in schools, which will help to develop an interest in the environmental issues.
- ✚ Give projects to students how to run cars, cabs and motors on energies other than the fossil fuels. Teach the benefits of sustainable transport options such as cycling. Not only does cycling help the environment but it is also a great way to keep our population fit.
- ✚ Teach them how to generate electricity from solar power. There are many small items such as garden lights that are perfect for solar power and small in built panels will collect generate enough power to provide a light in a garden for many hours.
- ✚ Government departments / enforcement agencies/ NGOs should join hands with the public to save running water bodies, fresh forests and ban what is disastrous for environment.
- ✚ The Mother earth is going to get unkind if soon we don't go green. So green technologies should be promoted and adopted everywhere, including in our laboratories and lands.

Thus, we need to **hold hands to save the environment** and extend help to organizations/institutions/ Boards for such noble causes. We will be at forefront for such a noble cause. It plays an important role in healthy living and the existence of life on,” **Only One Planet”**. **NLCO Chairperson is doing exceptional work for wetlands and water bodies.**

3. 8th Edition of “International Conference on Nanotechnology for Better Living” NBL - 2023 from 25-29 May 2025 at NIT Srinagar

Nanotechnology being multidisciplinary area of research and having applications in our day to day life in almost in all areas is expanding at a dazzling speed.

Thus, it was decided to organize the NBL series after every two years which is a fabulous fusion of biological, physical, agricultural, health and Engineering sciences at NIT Srinagar , which provide a vibrant platform to:-

- Present and discuss path breaking research ideas in nanotechnologies and shall be an interface between academia and industries.
- Young scientists, scholars and even bright students to showcase their research and innovative ideas in nanotechnologies and contemporary area.
- Networking opportunities to participating delegates, particularly faculty, in different sessions wherein thrust areas of research shall be discussed and presented.
- Strengthen our Research programs of diversified applications. It will also help us to establish links in this interdisciplinary research program with other Institutes and universities.
- Local students, scholars and faculty to interact with world class scientists and this activity will help our UG/PG students who are supposed to work on innovative projects as envisaged in NEP.

Bringing together more than 500 researchers and scientists across globe and almost from all states of the country with research interests in diverse areas is expected to enhance scientific collaborations which may take the nanotechnology a step closer to realizing its enormous potential for the betterment of mankind.

Thus the impact of this scientific gathering will provide an ample opportunity to young students to learn about new inventions in this new and interdisciplinary field. In addition, the endeavor will put the state of Jammu and Kashmir into scientific map of the country and beyond.

The TERI-Deakin Nanobiotechnology Centre (TDNBC) is a major flagship program of Sustainable Agriculture, and it was established in 2010 by collaboration between India's research think-tank TERI and Australia's Deakin University. TDNBC, TERI, India and Deakin University, Australia are two destinations engaged in intensive research around agriculture, material science, food storage and safety. Innovation in the area of Nanoscience in Deakin University, Australia is also on forefront therefore in 2010, a strategic engagement was established between Deakin University in Australia and TERI, New Delhi India and the centre “TERI-Deakin Nanobiotechnology (TDNBC)” was created at TERI Gram, Gurugram, India. Considering the importance and relevance of joint research platform, TERI-Deakin Nanobiotechnology Centre (TDNBC), Gurugram, India and Deakin University, Australia, in association with Department of Biotechnology, Government of India has created “DBT -TDNBC - DEAKIN – Research Network Across continents for learning and innovation (DTD-RNA)”.

This is the unique network and has the vision to contribute to a better world through nanotechnology. The Nanotechnology field is one of the fastest growing areas of research and technology.



DTDRNA is dedicated to substantially enhancing research outcomes across continents in this important field by promoting effective collaborations, exposing researchers to alternative and complementary approaches from other fields, encouraging forums for postgraduate students and early career researchers, increasing nanotechnology infrastructure, enhancing awareness of existing infrastructure, creating technology pipelines and IPRs, facilitating technology incubation, transfers and commercialization, connect with industries and

promoting international links. DTD-RNA is achieving these goals through its dedication to bringing together all the various groups working in the field of Nanotechnology and related areas across continents. <https://www.teriin.org/projects/dtd-rna/events.php>



In the first six months of this year (2022) Three (3) Summer school, Two (2) Hands on Training Programs, One (1) E-Winter school and One (1) Webinar on subject including (i) Electrolysis of Water were organized which are nanotech activities for training researchers, regulators, farmers and industries across the globe. The details of each of the training program and webinars are presented hereafter.

DBT-TDNBC-DEAKIN— RESEARCH NETWORK ACROSS CONTINENTS FOR LEARNING AND INNOVATION (DTD-RNA)



About the network: TERI, India and Deakin University, Australia are two destinations engaged in intensive research around application of nanotechnology in agriculture, material science, food storage and safety. Considering the importance and relevance of joint research platform, TERI-Deakin Nanobiotechnology Centre (TDNBC), Gurugram, India and Deakin University, Australia, in association with Department of Biotechnology, Govt. of India has created 'DBT-TDNBC-DEAKIN – Research Network Across continents for learning and innovation (DTD-RNA)'.

DTD-RNA has a vision to expand globally to foster nanoscience and innovation in different regions across continents by offering joint labs of Deakin, Australia and TDNBC, India to scientists and scholars to facilitate their research aspirations and goals. The network will be creating joint labs as country hubs and network of research institutions across all continents and International Centre for Translational Research for research training and education in biological synthesis of Nano materials.

Vision of the network: Creation of innovation hub across continents for networking between research institutes, universities and industries working on nanotechnology.

Thematic areas

Synthesis of nanomaterials

Food preservation using novel nanofibers

Cost-effective natural biodegradable polymer based nano-composites

Natural food colors

Mycorrhiza

Seed coating technology of microbes and nanofertilizers

Reclamation technologies

SALIENT FEATURES

- Connections and networking with Global Nanobiotechnology Community.
- TDNBC's and Deakin University's facilities and infrastructure.
- Networking opportunities with Industry.
- On-line as well as laboratory based Training/Courses.
- Cross fertilization of Ideas via ideation centre.
- Collaboration opportunities for joint research projects, conferences, on-line and laboratory courses.

- Exchanges and interaction for developing Regulation policy and setting up standards for Nano material for various sectors.
- Complimentary registration for the conferences/workshops organized by DTD-RNA network.
- E-mail alerts regarding the updates on DTD-RNA network.
- Funds for selected experts/institutes for visits, meetings, trainings, conferences.
- DTD-RNA networking dinners and start-up café





THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future

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1. E- Winter School on Advanced Applications of Nanotechnology for Food and Environment conducted” on 15 February 2022

The rapid development of nanotechnology has facilitated the transformations of traditional food and agriculture sectors, particularly the invention of smart and active packaging, nanosensors, nanopesticides and nanofertilizers. Numerous novel nanomaterials have been developed for improving food quality and safety, crop growth, and monitoring environmental conditions.

The TERI-Deakin Nanobiotechnology Centre conducted an e-winter school (online mode) on the "Advanced Applications of Nanotechnology for Food and Environment" on 15 February 2022. The intense one-day program aimed to promote research perspective and impart transformative educational experience to students, young researchers, and industrial participants.



The winter school included five different themes on theory and practical sessions. In Session I, the experts shared the existing state of the art on nanomaterials, the challenges involved in the synthesis, characterization, and their applications in agriculture. Session II was based upon 'natural biodegradable polymer-based nano-composites'. The invited talks were focused on the extraction of cellulosic materials from agro-waste and their applications in different areas. Session III was based on

'nanomaterials for rapid detection and food sensors' where portable nanosensing devices' design and application aspects were discussed. In particular, the Session focused on the portable and onsite nanosensors developments for food contaminants, pathogens, and other toxicants and their validation priorities, such as sensitivity, specificity, and precision. Session IV was based on developing food pigments from algae with improved bioavailability and stability for applications



TERI-Deakin Nanobiotechnology Centre (TDNBC) organized Instructor - led live hands-on training modules and Lecture Series for imparting training/ skill development of the scientific community, industries, and other stakeholders having interest in nanobiotechnology.

An invited talk was delivered on 'food preservation using novel nanofibers' in Session V. The speaker discussed the development of green polymeric nanofibers and their utilization in food packaging and preservations via incorporations of active biomolecules.

Various experimental videos were also shown during the Winter School to understand better the topics discussed above. Through participatory learning experiences facilitated by multidisciplinary faculty-student interactions, interactive lectures, and innovative learning methods, the program helped the participants explore numerous opportunities in the said areas.

2. The first HANDS ON TRAINING MODULE (Offline): Instructor-led live hands-on-training conducted, and lecture delivered on the “Synthesis and Characterization of Nanomaterials” on 22 February 2022

Nanotechnology is a promising science with wide applications from cosmetics, food products, clothing, and household appliances to fuel catalyst, disease treatment, and renewable energies. Nanotechnology is also being applied to various industrial and purification processes by interfacing the nanomaterials with biological molecules or structures, “green technology” to enhance environmental sustainability, and “renewable energy” to develop new ways to capture and store and transfer energy.



The TERI-Deakin Nanobiotechnology Centre (TDNBC) in collaboration with the Department of Biotechnology, Government of India hosted an in-person instructor-led live hands-on-training program to share the knowledge of synthesis and characterization of nanomaterials. The training sessions were held on February 22, 2022 at TDNBC, Gurugram.

Nanotechnology constitutes one of the many critical aspects of the contemporary trends of science and advanced technologies globally. TDNBC is one of the pioneer institutes working in this area. The said training modules were unique learning propositions to the participants and aim at equipping them with the evolving concepts, tools, practices, perspectives, and approaches in nanotechnology. These modules also strive to develop a sound knowledge base, collaborative analysis, and ability to appreciate varied views of a vibrant group of mixed (academia and industry) participants. The training pedagogies in different modules were aptly aligned to their specific needs and foster more effective comprehension through participative learning. The interdisciplinary faculty at TDNBC, offering these programs, was a perfect blend of knowledge, experience, and training skills.



3. The second instructor-led live hands-on-training conducted on quality control of arbuscular mycorrhizal bio-fertilizers on 3 march 2022

Bio-fertilizers based on mycorrhizal fungi represent a natural way to enrich the soil in respect of environmental balance. Arbuscular mycorrhizal fungi (amf) are the most common symbiotic association between terrestrial plants and microorganisms, which are known to improve plants development and growth, especially under stress conditions. The potential for application of amf in agricultures is an agro-ecological approach to allow better use of soil nutrient reserves. That receives increasing consideration for their prospective application for sustainable agriculture



The TERI-Deakin Nanobiotechnology Centre (TDNBC) with support from Department of Biotechnology, Government of India hosted an in-person instructor-led live hands-on-training program to share systematic and practical knowledge about 'Quality Control of Arbuscular Mycorrhizal Biofertilizers'. The training sessions were held on 3 March 2022 from 10:00 AM to 3:30 PM at TDNBC, Gurugram.



4. Summer School on “Advanced techniques on Microbiological Biotechnology” on 11 May 2022

A summer school on “Advanced techniques on Microbiological Biotechnology” organized by TERI-Deakin Nanobiotechnology Centre (TD-NBC) along with International Iberian Nanotechnology Laboratory (INL), Braga, Portugal through DBT -TDNBC - DEAKIN – Research Network Across continents for learning and innovation (DTD-RNA) network. The one-day program with 9 M.Sc. Biotechnology student was chaired by Dr. Pushplata Singh, Director, TERI-Deakin Nanobiotechnology Centre (TDNBC), Gurugram, India & Dr. Shruti Shukla, Fellow, TDNBC. The program has been successfully organized by Dr. Shovon Mandal, Fellow, TDNBC, Dr. Amritpreet Kaur Minhas, Associate Fellow, TDNBC and Dr. Leena Johny, Associate Fellow, TDNBC on 11 May 2022.

The training program included two different sessions, Session I focused on ‘**Demonstration on morphological and molecular characterization techniques of Arbuscular Mycorrhizal fungi**’ where the participants were briefed about the different mycorrhizal structures formed during the symbiotic association along with demonstration of the staining techniques used to define the mycorrhizal spore characteristics using microscopic analysis. This was followed with molecular characterization where extraction of genomic DNA from mycorrhizal spore was demonstrated and explanation regarding different instrumentation utilized to analyse the extracted genomic DNA was shared with the participants. Session II was based upon ‘**Demonstration on Algae culturing techniques and biochemical Characterisation**’ where the discussion was focused on basis of selection of algal habitat for different applications (agriculture, carotenoids, and biofuels). Experts shared their recent accomplishments with participants to enhance the society’s understanding of the existing state of the art on algal biology and other resources to identify challenges.

The session II was followed by the visit to outdoor microalgal pilot scale production facility where the experts showed the possible solutions to overcome the challenges and knowledge gaps in the downstream processing of microalgae at pilot scale with a central focus on maintaining the quality of the products and biomass.

Overall, it was a dedicated forum to discuss ‘How microalgae can be a great advantage for industrial applications?’ and ‘How can they be promoted and exploited in a better manner?’ Hence, experts demonstrate the approaches for effective cultivation strategies with main emphasis being on the downstream processing via offline platform.

There was an overwhelming response from the students who participated actively in the program and have gained valuable learnings that would help them in achieving their research goals.



5. Summer School on “Nano-based Solutions for Agriculture and Environment” on 17 May 2022.

A summer school on “Nano-based Solutions for Agriculture and Environment” was organized by TERI-Deakin Nanobiotechnology Centre (TD-NBC) along with International Iberian Nanotechnology Laboratory (INL), Braga, Portugal through DBT –TDNBC – DEAKIN – Research Network Across continents for learning and innovation (DTD-RNA) network. The one-day programme with 9 MSc Biotechnology students was chaired by Dr. Pushplata Singh, Director, TERI-Deakin Nanobiotechnology Centre (TDNBC), Gurugram, India. The programme has been successfully organized by Dr Ruchi Agrawal, Associate Fellow, TDNBC and Dr Suneeti Singh, Research Scientist, TDNBC on 17 May 2022.



The summer school included two major sessions. Session, I focused on an overview of nanotechnology and its applications in different field. Subject expert of nanomaterials, Dr. Suneeti Singh gave a detailed lecture on “Introduction to Nanotechnology and Its Application for Environmental Health and Safety”, where the participants were briefed about the various nanomaterials and mechanisms for their synthesis along with a brief on the impact of nanotechnology in agriculture. The session continued with laboratory visit and demonstration on nanomaterials synthesis and their characterization

via different techniques such as DLS, Zeta potential, FTIR, and UV spectroscopy and toxicity evaluation of nanomaterials.



In Session II Dr. Ruchi Agrawal talked about the ‘Bio-based Nano materials and Nano polymers’ and introduced the young minds with various methods for the synthesis of nanomaterials and various tools for their characterization which was followed by the Demonstration of the ‘Process

for the extraction of polymers from Agro-residues via Hydrothermal Fractionation of Biomass’. The sessions were followed by an hour-long brainstorming Q&A and an Interactive session.

Overall, it was a dedicated forum to discuss the ‘Alternate Solutions for Nanotechnology’ which are cost-efficient and eco-friendly and ‘How can they be promoted and exploited in a better manner?’ There was an overwhelming response from the students who participated actively in the programme, and they have gained valuable learning that would help them in achieving their research goals.



6. E-Summer School program on “Nanosafety Challenges: Rethinking Nanosafety” on 18 May 2022

Globally, as multiple nanoproducts are reaching the application and commercial stages, it becomes vital to understand any potential risks associated with their synthesis and application. However, due to unique physicochemical properties these nanoparticles also tend to have complex interactions in environment and interfere with the assays, detection, and estimation systems. Factors like these pose great challenge in their overall safety assessments.

The **Teri-Deakin NanoBiotechnology Centre (TDNBC)**, Gurugram, India, in association with the Department of Biotechnology, Government of India under “DBT-TDNBC-Deakin-Research Network (DTD-RNA)” for learning and innovation across the continents, organized E-Summer School program on “Nanosafety Challenges: Rethinking Nanosafety” on 18 May 2022.

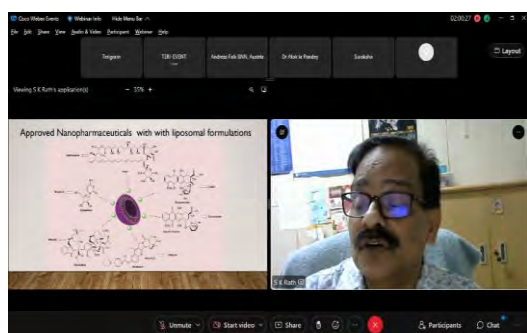
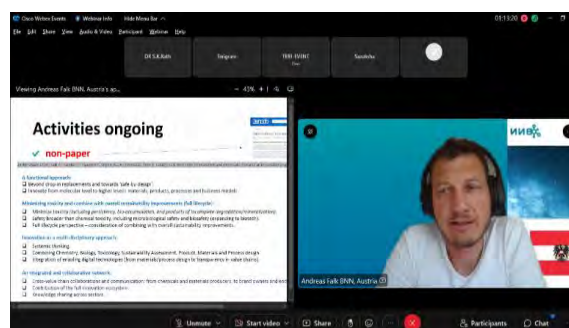
The winter school was aimed to spread advanced knowledge about Nanosafety challenges. Young researchers, students, and technocrats participated in this program to learn new insights into the thematic area.





The program began with the welcome address by **Dr. Pushplata Singh, Director – Teri Deakin Nanobiotechnology Centre, Gurugram**, followed by an introductory virtual tour of TERI and TDNBC nano-research achievements and facilities. The program was moderated by Dr Palash Kumar Manna, Senior Scientist, TDNBC, TERI.

The scientific session started with a keynote talk by **Mr. Andreas Falk, Chief Executive Officer Bionanonet Forschungsgesellschaft Mbh (BNN), Austria**, on Nano-Safety Challenges and Way Ahead for Global Collaboration. He briefly explained the challenges and focused on leading the way in global research nanosafety partnerships and tackling scientific and societal challenges in various areas.

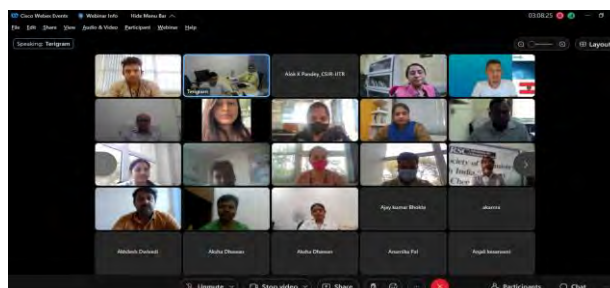


Dr. Srikanta K Rath, Chief Scientist, Division of Toxicology & Experimental Medicine CSIR-Central Research Drug Institute, India, delivered a perceptive talk on the Safety of Nano Pharmaceuticals. He explained the basics of the safety challenges involved.



The last lecture was presented by **Dr. Alok K Pandey, Senior Scientist, Systems Toxicology & Health Risk Assessment CSIR-Indian Institute of Toxicology Research, India**, who delivered an insightful talk on the Nanomaterial Toxicology: Methods and Challenges. He explained the methods and challenges one may face during the synthesis and characterization of nanomaterials.

After each session, an interactive Q & A session was held. The E-Winter School platform was attended by more than 70 participants across the globe.



7. Webinar on “Electrolysis of Water: The Way Forward” on 28 June 2022



Water electrolysis has come a long way since its discovery around 200 years ago. The world is working remarkably to cope with the energy demand and replace conventional fossil-fuel-based energy with affordable, reliable, and cost-effective green energy sources like hydrogen. The electrolysis of water is one of the go-to techniques for the same. However, the choice of catalyst, electrolyte and operating conditions play a significant role in energy

generation and pilot/industrial-scale production. **A clean hydrogen economy could be the answer to transitioning out of fossil fuel use. Being the most abundant element on the Earth and making up more than 90% of all known matter, it can be seen as the most feasible renewable resource available.**

The Teri-Deakin Nanobiotechnology Centre (TDNBC), Gurugram, India, in association with the Department of Biotechnology, Government of India under "DBT-TDNBC-Deakin-Research Network (DTD-RNA)" for learning and innovation across the continents, organized a webinar on "Electrolysis of Water: The Way Forward" on 28 June 2022.

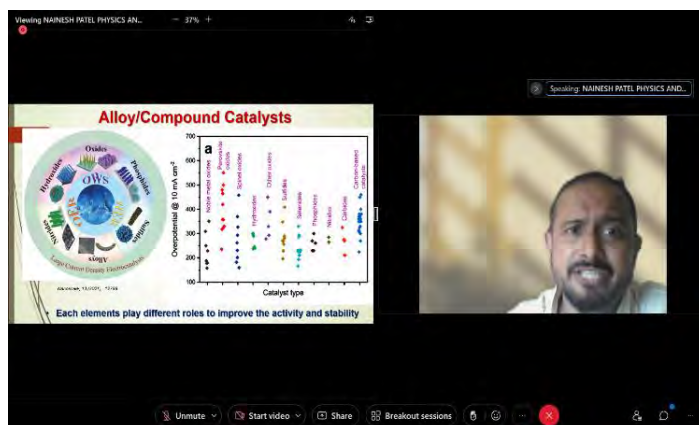
This Webinar was a great platform to recall the history and understand the present and future potential of water electrolysis in green energy generation. We aimed to bring together participants from academia, industry and regulatory bodies and brainstorm about water electrolysis's role as a future energy source.

The program began with the welcome address by Dr Palash Kumar Manna, Associate Fellow–Teri Deakin Nanobiotechnology Centre, Gurugram, followed by an introductory virtual tour of TERI and TDNBC nano-research achievements and facilities. The program was moderated by Dr Shruti Shukla, Fellow, TDNBC, TERI.

Electrolyzer technologies have been gaining more attention as they serve as a potential hydrogen production method capable of producing high-purity hydrogen from water and meeting hydrogen demands at various capacities. The scientific session started with a talk by **Prof. Subramaniam Chandramouli, Assistant Professor, Indian Institute of Technology Bombay, India, on Electrolyser Technology: The Basics.** He briefly explained the water electrolysis technologies for hydrogen production, which are discussed in the context of different electrolysis processes, including the historical development, theoretical thermodynamic, and electrochemical principles.

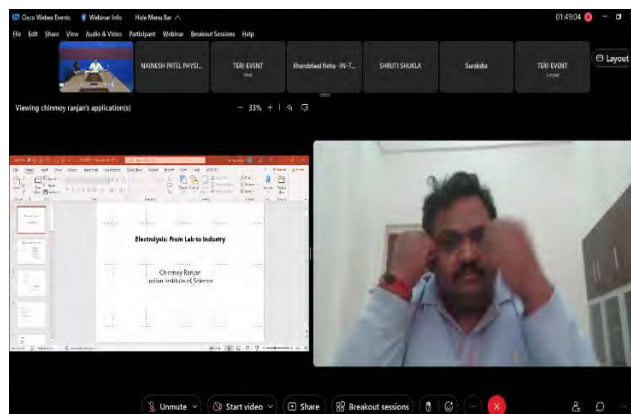


Water electrolysis is a well-established commercial technology; nevertheless, its practical application for the mass production of hydrogen is still limited as it suffers from several significant obstacles. With the advancement in the field of nanotechnology, the problems can now be addressed effectively. **Prof. Nainesh Patel, Associate Professor, Christ University India, delivered a perceptive talk on Water Electrolysis: The Role of Nanotechnology.** He

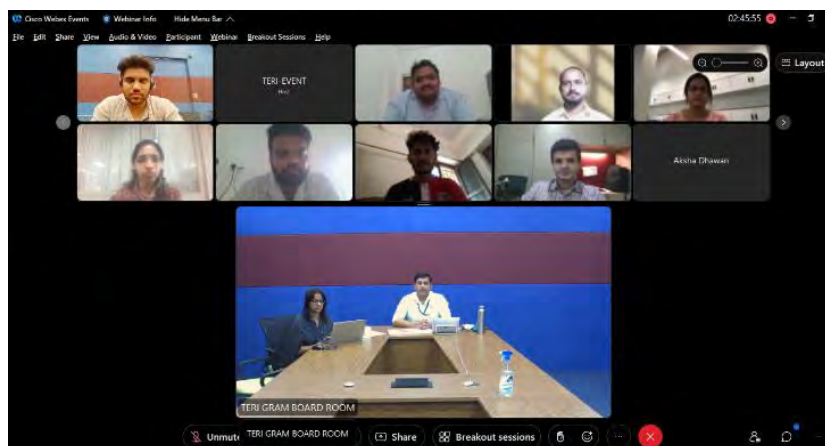


explained that the field of nanotechnology is integral for advancing a more green economy with the characterization of novel catalysts, which will ensure the quality of the catalyst is quantifiable and the use of nanomaterials as catalysts.

A revitalization of organic electrosynthesis has incited the research community to adopt electrochemistry as a green and cost-efficient method for activating small molecules to replace highly toxic and expensive redox chemicals. The last lecture was presented by **Prof. Chinmoy Ranjan, Assistant Professor, Indian Institute of Science, India, who delivered an insightful talk on Electrolyzers: From Lab to Industry.** He explained the commercialization of wide-scale electrification of organic synthesis. He highlighted the perspective and the advances made in large-scale flow electrosynthesis, its future trajectory while pointing out current methodologies' main challenges and critical improvements.

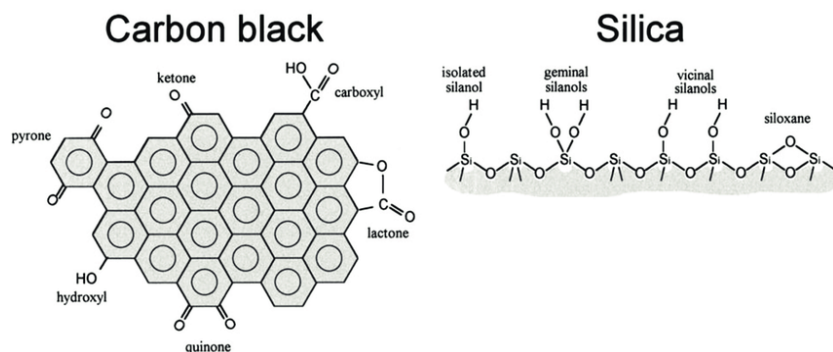


After each session, an interactive Q & A session was held. The Webinar was attended by more than 45 participants across the globe.



1. Development of a Standard for Measuring Carbon Black and Silica Concentration

The latest meeting of national committee of nanotechnology standards was resulted in approval of a national standard on determining the concentrations of carbon black and amorphous silica.



The latest meeting of national committee of nanotechnology standards (meeting no. 102) was held on 1 November 2021 to discuss and review the final draft of national standard entitled as "Nanotechnology- a method for determining the concentrations of Carbon black and amorphous Silica in the nanoparticle size range in the atmosphere of a mixed powder production environment" Ferrous carbon and amorphous Silica nanomaterials are used in various consumer products such as rubber products, insulation materials, etc. Despite the widespread use of this type of nanomaterial, determining the concentration of each specific nanomaterial in a mixed powder environment has been known as a barrier to setting specific exposure limits of nanomaterials for workers who are commonly exposed to those nanomaterials. This standard provides guidelines for quantifying and detecting concentrations of Ferrous Carbon nanoparticles and amorphous Silica based on size in air samples collected from an industrial production environment.

This national standard was developed with the participation of experts from universities, Iran National Organization for Standardization, industrial companies, and Iran Nanotechnology Innovation Council.

2. A Contract Signed for Commercialization of Iranian Anti-viral Mask



By signing an agreement contract with an industrial company, anti-viral mask developed by Sepanta Mehr Mandegar company is another step closer to commercialization and mass production.

The company uses nanotechnology to produce masks able to remove viruses, bacteria, and fungi. The company has succeeded in launching semi-industrial production scale.

It is worth mentioning that this product was exhibited in German A+A exhibition. This exhibition is one of the largest exhibitions in the world held every two years in Düsseldorf, Germany.

3. A National Standard for Nanomaterials Effect Evaluation of Protein Structure

A national standard was developed for specification of measurement protocols and test conditions for changes of secondary structure of a protein occurred due to its interaction with nanomaterials using UV-CD spectroscopy.



The 106th session of the national committee for nanotechnology standards was held virtually on 27 January 2022, and the standard "Nanotechnology - Evaluation of secondary structure of protein interacting with nanomaterials using UV-CD" was approved.

This national standard specifies measurement protocols and test conditions for changes of secondary structure of a protein occurred due to its interaction with nanomaterials using UV-CD spectroscopy. This standard is not used for characterization of changes in formulation of irregular proteins.

The international standard, ISO 23459 (published in 2021), was used as a source for development of the mentioned national standard. This standard was developed with the participation of several researchers from the country's different universities.

4. Identification of Salmonella typhi in Human Blood Serum Using Nano-biosensor

Researchers at University of Tehran successfully developed a biosensor for the identification and measurement of Salmonella typhi (S. typhi) in human blood serum with high sensitivity and accuracy.

The sensor can measure the amount of Salmonella typhi in patient blood with a detection limit of one picogram per milliliter.



Dr. Ghorchian, a professor at the Biochemistry and Biophysics Research Center of the University of Tehran, highlighted the significant achievements of this study, “in this process, carbon quantum dot (CQD) particles were used. Carbon quantum dot particles have received much attention due to their unique optical properties with high biocompatibility and good solubility in water. The research team successfully produced new carbon quantum dot particles with considerable optical and magnetic properties with an optical efficiency of 86%. They were used to design an optical biosensor to detect *S. typhi* in human serum with high sensitivity and accuracy.

Salmonella is usually transmitted through contaminated food or water to the feces or urine of patients. Contaminated fruits, vegetables, dairy products, as well as insects can transmit the infection. Semiconductor particles or quantum dots are usually made of heavy metals, especially cadmium and selenium. These quantum dots have proven to be powerful inorganic fluorescence nanomaterials. However, most high-performance quantum dots are limited due to the toxicity of their constituent metal elements. Compared to semiconductor quantum dots, carbon (graphene) quantum dots exhibit properties such as low toxicity, excellent solubility, and considerable chemical inertia. "Given that most carbon materials are cheap and available, increasing production scale can significantly reduce manufacturing costs," Ghorchian said, "also, considering the results of this research, the developed biosensor can be utilized as a rapid detection kit."

For the next step, the team wants to study the electrical and electrochemical properties of these quantum particles with similar heme structure to design and make various products for several applications. Results of this project was published at Biosensors & Bioelectronics journal entitled “High-performance porphyrin-like graphene quantum dots for immuno-sensing of *Salmonella typhi*.”

5. Workshop on Nanofiber between Iran and Thailand

On 5 April 2022, Iran Nanotechnology Innovation Council (INIC) and Thailand's National Nanotechnology Center (NANOTEC) held a virtual workshop on nanofiber.



This workshop aimed to bring Iranian and Thai professors, researchers, and scientists together to exchange research ideas on nanofiber and identify various opportunities for applying nanofiber technology in related industries.

Leading Thai and Iranian scientists from renowned universities and institutions joined the workshop to exchange their research ideas, knowledge, and work experiences among peers.

In addition, a few companies shared their achievements in applying nanofibers in industrial and consumer markets as well as manufacturing related industrial machinery.

6. Optimization of Fetal Sex-linked Diseases Diagnosis with Nano Biosensor

Researchers of an Iranian university successfully diagnosed fetal sex using a biosensor based on triple nanocomposite PANi-RGO-GNPs and DYS14 gene in the blood plasma of pregnant women in the 7th to 9th weeks of pregnancy.



“By earlier diagnosis, screening of pregnant women who are likely to give birth to a baby with sex-linked diseases is made possible that increase the likelihood of treatment and control of congenital diseases,” Mehdi Malmir, a PhD student at Bu Ali Sina University who is working on this project said, “thus, mother’s physical and mental problems as well as possible costs reduce.”

Fetal sex-linked diagnosis was conducted in this project by identifying the DYS14 gene using Apt/PANi-RGOGNPs/Au electrode, which is a part of the Y chromosome genome, in the blood plasma of pregnant women. This research project can be commercialized by making a special kit and also using DNA nano biosensors. By changing the desired sequence attached to the electrode surface, other bacteria and viruses could also be detected.

The project results were presented in an article published in Biosensors & Bioelectronics journal entitled “Label-free E-DNA biosensor based on PANi-RGO-G* NPs for detection of cell-free fetal DNA in maternal blood and fetal gender determination in early pregnancy.”

7. The Ninth Empowerment Camp for Nanotechnology Promotional Institutions Was Held

As part of its duty on promotion and education of nanotechnology across the country, Iran nanotechnology innovation council (INIC) has facilitated formation of several promotional institutions mainly in the universities and continuously support their activities.



The ninth empowerment camp for nanotechnology promotional institutions was held with the presence of 110 academic promotional institutions' liaisons and trainers for three days from 7 to 9 March 2022 in Tehran. During this three-day camp, various programs, and courses such as training workshops, teamwork course and team competition, overview of funding regulations of Nanotechnology Education Foundation (NEF), networking and transferring successful experiences among nanotechnology promoters were provided. The program also covered other skill development courses including communication principles, social network and branding, introduction to national nano competition, principles of negotiation and persuasion, and teamwork.

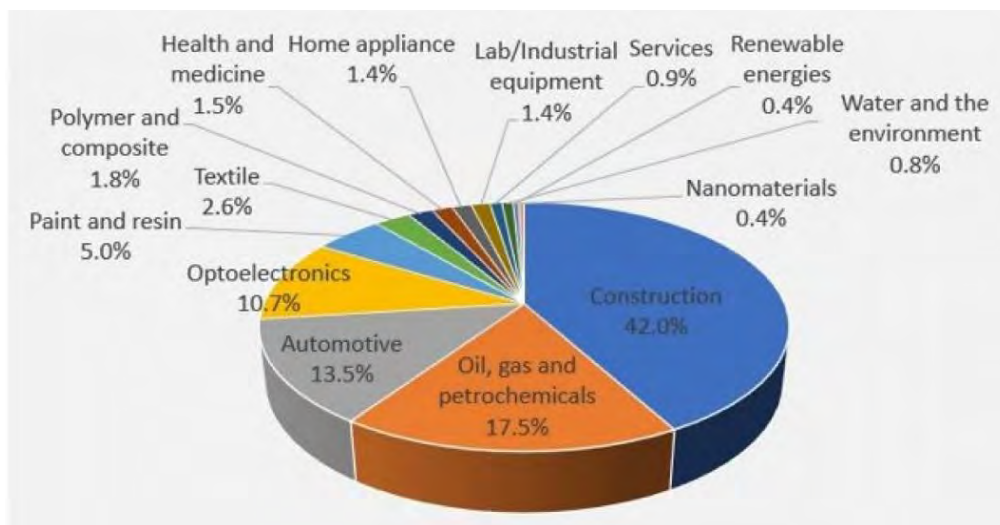
8. Iranian Nanotechnology Products Market Growth

The market for nanotechnology products made in Iran has amounted to over \$550 million in 2020 with a 7.3% export share, according to a review reported by Iran Nanotechnology Innovation Council (INIC). Among the various industrial fields, the construction sector has the lion's share in the Iranian nanotechnology market.



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To Have access to precise statistics and accurate information on domestic and international markets of nano products, the Iran Nanotechnology Innovation Council (INIC) conducts a survey of companies manufacturing nanotechnology products and equipment at the national level every year.



In its latest survey conducted in 2021, product sales and export information for 2020 of more than 320 manufacturing and service-providing companies active in the field of nanotechnology, whose products own Nanoscale certification from INIC were collected and verified through a census of nanotechnology companies and completing financial forms. The results obtained from the survey were also completed using market research methods based on the available valid facts.

9. Optimization of Industrial Wastewater Treatment with Nanosorbent

Researchers at Noshirvani University conducted research on using an adsorbent combination of carboxymethylcellulose-cellulose-nickel for the treatment of industrial wastewater containing nano-pollutants with potential for commercial production.



In this research, a new and cost-effective adsorbent was proposed and synthesized using emulsification method. Optimal hydrodynamic and physical properties confirmed their potential use as an adsorbent for the treatment of industrial wastewater containing nano-pollutants.

“Various processes such as copolymers are available to treat water, which can be divided into three mechanisms including freezing, combining, and adsorption. Extended Bed Adsorption (EBA) is a promising and practical separation method for biosynthetic product adsorption that has been studied in downstream process development. In this project, a new specially designed carboxymethylcellulose-cellulose-nickel composite adsorbent is fabricated by immersing water in an oil emulsion to create a stable development,” Meysam Sadeghi, PhD student in Noshirvani University said, “the innovation of this project is the synthesis of a new adsorbent along with comparing the results of using carboxymethylcellulose-cellulose-nickel adsorbent with the DEAE.”

The results obtained for the effect of particle size of the chemical structure of carboxymethylcellulose-cellulose-nickel composite on expansion properties of the substrate showed that at a uniform expansion coefficient, the larger chemical structure had a higher flow rate. In addition, it was observed that the smaller chemical structure forms a lower experimental value of the final velocity (U_t) and a more stable substrate. In order to commercialize the project, it is necessary to consider the use of adsorbents at industrial and semi-industrial scales as well as optimization of parameters affecting ligands to achieve optimal efficiency in the developed medium and evaluate their performance in columns with larger scales. The results of this study were published in an

article in Journal of Hazardous Materials entitling: “Treatment of nano-oil polluted wastewater in an expanded bed adsorption column based on carboxymethyl cellulose-cellulose-nickel composite beads.”

10. 5th Generation of Packaging in Iran

During an interview Dr. Lesankhosh, CEO of the company, Baspar Pishrafteh Sharif, emphasized on the development of the first international standard for smart and active nano-packaging as one of the company's major strategies for business development.



"Since 2015, in cooperation with the Standard Organization (Iran Nanotechnology Innovation Council represents Iran in ISO/TC229 sub-committee), development of a standard related to intelligent and active nano-packaging has started. After five years of continuous of intense work, the development of this standard was completed and accepted by ISO," Lesankhosh said. Developing and adopting such standard is an important act for facilitating international business in advanced packaging.

Dr. Lesankhos said: "Five generations of packaging technologies have been experienced over the last decades. In the first generation, the vacuum packaging was used; meaning that gases, including oxygen, were removed. In the second generation, in addition to removing oxygen, inert gases such as carbon dioxide or nitrogen were pumped into the packaging. Then companies moved on to adsorbents such as dehumidifiers or oxygenators. Nowadays adsorbents are added as additive materials in producing various types of packaging.

As Dr. Lesankhosh stated, in order to maximize product durability, a special combination of gases should be injected inside the packaging. Thus, for example, completely different combinations of gases are used for cucumber packaging in comparison with that of cherry packaging. This Iranian company produces and sells special nano-packages as well as nano masterbatches to different customers.

11. Design of Convergent Membranes for Highly Efficient Separation of Lithium Monovalent Ions

This research was conducted through a mutual collaboration of researchers from Iran and Australia. As the result of the project a convergent membrane was made to extract lithium ions and characterize them.



It is predicted that due to the growing need of industries for lithium, the demand for this element will increase further in a few years and it will become a more important and strategic element. Therefore, a number of research have been carried out to extract this important element from available resources. Seawater as a rich source of lithium ions can meet a significant portion of human needs for this vital substance. However, separating it from other ions present in the seawater is a challenging process. The future of lithium-based energy storage systems relies heavily on efficient separation of this element. Recently, biological ion channels with asymmetric cavity structures were considered as one possible approach to come across such challenge by researchers. However, the artificial reproduction of such a complex biological structure is technically challenging.

In this research, a highly tunable design concept was introduced to fabricate monovalent ion-selective membranes with asymmetric sub-nanometer pores in which energy barriers are implanted. The energy barriers act against ionic movements, which hold the target ion while facilitating the transport of competing ions. The membrane consists of bilayer metal-organic frameworks (MOF-on-MOF), possessing a 3.4- to 6 angstrom passable cavity structure. The ionic current measurements exhibit an unprecedented ionic current rectification ratio of above 100 with exceptionally high selectivity ratios. The results of this study were published in Advanced Materials journal entitling “Designing Angstrom-Scale Asymmetric MOF-on-MOF Cavities for High Monovalent Ion Selectivity”.

12. Granting “Nano Namad” License to An Industrial Company for Nanotechnology-based Car Air Filters

Behran Filter Company was able to receive the first “Nano Namad” license for its car air filter production line.

Using nanotechnology in the production of light and heavy vehicle's air filters through applying nanometer fibers on the filter surface, "Behran Filter" has been able to increase the durability of the filter and significantly improve the filtration efficiency.

After various stages of inspection and evaluation of the two products to receive the “Nano Namad” license, they were assigned for the two light and heavy vehicle's air filter products. A “Nano Namad” license (meaning nano-mark in Farsi) is a license assigned by the National Standards Organization based on compliance with the approved processes in nanotechnology

production line as well as the quality criteria in final products. It is hoped that this license will standardize various nanotechnology-based products in the country, improve their quality, expand markets of these products, increase consumer confidence, and finally prevent possible misuse of nanotechnology in society.



13. Nanocoating Using Ultrasonic Spray System

Sharif Solar Technology Development Company has succeeded in providing an ultrasonic spray system that can be used to create nanometer coatings of different thicknesses.



An Iranian company has succeeded in providing an ultrasonic spray system that can be used to create nanocoating using stable Nano colloid solution. This device has the possibility of layering on circular and cylindrical surfaces.

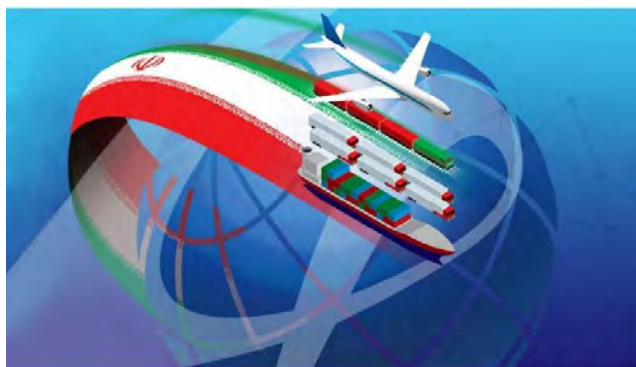
Coating using conventional spray methods creates droplets of different sizes, which reduces the quality of the formed layer. The ultrasonic method makes it possible to form droplets of very small size with uniform distribution. Ultrasonic spray method can be used with stable colloidal solutions to make controlled nanocoating.

The USS-40C Ultrasonic Spray is designed for precise coating using a variety of inks or nanoparticle solutions. The movement of the ultrasonic nozzle can be programmed, and a certain level can be sprayed for a certain time. The distance between the nozzle and the sample can be adjusted manually. The solution is injected into the nozzle through a syringe pump.

Sharif Solar is a knowledge-based company formed because of successful cooperation of some of researchers and graduates in the field of solar cells at Sharif University of Technology. Sharif Solar focuses on development and production of laboratory equipment. In addition to equipment, the company manufactures a wide range of laboratory materials used in solar cells and provides extensive services in the field of solar cell fabrication and analysis.

14. 915 Iranian nanoproducts exported to various countries in five continents

Iranian nanotechnology products are being produced and marketed in more than 15 industrial fields based on technologies developed inside the country.



Until March 2022, 915 nanotechnology –based products have been produced and marketed in more than 15 industrial fields based on domestic technologies developed inside the country. The development of nanoproducts export programs in recent years and opening of several export offices in various foreign markets have provided the basis for the entry of Iranian nanotechnology goods, equipment, and services to global markets. So far, Iranian nano products have been exported to 49 countries in 5 continents.

42% of the products are sold in construction market segment; while oil, gas and petrochemicals sectors have 17% share in nanoproducts. More than 13% belong to the field of automotive industry, and almost 10% of nanoproducts are produced by optoelectronics companies.

15. Powder Lubricant Production in Iran

Nano powder lubricant was developed and commercially produced by Iranian scientists and entrepreneurs.



“Zhikawa Construction Company is one of the leading companies in producing building materials,” Mr. Tahbaz said, “more than 60 different products are produced in Zhikawa, including a variety of additives, lubricants, and concrete-related compounds.” The companies R&D division worked on development of a super-lubricating powder with steady demand in the market. The company could succeed in development and production of this product. This powder lubricant has now reached the commercialization stage.

In addition to the mentioned product, the company also produces other nanotechnology-based products. “After getting acquainted with antibacterial property of some of the nanomaterials, we started to use this type of nanomaterial in a group of products. Finally, construction products with antibacterial properties entered the company’s product portfolio,” Tahbaz said.

16. Unveiling of Four Iranian Devices in Cancer Diagnostics and Treatment at the Iran Lab Expo

Four Nano Hesgar Sazan Salamat Arya Company devices in cancer diagnostics and treatment at the Iran Lab Expo were unveiled.



Nano Hesgar Sazan Salamat Arya Company devices were unveiled at the Iran Lab Expo. Cancer Detection Probe (CDP) for real-time diagnosis of involved margins and lymph nodes during breast cancer surgery, Impedance Tumor Detection Probe (ITDP), Positive Electrostatic Cancer Therapy (PECT) for malignant tumors and real-time Blood ROS detection system (BROS), and designed and built by Dr. Abdolahad's research team, can be used for diagnosis, and treat cancer.

According to Dr. Abdolahad, the first device is the Cancer Diagnosis Probe, a device for identifying margins and lymph nodes involved in cancer, which is designed to detect the remained cancerous cells in the cavity-side of the patient's body after tumor removal. This device has also received a license from the Iran Ministry of Health and Medical Education.

The second device, ITDP, is an impedance-based diagnosis probe that helps the radiologist determine the mass's condition in the patient's breast and its risk to the patient. In this method, the system's needle-shaped 2-electrode probe enters SLNs or ALNs under ultrasound guide, and without any tissue extraction, the radiologist can judge the risk of the tumor. This information helps physicians make the best decision when in doubt about a biopsy.

The third device is a device that uses electrostatic for cancer therapy of the malignant masses. This device has a patch placed on the patient's body, and its high electrostatic charge disrupts the proliferation and growth of cancer cells. Another application of this device is to concentrate

drugs with positive charges in the cancerous tumors and reach their cells in a targeted manner. So, thanks to this technology, many drugs can be used for cancerous tumors.

Dr. Abdollahad adds that the fourth device, BROS, is a device that detects ROS (reactive oxygen species) levels in the blood that is used for breast cancer detection. When a mass in breast cancer becomes malignant, the ROS in these cells decreases. This device can measure the amount of ROS in the blood of patients with cancerous mass and show that the amount of ROS is reduced compared to standard samples. If the concentration of ROS decreases, it is a pre-warning revealing that the tumor is malignant. Notably, there is more ROS in benign tumors than in malignant tumors.

Nano Hesgar Sazan Salamat Arya employs advanced technologies to design and manufacture medical equipment and products to diagnose and treat cancer. The company's main objective is to produce and commercialize innovative high-tech products in the medical field.

17. Treatment of Cancerous Masses Using Magnetic Nanoparticles

Researchers at the University of Isfahan, in collaboration with researchers from University of Ilmenau in Germany, conducted research on magnetic nanoparticles for medical applications.



The research aims to investigate the specific loss potential of nanoparticles prepared for the treatment of cancerous masses using magnetic transduction method.

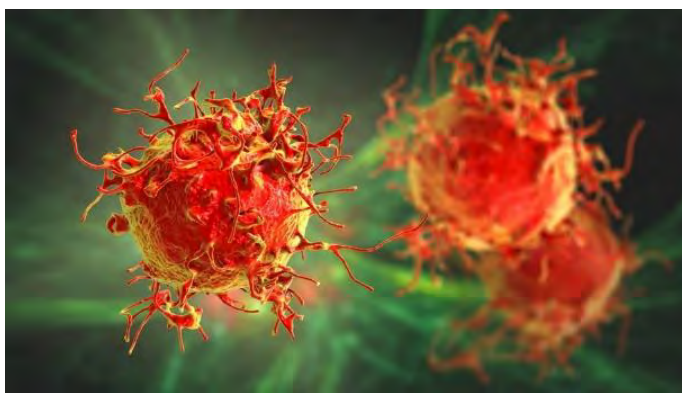
“In this work, magnetite nanoparticles as well as magnetite nanoparticles replaced with zinc and samarium were made using co-precipitation method. The nanoparticles were coated with citric acid and pluronic copolymer F127, in which acceptable stability was observed for ferroflux for a long time (several weeks),” Morteza Mozaffari, associate professor at University of Isfahan, said, “despite their large size, nanoparticles are well dispersed in the fluid and samples with low concentrations showed very good dissipation.” These nanoparticles can be used for targeted drug delivery and to improve MRI and MPI imaging. Based on the data obtained from various experiments, despite the large size of nanoparticles dispersed in the solution and the large magnetic interaction between them, ferroflux remained floating in an aqueous medium (pH 5.5) for a long time and showed good stability. The experiments showed that these samples were very good options for use in the treatment of cancerous masses by magnetic resonance imaging. Referring to the innovative features of the project, Mozaffari said: "Replacement of samarium

ions in iron oxide nanoparticles for extraterrestrial applications, which is less common than replacement of other rare earth ions, is coated with F127, citric and pluronic acid, which is very biocompatible and commonly used in medicine." "They are suitable, and the very good stability of the nanoparticle market, despite their large size, is a feature of this research."

The results of the project were published as an article in the journal of Scientific Reports entitling "Heat dissipation in Sm^{3+} and Zn^{2+} co-substituted magnetite nanoparticles coated with citric acid and pluronic F127 for hyperthermia application."

18. Cancer Patients Screening Using Immunity Nano Sensor

Researchers from Kurdistan University built a highly sensitive immunity sensor to detect and measure cancer marker, CA19-9, and screen patients with various cancers, including pancreatic.



Based on the use of different nanomaterials and their synergistic effect, different strategies were used to strengthen the signal and increase the sensitivity of CA19-9 marker measurement method with the lowest detection limit.

With the collaboration of other researchers from Kurdistan University, Dr. Salimi, a faculty member at Kurdistan University, succeeded in designing a biosensor for early clinical diagnosis of various markers related to certain diseases, including pancreatic cancer.

"Electrochemical luminescence (ECL) method is one of the most sensitive and accurate methods for measuring biological markers and is currently used in medical and clinical diagnosis laboratories" Salimi said, "using a high-performance probe is one of the most important challenges in this measurement method and different nanostructures including graphene have been used for ECL-based measurements."

Millions of cancer cases are reported all over the world annually. Punctual screening is generally followed by easier treatment, probable full control, and recovery. The designed biosensor is used in treatment centers for early clinical diagnosis of various markers related to certain diseases, including pancreatic cancer. Also, this product can be used in devices that are based on the ECL method in clinical laboratories for detection and measurement of different markers. Obtained results indicated successful application of this biosensor in real samples analysis and full agreement with the results obtained from the standard ELISA method.

The results of this research is published in an article entitled "Graphdiyne nanosheet as a novel sensing platform for self-enhanced electrochemiluminescence of MOF enriched ruthenium (II) in

the presence of dual co-reactants for detection of tumor marker” and published in BIOSENSORS & BIOELECTRONICS journal.

19. 300 Iranian Nanoproducts Received Nanoscale Certificate in 2022

New figures show the production of items and equipment developed based on nanotechnology in Iran witnessed a sharp increase from 1111 to 1409 in 2022.



According to a report published by Iran Nanotechnology Innovation Council (INIC), 1409 nanotechnology-based products have been developed in the country since 2007, i.e. the establishment year of the system of voluntary certification of NanoSclae. The figures show that currently 275 companies produce nanotechnology-based items and 64 make equipment in Iran.

The system of voluntary certification of NanoSclae was established in 2007 with the support of Iran Nanotechnology Innovation Council (INIC) to enhance consumer trust and confidence and to create nanoproduct market transparency. NanoProduct Certification Unit (NPCU) monitor and certify nanoproduct based on national/international standards.

20. 10th International Standard Published under Iran Supervision

Iran proposed the tenth standard in the field of nanotechnology entitle as “Nanotechnologies—Toxicity assessment and bioassimilation of manufactured nano-objects in suspension using the unicellular organism *Tetrahymena* sp.”



This standard was developed with the support of Iran Nanotechnology Innovation Council and tireless efforts of an academic group. The proposal of this standard was officially submitted to the International Nanotechnology Standardization Committee (ISO/TC 229) in February 2019. Finally, after two years of continuous research, study, and exchange of opinions in various meetings, the standard was approved for publication and is now available on the website: <https://www.iso.org/standard/80595.html>

A new guideline for investigating and evaluating the biological safety of nanomaterials in aquatic environments using a biological biomarker living in freshwater ecosystems called *Tetrahymena* was presented. This guideline helps to check and compare the toxicity and risk potential of manufactured nano-objects with minimum costs in no time.

UP to now, 99 international standards have been published by the Technical Committee of ISO/TC 229. Ten standards have been proposed and developed under Iran's supervision. Development of an international standard usually takes three to four years.

21. Iran Active Participation in the Meeting of ISO Technical Committee on Nanotechnologies

ISO technical committee of Nanotechnologies meeting was held virtually and physically with the participation of delegates from 22 countries on November 14-18, 2022

Iran's delegates attended virtually in this meeting and three international standards which are being developed under Iran's leadership were discussed in ISO's technical committee on Nanotechnologies (ISO/TC 229) meeting.

The first standard, entitled "Nanotechnologies — Superhydrophobic surfaces and coatings: characteristics and performance assessment" and being developed under Iran's leadership in ISO, was discussed and reviewed. The resolution was that the draft of the standard can be proceeded to the final stage of international standard development procedure. The standard is being developed by an Iranian knowledge-based company. The second one which focuses on superhydrophobic textiles, entitled "Nanotechnologies — Textiles containing nanomaterials and nanostructures — Superhydrophobic characteristics and durability assessment". In this session the resolution was that this is standard is ready to send for publication. The third standard which has recently approved by member countries of ISO/TC229 with the title of "Nanotechnologies — Test method for detection of nano-object release from respiratory masks media under different working conditions" was presented and discussed in this meeting. This standard is being developed by an academic and research group.

Iran also proposed a new standard covering properties and characteristics of hard nano coatings Working group 4 of ISO/TC229. The committee concluded to give Iran the opportunity to prepare a preliminary draft of this standard to send to the international committee for consideration and discussion.

22. Indian Surgeons visited the Company producing Cancer Detection Probe

A delegation comprising Indian investors and surgeons visited Iran to know more about an Iranian Cancer Diagnostic Probe to investigate application in hospitals in India.



The Iranian Cancer Diagnostic Probe (CDP) has been designed and manufactured by Dr. Abdollahad, faculty member of College of Engineering, University of Tehran, and his team. This device was developed with the supports of Iran Nanotechnology Innovation Council (INIC) succeeded in creating a technology for detecting cancerous margins and producing a CDP device.

The CDP is a medical device, which can determine the extent of metastasis and spread of a cancerous tumor in women's breasts. It can detect the margin of the breast cancer and help remove cancerous outgrowths with high precision. The cancer margin is the edge or border of the tissue removed in cancer surgery, where cancerous cells could still exist and lead to later recurrence of the disease.

The existing method uses frozen sections, and it takes about an hour to detect margin of cancer. However, the Iranian CDP can reduce that time to 15 seconds. The sensitivity of this device has been reported at over 97 percent. Iranian surgeons have been using the device for two years. After visiting the functionality of the device, the Indian delegation indicated its willingness to purchase the equipment and use it in 10 hospitals.

23. Nanotechnology Impact on Development of National Iranian South Oil-fields Company

The National Iranian South Oil-fields Company has used technologies of an Iranian company active in the field of nanotechnology for the maintenance of 22 wells.



"The National Iranian South Oil-fields Company is the largest subsidiary of the National Iranian Oil Company, which can produce more than 2.9 million barrels of oil per day," Roghanian, deputy technical director of National Iranian South Oil-field Company said, "the company is also responsible for the development of 45 oil fields." In order to increase production from the fields, drilling packers should be used which impose high costs on the company.

"In 2015, we signed a contract with the National Iranian South Oil-field Company," Mr. Arghawani, CEO of Kia Sanat Sharif said, "in 2018, the research phase of this project was concluded." The company's focus is on the production of packers used for oil and gas wells.

The whole process of design, development and production of these packers was carried out in Kia Sanat Sharif company. The product was used on a test well and the results were completely

satisfactory and were approved by the officials of National Iranian South Oil-fields Company. Therefore, the cooperation between the two companies continued and the packers were used in 22 wells. According to the officials of the National Iranian South Oil-field Company, these packers work quite well and overcome various challenges.

"We received considerable supports from Iran's Nanotechnology Innovation Council (INIC) which helped us in the way for commercialization," The CEO of Kia Sanat Sharif said.

As the head of production engineering department of National Iranian South Oil-fields Company said, a contract was signed for the purchase of 100 packers. Value of this contract is estimated at 5 million dollars.

24. A Quick Review on IRAN NANO 2022

The 13th international nanotechnology festival and exhibition ended on October 4, 2022 with participation of more than 160 companies..



During 4 days of IRAN NANO 2022, various programs such as signing of industrial contracts, official visits, various competitions among students from different schools and universities, scientific events, as well as group visits were held. More than 160 companies presented their latest achievements and capabilities in this exhibition and thousands of people visited the exhibition in three halls.

In this event, a large number of new companies and startups were also present. Increased number of startups present in the exhibition is a sign showing growing potential in university professors and graduates for commercialization of scientific achievements. In addition to various online photo reports and live video broadcasts, numerous news and reports were published on national and international media.

Major officials of the country including INIC secretary, Vice-president for Science and Technology, and Minister of Agriculture were among the visitors of the exhibition.

IRAN NANO 2022 also hosted international delegations from Mexico, Nicaragua, Venezuela, and Brunei.

In response to the global supply chain instability caused by COVID-19 and the Ukraine conflict, Japan has announced a series of industrial policies related to semiconductors and batteries.

In the semiconductor sector, the Ministry of Economy, Trade, and Industry (METI) announced its "Semiconductor and Digital Industry Strategy" in June 2021. The strategy aims to ensure semiconductor technology and improve its supply chain resiliency. Based on the strategy, METI decided to subsidize a semiconductor plant being built in Kumamoto Prefecture by Taiwan Semiconductor Manufacturing Corporation (TSMC) and others. It also decided to provide 70 billion yen to Rapidus, a new company aiming to produce next-generation semiconductors with IBM in USA. The "Basic Principles for Semiconductor Cooperation" signed by Japan and the U.S. in May 2022 called for joint research on advanced technologies. The Ministry of Economy, Trade and Industry (METI) launched the "Leading-edge Semiconductor Technology Center (LSTC)" in December 2022 as a center for such joint research, which will be responsible for research and development of advanced semiconductor technologies for the 2 nm and smaller nm miniaturization generation. It has already been announced that Rapidus and other companies, as well as several national laboratories and universities, will join the project. Since the growth of the semiconductor industry requires the development and securing of human resources in a wide range of fields from design to R&D and manufacturing, the development of these human resources is also an urgent task.

In the battery sector, the Ministry of Economy, Trade and Industry (METI) launched its Battery Industry Strategy in August 2022. The strategy aims to secure the supply chain and domestic manufacturing base for batteries, which have high material resource risk. Based on the strategy, the ministry has decided to subsidize 100 billion yen to build domestic manufacturing and recycling bases for conventional lithium-ion batteries with a liquid electrolyte. Human resource development is also an urgent task, and a consortium led by AIST is being formed to develop 30,000 battery-related human resources, from R&D to manufacturing management, by 2030.

In both strategies, the development of cutting-edge nanotechnology and materials is an indispensable issue, and the Center for Research and Development Strategy (CRDS) of JST is making strategic proposals regarding basic technologies of materials, devices, and advanced manufacturing, considering these technological trends.

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 2021-2022. (Available in Japanese Language at <https://www.jst.go.jp/crds/report/report01/index.html>).

1. Control of Generation and Decomposition of Modular Structures for Materials Circulation - Sustainable Element Strategy

This proposal describes a new material design concept which enables the flexible control of the stability and decomposition of inter-block bonds through the generation and decomposition of modular structures composed of multiple blocks, with the aim of realizing sustainable material

circulation. This is a research and development concept that aims to develop materials with an awareness of the flow of materials after use. Here, "block" refers to the constituent unit of a Modular Structure, such as the main phase (Nd-rich phase) and the sub-phase (grain boundary phase) in permanent magnets, the matrix (resin) and the filler (fiber) in composite materials, and the two-dimensional atomic layer thin film that constitutes layered materials. By carrying out research and development based on this concept, we aim to make it possible to make materials highly functional and multifunctional, which cannot be achieved with a single material phase (block), and to contribute to the realization of a circular society by solving waste disposal problems, reducing environmental impact, and reducing resource supply risks through decomposition controllability between blocks.

As we work toward the achievement of the SDGs and the realization of Society 5.0 proposed by Japanese government, and as digital transformation (DX) accelerates after the global pandemic of the new coronavirus infection (COVID-19) that broke out at the end of 2019, the requirements for various products are becoming increasingly sophisticated not only in terms of performance, but also in terms of environmental and energy impacts. The materials that make up the core components of these products are required not only to improve single performance but also to satisfy various functions simultaneously. In these materials, many critical elements are contained. In this context, the "Elemental Strategy" proposed by Japanese government to solve these problems is becoming increasingly important(<https://elements-strategy.jp/en/about/outline>) . With the recent changes in foreign countries' resource policies and the disruption of supply chains triggered by the expansion of COVID-19 infection, it is necessary to formulate a new materials development strategy in order to secure resources in a sustainable manner and to maintain the international competitive advantage of materials, devices, and manufacturing technologies in which Japan has so far, an advantage. While we pursue new functions and usefulness in materials and products, there is a growing concern about the environmental impact of products made of new materials and general-purpose products manufactured and consumed in large quantities and their waste disposal problems. The growing social attention in these issues has led to the idea that we should depart from the conventional mass-production, mass-consumption, mass-disposal society and build a circulating society instead, which could change manufacturing drastically. Based on the concept of "inverse manufacturing" proposed in Japan in the 1990s, the construction of recycling systems for various products such as home appliances has progressed, but it can be said that it is just a shift from mass production, mass consumption, and mass disposal to mass production, mass consumption, and mass recycling, and the question remains whether this is the sustainable manufacturing that we should be aiming for. It is said that 5% of the energy consumed in the world is used for metal separation, of which 80% is for crushing and grinding. To reduce these energy consumptions and realize a circulating society with low environmental impact, it is necessary to pursue material circulation from the product level to the materials level. At present, however, both academia and industry are lacking in such efforts. Looking at the trends in science and technology to meet the increasing social demands from the materials aspect, for example, inorganic materials have evolved from single-element materials to multi-element materials, composite materials have evolved to control structures with complex combinations of multiple compositions, and polymer materials have evolved to control structures with higher-order hierarchical structures. Materials science and technology for precise control of complex structures and higher-order hierarchical structures has not yet been established. In separation and recycling technology, while physical separation technology

developed from ore dressing and chemical separation technology developed from smelting (high temperature wet separation process) have been developed individually, the fusion of physical and chemical separation technologies is evolving into the development of localized, selective, and highly precise separation technology that concentrates energy only on the part that needs to be decomposed. In the background above, this proposal focuses on the control of generation and decomposition of modular structures as a common target for materials creation (arterial side) and materials separation and recycling (venous side) and proposes to promote R&D toward the realization of a sustainable circulating society by targeting the flexible control of the stability and decomposition of inter-block bonds. By achieving this, we will demonstrate that there is technological potential to not only satisfy the functions demanded by society when materials are used, but also to contribute to the reduction of environmental impact and material recycling after materials are used. The R&D issues to be addressed in implementing the R&D strategy include "designing new materials with new functions by controlling modular structures," and the "establishment of the science of the generation and decomposition of modular structures" and "advancement of common basic technologies" that are necessary to make this possible. In order to implement the "design of new materials with new functions by controlling modular structures," it is important to consider the following points: 1) how to combine multiple blocks to achieve the advanced functionality and multifunctionality required in the materials, and 2) how to achieve a low-cost decomposition process to reduce environmental impact and achieve material circulation. In order to control the stability and decomposition of inter-block bonds, it is necessary to establish the "science of generation and decomposition of modular structures" through the elucidation of deterioration and destruction mechanisms in existing materials and scientific understanding of current separation and recycling processes. In addition, in promoting the above-mentioned R&D, it is necessary to advance simulation and measurement technologies in combination with data science that can handle more complex physical and chemical processes. In particular, it is necessary to develop simulation techniques for non-equilibrium and unsteady states, including decomposition processes, and to build a database of dynamic phenomena that can track the time evolution of reactions and processes. In addition, it is necessary to develop new process technologies for the generation and decomposition of modular structures, as well as high-throughput experimental methods and real-time process measurement methods to support them.

2. Innovation of dynamical measurement under operation to elucidate material & device functions - Next-generation operando measurement

This proposal describes a measurement method that measures chemical, biochemical, and physical dynamic phenomena occurring in materials, living organisms, and devices under actual use, operating, and manufacturing environments, and links these phenomena to elucidation of the functions of the measured objects. This method is called "operando measurement". Now, there is a strong demand for development of fuel cells and batteries with improved performance that will be effective in preventing global warming, and catalytic materials that promote energy saving and low environmental impact. In response to these demands, operando measurement is attracting much attention because the method possibly elucidates the functions of the measured materials and devices. Operando measurement has already been applied to catalysts and battery materials, providing useful information that is qualitatively different from the static and fractional

information of materials and devices in a non-operating condition provided by conventional methods.

However, there are several problems with the present operando measurement. For example, the present measurement does not always reproduce the actual environment of the measured object. As a result, the results measured on the nano-scale structure of the measured object do not reflect the actual situation under its operation. The spatial and temporal resolutions are insufficient for elucidating the functions. The measurement and analysis processes are difficult for users who are not familiar with such a measurement. Due to these problems, we cannot fully elucidate the functions of the measured objects by utilizing the present method. Additionally, we are applying the current operando measurement methods to only a limited range of research fields.

This proposal aims to solve the above problems in the present operando measurement, establishing the “next-generation” operando measurement. Here, we refer to the following as the next-generation operando measurement: an innovated measurement method that provides enough information enabling a direct approach for the core of functions of the object and expands the application areas beyond the present catalysts and batteries to other areas of materials and devices, even living organisms.

To establish the next-generation operando measurement by solving the above problems, we will discuss the following four issues:

- (i) Development of an optimal “model environment” that corresponds to the R&D needs which can produce experimental data to elucidate functions of the measured objects, and which also expands applications to wide range of materials and devices, particularly to biological tissues.
- (ii) Construction of a sophisticated measurement system and development of measurement / data science technologies that connect between different scales to measure and analyze highly complex hierarchical structures in materials, devices, and biological tissues on multiple temporal and spatial scales, elucidating the relationship between the structures and their functions.
- (iii) Development of measurement instruments and technologies with high resolution (time, space, energy, etc.) to raise the level of existing technologies and to extract information on inside of materials, devices and biological tissues, and interfaces between materials.
- (iv) Development of measurement technologies based on data science to achieve the next-generation operando measurement sooner by utilizing data science technologies to make measurement and analysis more advanced and efficient.

The next-generation operando measurement will create and develop new scientific fields driven by measurement techniques for heterogeneous, unstable, and transient complex systems. Looking back at the history of scientific discoveries in various fields, this new technique has the technological potential to bring innovation and open up new science.

3. Basic technologies for wireless and optical convergence toward advancing next-generation communication

This proposal discusses how to create and establish innovative basic technologies for next-generation high-performance communication allowing the smooth connection between physical

and cyber space. The key approach toward the goal is to combine technologies from the fields of wireless and optical communications, or electronics and photonics in other words, which have been so far developed without intensive interactions between each other, and to enhance the communication capabilities in terms of high speed, large capacity, and low latency. The converging technologies will initiate the developments of novel science and technologies that will be crucial for next-generation communication. In the proposal, we focus on the terahertz (THz) region, the frequency range between the current communication bands in wireless and optical networks, which has not been well explored. For the advanced use of this unexplored frequency band of electromagnetic waves, we raise the strategic research areas as the following.

- (i) Research and development for the use of unexplored frequency regions. To significantly increase the data rate and capacity, it is desirable to use the terahertz band (100 GHz to 1 THz), which is a frequency region above the millimeter wave band of several tens of GHz. However, in such a high-frequency region, there will be problems such as suppressed diffraction, an increase in absorption of electromagnetic waves in the atmosphere, a decrease in power efficiency of radio wave generation, difficulty in signal amplification, and an increase in transmission loss of conductors and dielectrics. Thus, it will be difficult to transmit radio waves for long distances. To overcome these issues, research and development is necessary on array antenna technology that transmits radio waves only to the desired direction, active use of radio wave reflection / transmission, high-efficiency terahertz wave oscillators / detection elements / amplifiers, new substrate material / conductor structure / dielectric material for low transmission loss, and high-frequency material characteristic evaluation method / evaluation tools.
- (ii) Research and development for advanced use of wireless communication and optical communication schemes. Within the limited frequency band, it is necessary to develop technology that achieves higher speed and larger capacity with various multiplexing technologies. In addition, we will also work on extreme massive connectivity technology that makes possible the simultaneous connection to many terminals including automobiles and IoT sensors, which will be required as a future communication system, and technology for highly reliable communication with extremely low latency to ensure real-time control. Furthermore, to produce various system configurations that take advantage of the features of wireless and optical communication, we will also work on technology that performs mutual efficient conversion between wireless signals and optical signals, and analog-digital conversion at high speed and efficiency. Since software technology plays an important role in the configuration of various systems, it is important to consider the cooperation with software when conducting research and development of these hardware technologies.
- (iii) Research and development for low energy consumption, high reliability, and low cost. The functional requirements as the basic technology for next-generation communication are the above (i) and (ii). However, in response to social requirements such as CO2 reduction of network systems, and reliability and resilience as social infrastructure, as well as utilizing the basic technology not only in communication systems but also in application fields such as computer networks consisting of data centers and edge computing, radar systems, and IoT sensors, it is necessary to conduct research and development aiming at low energy consumption, high reliability, and low cost. This

requires not only the pursuit of characteristics at the material and device level, but also the implementation of functional modules through the integration of various components. Therefore, it becomes important to conduct research and development of heterogeneous integration technology that integrates different materials and devices such as optical devices, advanced CMOS digital devices / circuits, high-frequency analog devices / circuits, and compact antennas with advanced massive MIMO.

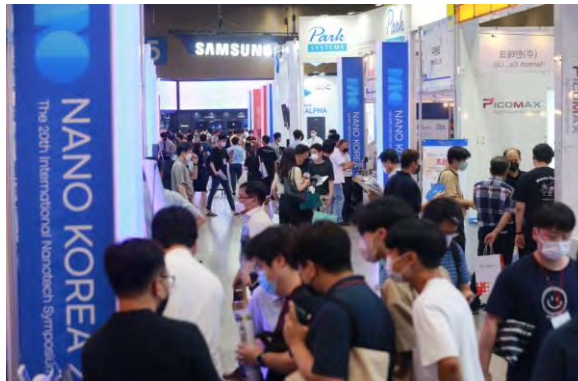
- (iv) Basic technology and materials research that support technological evolution. In addition to the research subjects that can be realized by continuous development making the best use of existing technologies, there are also challenging goals that are difficult to achieve just by the simple extension of existing technology. Even discontinuous evolution of technology will be required sometimes to respond to such challenging goals. To respond to these sophisticated communication requirements, it is also important to promote research in a wide range of related basic fields, such as basic research in condensed matter physics, optical science, and emerging materials / process technologies.

NANO KOREA 2022

NANO KOREA, Korea's largest symposium and exhibition on nanoscale science and technology, was held from July 6 to 8, 2022 at KINTEX in Ilsan, Korea as an on off-line hybrid event with the slogan of 'Nanofabrication: Connecting Science and Technology for Better Life'.



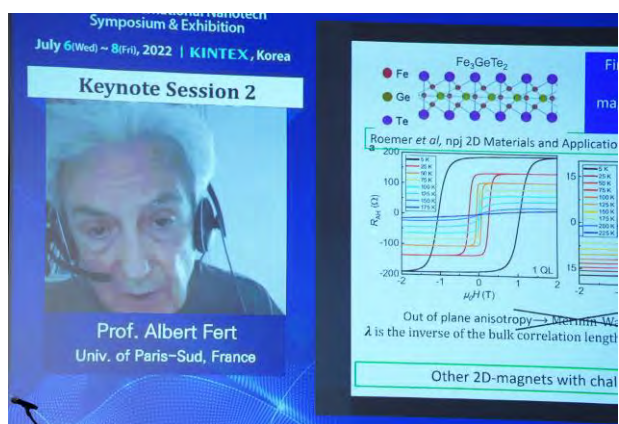
To celebrate the 20th anniversary of NANO KOREA, various meaningful programs and events were opened to the public as well as researchers in nanoscience. A TV program co-produced by the organizing committee and YTN was broadcasted to the public under the theme of "Future Technology, Nano that Makes Dreams Real" through various platforms a week before the event. At the opening ceremony attended by over 200 experts in the nanotechnology field, a commemorative video containing the history and achievements of NANO KOREA over the last 20 years was released. In addition, the "NANO KOREA 20th Anniversary Special Exhibition Booths," which presents innovative products with core nanotechnology applications that have been successfully developed over the past 20 years and advanced nanotechnology in the future industry, was displayed in the exhibition hall and opened to over 10,000 participants during the event.



For keynote speeches, Nobel Prize winner Professor Albert Fert of Université Paris-Saclay delivered the online lecture titled '2D magnets: from physics to spintronic devices magnets' to the participants real-time. The symposium programs, including technical sessions, public sessions, special sessions, and poster sessions all be held in a hybrid format to increase the participation rate of domestic and foreign registrants. The technical session covered important issues in nanoscience and nanotechnology and consisted of 12 different technical departments. In particular, this year, the Young Scientist Awards were awarded for the first time to 55 oral

presenters who presented their excellent research during the technical sessions. In addition, the public session is for teenagers encountered nanotechnology and provided short practical experience in nanotechnology experiments. There were over 3,900 participants in the symposium this year, which ranked the highest number of participants ever, and the number of participants increased to 61% compared to the previous year after overcoming the COVID-19 crisis over the past two years.

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



Nano Convergence

Nano Convergence(ISSN: 2196-5404) is a peer-reviewed, open access, international and interdisciplinary research journal that seeks to facilitate communication among scientists from a variety of research areas whose topics are closely related to nanoscience and nanotechnology jointly published by **Korea Nanotechnology Research Society (KoNTRS)** and **Springer Nature**.

According to the Journal Citation Report in 2022(based on 2021 citation data), Nano Convergence received its **Impact Factor as 10.038**, and is ranked **Q1 in 3 categories** such as **Physics, Applied (87.89%), Materials Science, Multidisciplinary (84.78%)** and **Nanoscience & Nanotechnology (77.52%)**.

Average 4-5 articles are published per month (irregular) **in the fields of nanotechnology (Electronics, devices, materials, bio, processing, energy & environment, emerging technology)**. All articles published are made freely and permanently accessible online immediately upon publication, without subscription charges or registration barriers. (<https://nanoconvergencejournal.springeropen.com/>).



In November, KoNTRS participated as an exhibitor in the MRS Fall Meeting & Exhibition, the world's largest international conference in the field of nanomaterials, which was held in Boston, USA to promote the Nano Convergence and facilitate networking between the Journal Editorial Board and the researchers attending the event. Also, the Editorial Board Members had a meeting with Springer Nature, the publisher of the Nano Convergence and discussed the journal promotion strategies and improvements. Through these promotions and activities, the journal secured potential authors and international readership, and found its possibility that it becomes one of the most influential journals not only in Korea but also in the worldwide leading the nanotechnology field.



National Nanotechnology Centre (NNC) and NanoMalaysia Berhad (NMB) Jan 2022 to Jun 2022

1. National Nanotechnology Policy and Strategy 2021-2030 (DSNN)

Following its launch on 15 November 2021, NNC embarked on a nationwide roadshow to create awareness and gather input on the implementation of DSNN. The program kicked off at the Central Zone in Putrajaya, 2-3 February 2022, followed by North in Penang (7-8 March), East in Terengganu (28-29 March), Sarawak (17-18 May), Sabah (22-24 May) and the final destination Southern Zone in Johore (30-31 May).

2. National Nanosafety Study: Stakeholder Engagement



Early findings from the national study project titled 'Benchmarking Risks of Nano-Products in the Local Market' were shared with represents from ministries, academicians, researchers, and the industry. This event was held as a hybrid on 10 March 2022 with a total of 43 participants and 22 were present physically at Everly Hotel Putrajaya.

3. Nanotech Talk 2022 Webinar



The Nanotech Talk 2022 webinar series was held from 4 to 6 April 2022. In this series the focus was on the current market, development, issues, and the future of Industrial Revolution 4.0 through applications that focus on nanotechnology in the food safety sector. Speakers shared about business opportunities under the nanotechnology market especially in the food safety sector, and there were sharing sessions with partners who have collaborated with NanoMalaysia. The webinar series was held in collaboration with the National Science Week 2022 (MSN 2022).

4. National Nano Products and Technology Roadmap 2021-2025

The National Nano Products and Technology Roadmap 2021-2025 launched by the Minister of Science, Technology and Innovation Malaysia on 13 April 2022 is the main supporting document to the National Nanotechnology Policy and Strategy 2021-2030. Implementation of this roadmap is expected to create over 30,000 jobs with GDP increase amounting to RM151 billion within the next 5 years.



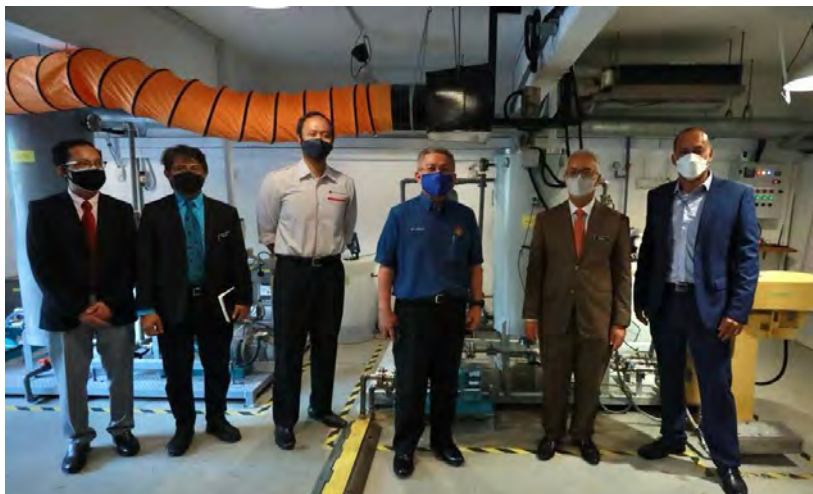
5. Malaysia's Minister of Science, Technology and Innovation visited NanoMalaysia's office

On 14 April 2022, the Minister of Science, Technology and Innovation, Dato Seri Dr Adham Bin Baba visited NanoMalaysia's office in Kuala Lumpur and met with the management team lead by NanoMalaysia's Chairman, Professor Emeritus Dato 'Ir. Dr Mohamad Zawawi Bin Ismail, and NanoMalaysia's CEO, Dr Rezal Khairi Ahmad where the Minister was updated on NanoMalaysia's activities and achievements. This was the Minister's second visit to NanoMalaysia following an earlier visit in 2021.

6. Visit by Malaysia's Minister of Science, Technology, and Innovation to NanoMalaysia's project partner graphene-based coolant

On 18 April 2022, the Minister of Science, Technology and Innovation (MOSTI), YB Dato' Sri Dr. Adham Baba, the Secretary General of the Ministry of Science, Technology and Innovation (MOSTI) Datuk Zainal Abidin Abu Hassan; and Dr. Rezal Khairi Ahmad, Chief Executive Officer of the NanoMalaysia Berhad Group (NMB), held a technical visit to Blue Snow Consulting & Engineering Sdn Bhd (Blue Snow). The visit was to evaluate the innovative product produced by Blue Snow, which is a graphene-based nano-liquid that can replace water as a

medium in cooling systems, as well as the feasibility of this material to be used in all refrigeration-based centralized commercial air conditioning systems to reduce energy consumption.



7. REVIVE Workshop

NanoMalaysia organised the first workshop for REVIVE (Rapid Electric Vehicles Innovation Validation Ecosystem) Intercontinental Hotel Kuala Lumpur on 26 April 2022. REVIVE is national level programme to convert ICE (Internal Combustion Engine) vehicles including buses, trucks, motorcycles, and cars into EVs. This initiative aims to enable the adaptation of EVs in an alternative way compared to buying new EVs which are generally 20-50% more expensive. New job opportunities will be created and, simultaneously, improve the skills of workshops and local workers. Strategic cooperation is being worked on between the government, agencies, industry, academia, and EV user members to achieve the comprehensive goal of conversion to electric vehicles by the year 2023/2024. REVIVE involves collaboration with the following strategic partners:

Related Agencies	Function/ Roles
Higher Education Department, (JPT) Ministry of Higher Education (MOHE)	Technology Collaborator & Campus Validation
Road Transport Department (JPJ) Ministry of Transport (MOT)	Regulations
Malaysian Green Technology and Climate Change Corporation (MGTC) Ministry of Environment and Water (KASA)	Low Carbon Mobility
Malaysia Automotive Robotics and IoT Institute (MARii) Ministry of International Trade and Industry (MITI)	Automotive Sectoral Policy
Department of Standards Malaysia (Standards Malaysia) Ministry of International Trade and Industry (MITI)	Conversion Standards
Malaysian Investment Development Authority (MIDA) Ministry of International Trade and Industry (MITI)	EV Task Force Secretariat and FDI
Public Works Department (JKR) Ministry of Works (KKR)	Government Vehicles and Services
General Insurance Association of Malaysia (PIAM)	Insurance



8. ISO/TC 229 Nanotechnologies Interim Meeting

Malaysia participated in the ISO/TC229 Working Group meeting held virtually 9-20 May 2022. Malaysia (DSM) and Colombia (ICONTEC) lead the revision of ISO/TS 12091:2014 Occupational risk management applied to engineered nanomaterials – Part 2: Use of the control banding approach. Malaysia continues to develop the draft document, registered as a Preliminary Work Item (PWI 4963), titled ‘Radiotelemetry-spectral-echocardiography Based Real-Time Surveillance Protocol for *In Vivo* Toxicity Detection and Monitoring of Engineered Nanomaterials (ENM)’. The project group webmeeting was held on 18 May 2022.

9. Visit to Floraponic Farm Malaysia (FFM) aquaponics project



On 18 June the Menteri Besar of Perak, Datuk Seri Saarani Mohamad and the Malaysian Minister of Agriculture and Food Industry (MAFI) Datuk Seri Ronald Kiandee visited Floraponic Farm Malaysia (FFM) aquaponics project in Manong, Perak to assess firsthand

NanoMalaysia Berhad's innovative agriculture programme. FFM @ Manong is a large-scale collaborative aquaponics project between NanoMalaysia Group and Flora Niaga Sdn Bhd and is an initiative by MOSTI to further identify technological solutions to handle food security issues facing the nation.

FFM @ Manong in Manong, Perak is funded by NanoMalaysia Berhad under the REVOLUTiONT programme. REVOLUTiONT, is an initiative under the National 4IR Policy that was introduced by the government in 2021. It is one of the policy's keys pillars that focuses on nanotechnology and the development of The Internet of Nano Things (IoNT) products and applications to enhance solutions for various applications, including food and agriculture and aligns with the National Nanotechnology Policy & Strategy 2021 – 2030. With REVOLUTiONT, NanoMalaysia aims to develop innovative ecosystems that will help democratise the food supply chain to be more resilient, sustainable and address concerns of food security. FFM @ Manong is one of NanoMalaysia Berhad's projects which utilises a combination of aquaculture-agriculture, integrated with nanotechnology. The objective of this project is to offer an alternative for protein and vegetable nutrient sources by employing Nano Solar Energy Panel (NLEP) as a power generator.

10. OECD WPMN

Malaysia participated in the 22nd OECD Working Party on Manufactured Nanomaterials (WPMN) meeting held in Paris, 27-29 June 2022.

11. Nanotechnology Awareness Programme, 24-25 June 2022

NNC accepted invitation from the Ministry of Finance Malaysia to participate in a public engagement programme held at Paya Besar, Pahang. Such an opportunity was used to promote awareness on nanotechnology. The Paya Besar community has benefitted from the Nanotechnology Awareness Programme through the interactive and exciting activities, while learning the challenges and potential applications of this emerging field in medicine, electronics, energy, and environmental remediation.



12. National Nanosafety Study: Project Monitoring Session, 13-14 July 2022

Technical Committee of the on-going national study titled ‘Benchmarking Risks of Nano-Products in the Local Market’ gathered in Shah Alam for a 2-day project monitoring session. Committee members assessed and monitored current status with respect to key project milestones from the presentations by SIRIM Berhad’s sub-project leaders and visited several laboratories involved in the conduct of toxicology and ecotoxicology studies in this project.



13. The 5th EU-Asia Nanosafety 2022 Dialogue

- **5th EU-Asia Dialogue on Nanosafety & 19th Asia Nano Forum Summit (ANFoS2022), 17 – 19 July 2022**

Malaysia through the National Nanotechnology Centre and NanoMalaysia Berhad hosted the 5th EU-Asia Dialogue on Nanosafety & 19th Asia Nano Forum Summit in Kuala Lumpur. This event was also held virtually with online participations from 16 countries across Asia and Europe.

EU-Asia Dialogue on Nanosafety discussed the concept paper ‘International Network Initiative on Safe & Sustainable Nanotechnology’ (INISS-nano). Keynotes were delivered by Prof. Dr. Flemming Casse on the leading EU-initiatives towards INISS, followed by Dr. Pavadee Aungkavattana and Mr. Helme Helan on infrastructures across ASEAN to support nanosafety. Participants were then broken up into four groups, according to the Pillars under INISS-nano, namely: Harmonization, chaired by Dr. Steffi Friedrichs; Support Industrial Understanding, by Prof. Patricia Farias; Sharing/ Facilitate Sharing of Resources/ Infrastructures, by Dr. Ali Marjovi; and Ethical Aspects, by Dr Ineke Malsch. Berlin will host the next dialogue in June 2023.

The ANF Workshop on Commercialization with the theme ‘Regional Cooperation in Monetising Nanotechnology’ opened ANFoS2022. Nine presenters shared their views and experiences related to policy, business, technology and products.

The ANF Annual General Meeting was chaired by Dr. Wannee Chinsirikul, ANF President and attended by office bearers together with ANF members.



5th EU-ASIA DIALOGUE ON NANOSAFETY & 19th ASIA NANO FORUM SUMMIT (ANFoS2022)

Will Be Held On:
17th – 19th July 2022
Hilton Kuala Lumpur, Malaysia
Malaysia Time (MYT), GMT +8 hours
Hybrid Conference

FREE REGISTRATION

SCAN HERE
CLOSING DATE : 1st JULY 2022
CLOSING DATE : 10th JULY 2022

Programme

Sunday
17th July 2022
Welcoming Hi-Tea

Monday
18th July 2022
EU-Asia Dialogue on Nanosafety
Gala Dinner

Tuesday
19th July 2022
ANF Workshop on Commercialization
ANF Annual General Meeting Program
Invitation AGM for ANF Members Only

5th EU-ASIA DIALOGUE ON NANOSAFETY

18th July 2022
Hilton Kuala Lumpur, Malaysia
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Hybrid Conference

1000 1010 1020 1030 1050 1110 1130 1150 1200 1300 1400 1420 1440 1500 1530 1600 1605 1610 2000	Welcome Addresses YBhg. Datuk Zainal Abidin Bin Abu Hassan, Secretary General, MOSTI, Malaysia Alexander Pogany, EU Dr. Wanhee Chinsirikul, ANF President, Thailand Key Note Lectures on INISS-nano Key Note 1: Collaboration Potential with the Leading EU-Initiative IRIS Dr. Flemming Cassee, Netherlands Key Note 2: Infrastructures Across ASEAN to Support Nanosafety Dr. Pavadee Aungkavattana, Thailand Q&A Nano4Society Prof. Dr. Urs Stauder, TU Delft Breakup Session Briefing Group 1. Pillar 'Harmonisation' Chair: Dr. Steffi Friedrichs Group 2. Pillar 'Support Industrial Understanding' Chair: Nils Bohmer and Patricia Farias Group 3. Pillar 'Sharing/ Facilitate Sharing or Resources/ Infrastructures' Chair: Dr. Ali Marjovi Group 4. Pillar 'Ethical Aspects' Chair: Dr. Ineke Malsch Break Summarization Group 1. Pillar 'Harmonisation' Group 2. Pillar 'Support Industrial Understanding' Group 3. Pillar 'Sharing/ Facilitate Sharing or Resources/ Infrastructures' Group 4. Pillar 'Ethical Aspects' Closing Reflection/ Resolution Moderator: YBrs. Dr. Retal Khairi Ahmad, Malaysia Announcement Dr. Thomas Kuhlbusch, Germany Closing Remarks YBrs. Prof. Madya Dr. Ruslinda A. Rahim, National Nanotechnology Centre, Malaysia End Gala Dinner
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SCAN FOR REGISTRATION
CLOSING DATE : 1st JULY 2022
CLOSING DATE : 10th JULY 2022

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- **Malaysia Hosts The Gala Dinner For The Fifth EU-Asia Nanosafety Dialogue 2022 and The 19th Summit Of The Asia Nano Forum 2022**

Ministry of Science, Technology and Innovation (MOSTI) through the National Nanotechnology Center (NNC) and NanoMalaysia Berhad, in collaboration with the Asia Nano Forum (ANF)

organizes the Fifth EU-Asia NanoSafety Dialogue 2022 and the 19th Summit of the Asia Nano Forum 2022 from 18 to July 19, 2022.

The fifth EU-Asia NanoSafety 2022 Dialogue session was held in a hybrid manner on 18 July 2022 with the participation of 15 countries including Malaysia represented by the NNC. The organizing objective is to increase exchange and understanding between policy makers, researchers and non-governmental organizations from Europe and Asia on the importance of nanosecurity.

Over the past six years, this dialogue has built synergy between Asian and European countries in establishing standard test guidelines that can be used as reference documents among Asian and European countries. This is important in ensuring the development and safety of nanomaterials in the market as well as supporting the growth of the nanotechnology industry on both continents.

While the Asia Nano Forum Summit held on 19 July 2022 involves the ANF Commercialization Workshop and the Annual General Meeting of the ANF Executive Committee Members. For information, ANF is a network of nanotechnology associations consisting of 23 organizations from 17 countries in the Asia Pacific region.

Minister of Science, Technology and Innovation, YB Dato' Sri Dr. Adham Baba said that as with other new advances in science and technology, the ability to manipulate and produce materials at the nanoscale level brings many concerns to society. The safety of nanomaterials and their potential impact on human health and the environment is a challenge that we must address together through science.

During the Gala Dinner, YB Dato' Sri Dr. Adham Baba also witnessed the exchange of Memorandum of Understanding (MoU) between NanoVerify Sdn. Bhd. (NVSB) which is a subsidiary of NanoMalaysia Berhad with P.T Nanotech Indonesia Global T.B.K regarding the nanotechnology certification program.

Through this MoU, both parties will work together to explore nanotechnology opportunities between Malaysia and Indonesia in addition to benefiting through international certification bodies and direct certification of new nano products in Indonesia through the NANOVerify program by NVSB.



14. MALAYSIA INOVATION CONFERENCE 2022, MITEC (2 & 3 AUGUST 2022)



NanoMalaysia Berhad exhibited HyPER Bike, NAVi-D, Eclimo Bike at the Malaysia Innovation Conference 2022, a brainstorming platform to gather the creations of local designers and discuss and explore new ideas related to research, development, commercialization and innovation (R&D&C&I), which play an important role in accelerating the socioeconomic development of Malaysian Families.

15. 3rd Bionanotechnology Research Seminar and Conference (BIONANOSEM) 2022, 4th – 5th August 2022



YBhg. Datuk Zainal Abidin bin Abu Hassan, MOSTI Secretary-General officiated the 3rd *Bionanotechnology Research Seminar and Conference (BioNanoSEM)* 2022 organized by Center for Sustainable Nanomaterials, University of Technology Malaysia (CSNano UTM) in collaboration with the National Nanotechnology Center (NNC), Ministry of Science, Technology and Innovation (MOSTI) and Malaysian Biomaterials Association (MBS).

To ensure that the technology developed by academia meets the needs of industry, the relationship and collaboration between industry and academia is strengthened through the organization of the BioNanoSEM 2022 program.

This program was a suitable platform to bring together experts in the field of bionanotechnology consisting of lecturers, researchers, associations and industry parties in Malaysia to share knowledge, experience and expertise in research, innovation and commercialization of bionanotechnology.



16. POCKET TALK, MAFI PAVILION, MAHA EXPO 2022 (7 AUGUST 2022)



NanoMalaysia participated in the pocket talk under Ministry of Science, Technology and Innovation Pavillion at MAHA 2022. MAHA 2022 is a 11-day biennial event that was held from 4th - 14th August 2022 in Serdang, on the northern edge of Putrajaya. MAHA stands for Malaysia Agriculture, Horticulture & Agrotourism and it is the leading agricultural show of its kind in Malaysia and indeed in the region.

17. MAJLIS PELANCARAN PELAN HALA TUJU TEKNOLOGI (9 AUGUST 2022)

Majlis Pelancaran Pelan Hala Tuju Teknologi Date: 9 Aug Venue: The Aloft, KL Sentral
Organiser: MOSTI Products: Graphene Based Products

18. Exhibition at the Malaysia Agriculture, Horticulture & Agrotourism (MAHA) 2022, 4th – 14th August 2022

The 2022 Malaysian Agriculture, Horticulture and Agrotourism Exhibition (MAHA 2022) was held at the Malaysian Agricultural Expo Park (MAEPS) in Serdang, Selangor from August 4 to 14, 2023. This biannual international event was organised by the Ministry of Agriculture and Food Industries (MAFI). NNC participated in MAHA 2022 by showcasing a collaborative project to develop three different diagnostic tools based on nanotechnology. NNC collaborated with the Malaysian Agricultural Research & Development Institute (MARDI) on Development of Nano-Biosensor Strips for Aquaculture and Food Sector Safety Applications Project with a scheduled completion date by the end of 2023. Participation in MAHA 2022 is to promote the diagnostic tools currently under development and to identify potential commercial partners and end-users both within local and international aquaculture community.



19. The National Nanotechnology Program (NanoKebangsaan) 2022, 6th – 9th August 2022

In conjunction with National Science Week – Nanotechnology week, the National Nanotechnology Program (NanoKebangsaan) 2022 or NanoKEB 2022 was held in hybrid mode at Bangi Resort Hotel, Selangor, which was accessible anywhere through the MSN22 platform from 6th to 9th September 2022. Nano Kebangsaan (NanoKEB) is an annual program initiated by National Nanotechnology Centre Malaysia and Kementerian Sains, Teknologi dan Inovasi (MOSTI) since 2015. The organization of a series of technical workshops, seminars, technical exhibition, forum and engagement sessions, and a lineup of engaging and inspiring nanotechnology activists had imparted their knowledge on various topics related to the development of nanotechnology in the nation. It is a national level program for nanotechnology activists to share the latest knowledge and best practices in the field of nanotechnology through a series of talks, engagement sessions, multilateral forums and a series of technical workshops that have been organized collaboratively with an interactive mode involving all participants. NanoKEB this year was joined by 500 participants from all over the country physically and virtually.





20. 2022 National Nanotechnology Innovation Research Project Competition

The 2022 National Nanotechnology Innovation Research Project Competition (PIN) was organized by the National Nanotechnology Center, MOSTI from 1st July to 8th August 2022. The winning prizes were presented by YB Dato' Sri Dr. Adham Baba, Minister of Science, Technology and Innovation on the 9th September 2022 during the official closing ceremony of the National Nano Program 2022.



21. REVIVE GROUP DISCUSSION CLUSTER 1 (16 AUGUST 2022)



Rapid Electric Vehicles Innovation Validation Ecosystem (REVIVE) Focus Group Discussion (FGD) 1 – Technology & Components was conducted by Special Project Offices of NanoMalaysia Berhad at Intercontinental Hotel Kuala Lumpur. REVIVE is a program that focuses on the conversion of internal combustion engine (ICE) vehicles into electric vehicles (EV) and how to make it viable through the 4 clusters:

- Cluster 1: Technology & Components
- ii. Cluster 2: Process & Procedures
- iii. Cluster 3: Business Case & Model
- iv. Cluster 4: Policy & Governance

Conversion is an alternative to buying a new EV in which the target is to have the conversion be cheaper than buying a new EV. It is also an alternative to accelerate EV adoption in Malaysia.

For commercialisation status of the product, countries such as Australia, Indonesia, the United Kingdom, Ireland, USA have managed to establish regulations to have converted EVs to be deemed legally roadworthy.

Hence, REVIVE works with multiple ministries, agencies, and industry players to establish the stated regulations. The initiative also includes ensuring the converted vehicles through our engagements with Persatuan Insurance Am Malaysia (PIAM).

22. ISES 2022 - INTERNATIONAL SUSTAINABLE ENERGY SUMMIT 2022 (29 – 30 AUGUST 2022)

Ir. Tengku Kahar Muzaffar Tengku Mohd Yusof Anuar, Vice President of Strategy and Special Projects of NanoMalaysia Berhad (NMB) presented at the main motherbooth of International Sustainable Energy Summit (ISES 2022) about NMB & national electric vehicles and hydrogen initiatives on 30 August 2022.

Among of products that has been displayed in NMB's booth during the event includes NAVI-D, BSS, NLEP, MNA Battery and HyPER Bike.

23. Nanosafety Course 2022, 6 September 2022

In conjunction with the National Nanotechnology Week 2022 (NanoKeb 2022), NNC organized a Nanosafety Course in Bangi, Selangor. Five local speakers presented their topics related to safety of manufactured nanomaterials (MN): Introduction to MN by Dr. Syed Muhammad Hafiz from MIMOS; Hazards of MN by Prof. Dr. Nor Fadilah Rajab from University Kebangsaan Malaysia; Occupational, Population and Environmental Exposures to MN by Ir. Ts. Hazlina Yon from the Department of Occupational Safety and Health; Risk Assessment and Risk Management of MN by Ts. Helme Helan from MOSTI; and National Approaches/ Pilots on Nanomaterial Safety by Puan Sri Dr. Halila Faiza from MOSTI.



24. NANOKEB & MNIG LAUNCHING @ BANGI RESORT HOTEL (6-9 SEPTEMBER 2022)

NanoMalaysia Berhad (NMB) has partnered with National Nanotechnology Centre (NNC) under the Ministry of Science, Technology & Innovation (MOSTI) to organize NanoKEBANGSAAN (NanoKEB) 2022 from 6th until 9th September 2022. The event consists of activities (Exhibition, Nanotech Talk, Seminar, Forum, etc.) that focus on the nanotechnology development in Malaysia aligned with the National Nanotechnology Policy (NNP). NNP consists of 4 Strategic Levels that will be supported by 15 Strategies and 32 Initiatives – with a special focus on the areas of energy, environment, agriculture, medicine, and electronic devices. The initiative aims to bring Malaysia closer to the aspirations of the National Science, Technology and Innovation Policy (DSTIN) 2021-2030 to become a high-tech nation by 2030.

NanoMalaysia Berhad together with Malaysia Nanotechnology Association and Institute of Microengineering & Nanoelectronics (IMEN) has organised 3 satellite programmes under NanoKEB 2022 which are:

- 1) Malaysia Nanotech Industrial Congress 2022 (8 September 2022)
- 2) Hi-Tech Instrument Industrial Training (8 September 2022)
- 3) The Value of Intellectual Property Management in Nanotechnology Commercialisation Seminar (9 September 2022)

The participants consist of both international and Malaysian nanotechnology industry visitors and government officials. It is a platform for participants to know more about nanotechnology entrepreneurial ecosystem/commercialisation/technology transfer or products/technologies/services.

25. Launching of Malaysia Nanotechnology Industrial Group (MNIG)

Minister of Science, Technology and Innovation, YB Dato' Sri Dr. Adham bin Baba launched the Malaysia Nanotechnology Industrial Group (MNIG) in conjunction with the official closing ceremony of the National Nanotechnology Program (NanoKEB) 2022 on the 9th September 2022 at Bangi Resort Hotel, Selangor.

The official launch of MNIG aimed to bring together nano industry players in Malaysia, thereby reducing the gap in the country's nanotechnology ecosystem. MNIG is targeted to be the best platform towards the involvement of more industries, especially Small and Medium Enterprises (SMEs) and local innovation ecosystem players in the field of nanotechnology, subsequently able to penetrate the international market with high-value innovative products. MNIG will represent the nanotechnology industry in Malaysia and will be composed of nanotechnology-related industry representatives. It acts as a medium to establish close cooperation between nanotechnology companies, SMEs and other stakeholders and help coordination between companies in the supply chain of nanotechnology products.

At the same event, two (2) Memorandums of Understanding (MoU) were signed between NanoMalaysia Berhad (NMB) and Universiti Tunku Abdul Rahman (UTAR) and NMB with Universiti Malaysia Pahang (UMP). Through the MoU between NMB and UTAR, both parties will cooperate in the implementation of the Remote Energy System (NREgS) project which includes the scaling of energy harvesting technology with the application of advanced materials to strengthen the performance of wireless charging devices based on applications that require mobility like users mobile phones, the transport sector and smart cities. This project also aims to build a strong ecosystem network in support of the commercialization and industrialization phase.

As for the MoU between NMB and UMP, both parties will work together in the Biomass Circular Economy Program (BICEP). This project will use biomass waste from agricultural activities in Malaysia to produce high-quality advanced materials and products that have various benefits such as advanced materials such as graphene, nanocellulose, nanosilica that can be used in Internet of Things (IoT) devices, electric vehicle (EV) components and materials for renewable energy such as hydrogen.





26. MAJLIS PELANCARAN DASAR TENAGA NEGARA (19 SEPTEMBER 2022)

NanoMalaysia attended the Launching Ceremony of the National Energy Policy 2022-2040 (DTN), Marriot Hotel, Putrajaya yesterday.

The government formulated the DTN after taking into account internal and external developments and challenges to ensure that the energy sector can continue to develop sustainably. DTN is the Government's commitment to provide new job opportunities and make the energy sector the main catalyst of socioeconomic sustainability for the well-being of Malaysian Families. The government will also continue to play an important role in realizing DTN's vision so that great economic benefits will be obtained through the development of new growth areas.

27. HEBATT LAUNCH BY YBM MOSTI (20 SEPTEMBER 2022)

Minister of Science, Technology and Innovation, YB Dato' Sri Dr. Adham bin Baba inaugurated the Hydrogen-Electric Vehicle-Battery Centre or HEBATT which is a local battery innovation center that will produce nanotechnology pocket cell batteries for Electric Vehicle (EV) applications yesterday at Incubator 3, Technology Park Malaysia.

HEBATT is a collaboration between the investment recipient of the NanoMalaysia Group, HyPERTech Industries Sdn. Bhd. (HTSB) and International Battery Center (IBC) Sdn. Bhd. which is a one-stop consultation center for local and international innovative collaboration between industry, universities and government agencies. This center will be a focus in the construction and development of local expertise in battery manufacturing and its application for related industrial sectors. It will focus on the development of new battery chemistries and the production of advanced batteries in various hydrogen-based factors, forms and storage.

28. Scientific Conference 2022 Joint International Conference on Nanoscience and Nanoengineering (BOND21 22),

On September 22, 2022, at Putra Brasmana Hotel, Perlis, the Scientific Conference 2022 Joint International Conference on Nanoscience and Nanoengineering (BOND21 22) was successfully organized. BOND21 2022 were jointly organized by the National Center for Nanotechnology, Ministry of Science, Technology and Innovation (MOSTI) and the Institute of Nanoelectronics Engineering (INEE), University of Malaysia Perlis (UniMAP).

This BOND21 22 international conference is the third time organized on nanoscience and nanoengineering which was also attended by representatives of the Embassy of the Republic of Iraq in Malaysia and delegations from the Bogor Agricultural Institute (IPB), Indonesia and the Iraqi University of Technology. This year the organization attracted about 100 participants and 70 papers were presented.



29. Junior Electronics and Nanotechnology Camp 2022

In conjunction with National Science Week – Nanotechnology week, Institute of Microengineering and Nanoelectronics (IMEN) – University Kebangsaan Malaysia (UKM) and National Nanotechnology Centre (NNC) organized the Hybrid IMEN Junior Electronics and Nanotechnology (IJEN) Camp from 14th to 17th September 2022. This year IJEN 2022 received about 500 participants from various primary school students throughout the country.



PROGRAM CUTI SEKOLAH 2022

SEPTEMBER 2022

IMEN JUNIOR ELECTRONICS & NANOTECHNOLOGY CAMP

TARIKH: 14-17 SEPTEMBER 2022
TEMPAT: ONLINE

• • •

PILIHAN SESI:

SESI I : 9AM-12PM, RABU

SESI II : 9AM-12PM, KHAMIS

SESI III: 9AM-12PM, JUMAAT

SESI IV: 9AM-12PM, SABTU

SESI V : 2PM-5PM, SABTU

PENYERTAAN

***DITAJA SEPENUHNYA OLEH NATIONAL NANOTECHNOLOGY CENTRE (NNC), MOSTI**

*Tajaan hanya bagi sesi september 2022 sahaja

• Terhad kepada 100 peserta bagi setiap sesi

• Kit akan dihantar kepada peserta

• Sijil penyertaan dan pencapaian disediakan

• Pemenang kuiz akan menerima **baucar e-wallet**

Hubungi Kami:

ukmimen@gmail.com

https://www.ukm.my/imen/en/ijen

Jom Daftar Sekarang!! >>>
<https://bit.ly/JuniorElectronics2022>

30. EVM ASIA (27 – 29 SEPTEMBER 2022)



NanoMalaysia and over 300 exhibitors including major industry leaders such as ABB, Fujitsu, GoAuto, Big Blue, GreenTech, Haval, Hitachi, participate in EVM ASIA 2022 – the Region's No.1 EV, Hybrid Vehicles, Mobility and Manufacturing Technology, Parts and Components Exhibition which was held from 27-29 September 2022 at MITEC, Kuala Lumpur.

31. TECHNICAL VISIT BY YBM MOSTI TO NICKEL GARDEN, KG MONGGIS, RANAU, SABAH (PHYTOMINING) (5 OCTOBER 2022)



MOSTI through NMB and UIAM will conduct a research collaboration to implement a phytomining project at the Kampung Monggis greenhouse here.

Phytomining is the extraction of active metal substances from high biomass plants, and the project is being carried out as part of the NanoMalaysia Energy Storage Technology Initiative Programme (NESTI). Phytomining uses local native plants, namely *Phyllanthus Rufuschaneyi* and *Rinorea Bengalensis*, that will produce nickel and cobalt which are the active ingredients of lithium-ion type batteries.

The findings of this phytomining research can conserve the limited supply of active materials in lithium batteries; it can also reduce the conventional mining activities of active materials to produce new lithium-ion batteries.

This project involves battery sustainability, leading the development of sustainable battery technology in line with Malaysia's aspirations to become a high-tech country by 2030.

32. 3rd Selangor R&D and Innovation Expo (SRIE) 2022

The 3rd Selangor R&D and Innovation Expo (SRIE) 2022 was held on 6th to 9th October 2022 at Kuala Lumpur Convention Centre (KLCC), Kuala Lumpur. Participation of the National Nanotechnology Centre (NNC) in SRIE 2022 exhibition aims to give exposure to nanotechnology about the policy and role of NNC in Malaysia to the academics, researchers, industry players and the general public. Also exhibited was "Electrospinning for Nanofiber Production", equipment and technology commercialised by the Progene Link Company which has been funded by MOSTI Fund. Additionally, the NNC also participated in the SRIE competition for Development of Nano-Biosensor Strips for Aquaculture and Food Sector Safety Applications, a collaborative project with the Malaysian Agricultural Research & Development Institute (MARDI).



33. National Nanosafety Study: 2nd Stakeholder Engagement, 13 October 2022

The 2nd Stakeholder Engagement session was held both physical in Putrajaya and virtual, to update and discuss findings from the national study project titled ‘Benchmarking Risks of Nano-Products in the Local Market’. Participants comprising relevant stakeholders from the government, academic institutions, research organizations, and industry, agreed for the need of a national reference/ standard to verify the presence of nanomaterial in products with nano-claims.

34. 5th International Conference on Nanoengineering Technology Devices and Materials 2022 (IC-NET2022).

The 5th International Conference on Nanoengineering Technology Devices and Materials 2022 (IC-NET2022) was held from October 11 to October 12, 2022 at Glenmarie Hotel and Golf Resort, Shah Alam, Selangor. The fifth IC-NET 2022 was jointly organized by the National Center for Nanotechnology, Ministry of Science, Technology and Innovation (MOSTI) and the Institute of Science, Universiti Teknologi MARA. This year organization attracted almost 120 participants and about 80 papers presented.



35. IGEN 2022 (12 – 14 OCTOBER 2022)



A conference titled "Advancing Sustainable Development Through Science, Technology and Innovation Policies and Initiatives" was organized in conjunction with the International Greentech & Eco Products Exhibition & Conference Malaysia (IGEM) 2022, featuring expert panels. The opening remarks were given by YBhg. Datuk Ts. Dr. Mohd Nor Azman Hassan, Deputy Secretary General (Technology Development) MOSTI, and the moderator was Mrs. Fairul Azida Shahabudin, Deputy Secretary of the Division R&D Technology Transfer and Commercialisation Division, MOSTI. The panelists included YBrs. Dr. Rezal Khairi Ahmad, CEO of NanoMalaysia Berhad, Madam Hazami Habib, CEO of Akademi Sains Malaysia, Mr. Shahril Anas Hasan Aziz, CEO of MavCap, and Mr. Khairil Anuar Sadat Salleh, Chief Land Officer of MRANTI.

36. The 2022 Olympiad Nanotechnology Malaysia (ONM) National Competition

From 23rd to 29th October 2022, the final round of 2022 Olympiad Nanotechnology Malaysia (ONM) National Competition was organized by National Nanotechnology Centre (NNC) at Bangi Avenue Convention Centre (BACC), Selangor. The preliminary round of the competition attracted 300 participants taking the online nanotechnology theory examination. About 30 participants were shortlisted for the final round where they were divided into 6 groups and competed in presenting the best nanotechnology solution for energy generation and energy storage grand challenge. The winners will be groomed to compete in the future International Nanotechnology Olympiad.






KEMENTERIAN SAINS, TEKNOLOGI DAN INOVASI
MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

Terbuka Kepada:
Semua Pelajar Universiti Awam dan Swasta
di Peringkat Sarjana Muda, Sarjana dan PhD

Pendaftaran:
16 – 30 September 2022

Pilihan Peperiksaan Saringan
Sesi 1: 5 Oktober 2022 | 10.00 Pagi
Sesi 2: 7 Oktober 2022 | 10.00 Pagi

Pendaftaran secara dalam talian:
<https://forms.gle/HtQBs7vaagVZaE4J8>
atau imbas QR kod untuk pendaftaran



Fasa Pertama:
Peperiksaan Saringan Dalam Talian
Pertandingan ONM Peringkat Kebangsaan 2022

Fasa Akhir:
30 Peserta Terbaik Fasa Pertama
akan dipilih ke fasa akhir KEM OLYMPIAD
NANOTEKNOLOGI MALAYSIA 2022, di Bangi, Selangor pada
23 hingga 29 Oktober 2022

PENYERTAAN ADALAH PERCUMA

Untuk maklumat lanjut, sila hubungi urus setia ONM 2022

03-8885 8665/8669
nanokebangsaan@mosti.gov.my





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MALAYSIA

MERAKYATKAN SAINS
MENGINSANKAN TEKNOLOGI

PERTANDINGAN OLYMPIAD NANOTEKNOLOGI MALAYSIA (ONM) PERINGKAT KEBANGSAAN 2022

Tema:
Nanoteknologi untuk Aplikasi Penjanaan
dan Penyimpanan Tenaga

HADIAH	
Tempat Pertama	RM1,500.00 + trofi + sijil
Tempat Kedua	RM1,000.00 + trofi + sijil
Tempat Ketiga	RM500.00 + trofi + sijil

Pingat Emas, Perak dan Gangsa
(untuk 30 peserta fasa akhir)

Penganjur dan Urus setia ONM 2022
Pusat Nanoteknologi Kebangsaan,
Kementerian Sains, Teknologi Dan Inovasi,
Arau 4 Blok C2 Kompleks C,
Pusat Pentadbiran Kerajaan Persekutuan,
62602 Wilayah Persekutuan Putrajaya

Dengan Kerjasama:
Persatuan Sains Dan Teknologi Keadaan
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37. ASEAN – SCMST Workshop on Advanced Materials Characterization Techniques for Young Researchers from ASEAN Member Countries in the Philippines, 26 – 28 October 2022

The Department of Science and Technology, Industrial Technology Development Institute, in cooperation with ASEAN-ASTIF facilitated the “Training on Advanced Materials Characterization Techniques for Young Researchers from ASEAN Member Countries” in the Philippines. The training was held from 26 to 28 October 2022 and focused on the basic operation and hands-on workshop of Time-of-Flight Secondary Ion Mass Spectrometry (ToFSIMS), Transmission Electron Microscope (TEM) and Auger Electron Spectroscopy (AES) at Acacia Hotel, Alabang and the Industrial Technology Development Institute, Department of Science and Technology (DOST), DOST Compound, Bicutan, Taguig City, Philippines. Dr. Nurul Asyikin Bt Kamaruzaman from National Nanotechnology Centre (NNC) attended the training as a NNC representative.



38. ASEAN-SCMST Workshop on Advanced Materials Characterization Techniques for Young Researchers from ASEAN Member Countries in Thailand, 27–30 November 2022

Mr Dominic Geruka of NNC accepted the invitation from National Metal and Materials Technology Center (MTEC) in cooperation with ASEAN-ASTIF, to a ASEAN-SCMST Workshop on "Training on Advanced Materials Characterization Techniques for Young Researchers from ASEAN Member Countries". This workshop was held at Thailand Science Park, 27-30

November 2022, after two previous workshops held in Singapore (21-23 September 2022) and the Philippines (26-28 October 2022).

This workshop aimed at young researchers from ASEAN Member States in various advanced characterization namely electron microscopy, x-ray spectroscopy, mass spectroscopy and scanning electron microscopy. Participants gained technical insights on advanced characterization techniques, exchanged experiences, and fostered networking across the region.



39. MOU EXCHANGE MRC (8 DECEMBER 2022)

NanoMalaysia Bhd (NMB) has signed a memorandum of understanding (MOU) with the Malaysian Rubber Council (MRC) on 8 Dec 2022. This MOU aims to promote successful uptake and commercialisation of local intellectual properties (IPs) and products developed by Malaysian companies related to the rubber industry. The development and commercialisation of rubber and other commodities align with the National Agricommodity Policy 2021-2030 and the National Nanotechnology Policy and Strategy 2021-2030.

The MRC-NMB partnership provides a platform to aggregate rubber innovation IPs first developed under the National Graphene Action Plan 2020, and now continuing through our Graphenovation programme under the 12th Malaysia Plan. The alliance will further the multibillion-ringgit national revenue projection by collaborating with local enterprises through NMB's venture builder model.

The activation of both supply and value chains from raw materials to high-value nanotechnology - enhanced finished products can be planned and executed through the unique venture builder investment model to address a global market size for rubber additives of more than US\$42 billion (RM184.95 billion). The joint partnership with NMB will boost the Malaysian rubber industry by encouraging new technological innovations and high-value creation to further stimulate demand for rubber products.

The Philippines is known to have abundant natural resources. For the past years, the Industrial Technology Development Institute (ITDI) of the Department of Science and Technology (DOST) has been developing methods for producing nanomaterial from indigenous materials, namely, nanoclay, nanoprecipitated calcium carbonate, nanozeolite, and nanosilica. Among these nanomaterials, nanosilica can be used as drug delivery systems carriers.

There is a growing interest in the Drug Delivery System (DDS) to improve the bioavailability of pharmaceutical drugs by attaching this drug to a carrier that will control the drug release rate. DOST-ITDI developed a porous inorganic carrier from nanosilica that was synthesized from local rice hull ash (RHA). Characterization results such as Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetric Analysis (TGA) and UV-VIS Spectrophotometer showed that nanocarriers synthesized from RHA are comparable with the nanocarriers from commercially available nanosilica.

Turmeric extract was reacted with the locally developed nanocarriers, and curcumin had an evident attachment to the nanocarriers based on the results of UV-VIS analysis. Incorporating curcumin from turmeric extract into the developed nanocarriers showed a promising development. The study is ongoing to optimize the drug loading process, including different pharmaceutical drugs and other herbal medicines, as well as kinetics studies on drug sorption-desorption.

DOST-ITDI also conducted a study to develop an innovative, flexible piezoresistive sensor for smart device gestures for speech applications. Selective laser sintering (SLS) technology was used to 3D print the flexible sensors using carbon nanotube additive mixed into SLS TPU powder. Electrical, mechanical, morphological, and other properties of the sensors were characterized. The study is ongoing to optimize the parameters and prototyping further.

To further increase the current pool of nanotechnology experts in the Philippines, DOST-ITDI collaborated with MAPUA University for a doctorate in materials science and engineering specializing in a nanotechnology by research program. This Ph.D. degree starting this August will help accelerate science, technology, and innovation that can improve lives and positively impact society. In support of this doctorate, a webinar series on nanotechnology was conducted by Dr. Maria Cynthia Goh, a DOST Balik Scientist and a professor from Toronto, Canada, to inspire more graduate students to pursue the said Ph.D. degree.

The first batch of students for the Ph.D. in Materials Science and Engineering specializing in Nanotechnology by Research Program commenced last August 2022. This program, a collaboration between DOST and MAPUA University, offers a 3-year postgraduate research for a Ph.D. degree with a scholarship from DOST-Science Education Institute (DOST-SEI). The said scholars will be allowed to use the DOST-ITDI's Nanotechnology and ADMATEL Laboratories in conducting their research, and DOST-ITDI's nanotechnology experts will guide them as their advisers.

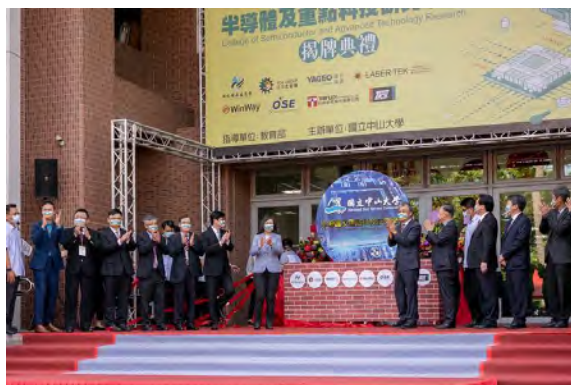
This Ph.D. program aims to increase the current pool of nanotechnology experts in the country to help accelerate science, technology, and innovation and improve the country's rank in the global innovation index. This program will also provide the necessary technical knowledge and hands-on training to graduate students in conducting their research projects in the field of nanotechnology aligned with the DOST Harmonized National Research and Development Agenda (HNRDA).

DOST-ITDI continues contributing to establishing National Standards for Nanotechnology in the country by actively participating in the meeting organized by The Department of Trade and Industry – Bureau of Philippine Standards (DTI-BPS). Under BPS Technical Committee (TC) 85, DOST-ITDI and members from academe, private, and government institutions reviewed and deliberated 43 ISO Standards on nanotechnology last year. Among these reference standards, 18 were published as Philippine National Standards (PNS), and 13 were recommended for endorsement as PNS.

On the other hand, DOST-ITDI developed nanomaterials from natural resources to develop biodegradable nanocomposites and antimicrobial wound dressing. Thermoplastic starch nanocomposites and three locally developed nanomaterials were processed by the melt mixing method in a twin-screw extruder. The three nanofillers, halloysite nanotube (HNT), nano zeolite (NZ), and nano precipitated calcium carbonate (NPCC), were incorporated into the starch matrix. The resulting bio nanocomposites were characterized in terms of mechanical properties, morphology, thermal properties, moisture absorption, and crystallinity. A migration test was also performed to check the suitability of these starch-based bio-nanocomposites for food application. A study was also conducted to develop an antimicrobial wound dressing from bacterial cellulose - nanoclay composite as an alternative advanced wound dressing for infected wounds like pressure ulcers and venous leg ulcers. Among the developed composites, bacterial cellulose–silver modified nanoclay showed the most promising exudate absorption and antimicrobial activity.

1. The Fifth Semiconductor Talent Cultivator in Taiwan

National Sun Yat-sen University (NSYSU) and seven local companies in Kaohsiung inaugurated the institution's College of Semiconductor and Advanced Technology Research on 22 July 2022, the latest local university to set up a semiconductor talent cultivator. The semiconductor industry is vital in Taiwan, generating output of more than US\$133.71 billion last year, Taiwan President Tsai Ing-wen told the ceremony. NSYSU plays an important role in cultivating talent in the industry, with the seven companies investing about US\$30 million to foster chip testing and packaging, and electronic components talent over the next 10 years, Tsai said.



According to the “National Key Fields Industry-University Cooperation and Skilled Personnel Training” Act promulgated in May 2021, there are currently 5 academies collaborated with industry have been established by leading universities in Taiwan to boost innovation of industry-university cooperation in national key fields and innovation of the training of skilled professional personnel for these fields to upgrade the effectiveness of the results of the research and development (R&D) achievements of national universities, train high level science and technology professionals, and enhance industry competitiveness.

- National Taiwan University (NTU)
– [*Graduate School of Advanced Technology*](#)
- National Tsing Hua University (NTHU)
– [*College of Semiconductor Research*](#)
- National Yang Ming Chiao Tung University (NYCU)
– [*Industry Academia Innovation School*](#)
- National Cheng Kung University (NCKU)
– [*Academy of Innovative Semiconductor and Sustainable Manufacturing*](#)
- National Sun Yat-sen University (NSYSU)
– [*College of Semiconductor and Advanced Technology Research*](#)



Sources:

1. 中山大學半導體學院揭牌 <https://www.president.gov.tw/News/26824>
2. NSYSU semiconductor talent cultivator launched <https://www.taipeitimes.com/News/biz/archives/2022/07/23/2003782235>

2. Selenium-enriched agricultural products by using unique BNT

Erlin Town Office matches local farmer, Mu-Chi Juang, the leader of the 19th Red Dragon Fruit Production and Marketing Class, and Amber Nanotech Co., Ltd. (Amber Nanotech) to use the unique Bionic Nano Technology (BNT) developed by Amber Nanotech and add selenium of SUPEROSELEN to the red dragon fruit field test. After the SGS testing, the selenium-enriched red dragon fruit was successfully planted. In order to increase production and supply the market, Erlin Town Office held a memorandum of understanding of cooperation on selenium-enriched agricultural products in Erlin Town, Changhua County on 12 April 2022. Dr. Shih-Chieh Tsai, the mayor of Erlin Township, said "In order for Taiwan's agriculture to survive, it must use innovative technologies to transform, develop agricultural technology, and make agricultural products more competitive and functional."



Selenium (Se) is an essential trace element for organisms but cannot be synthesized in organisms by itself. It is the main component of glutathione peroxidase and participates in important biochemical reactions to remove peroxides in the body and protect cells and tissues. Avoid the damage of peroxides, help the human body detoxify, avoid cell membrane rupture, and activate the immune system, with anti-cancer, anti-oxidation, prevention of cardiovascular disease and other effects, fast metabolism, must be taken from the daily diet.

Amber Nanotech is the member of Taiwan Nanotechnology Industry Development Association (TANIDA) and Institute for Biotechnology and Medicine Industry (IBMI), respectively. Chun-Lun Chiu, the co-founder of Amber Nanotech, said that she is very grateful to Academician Pan-Chyr Yang, the vice president of IBMI, for his support for the industry to do a good job of 'selenium' all the time. In order to achieve this goal, Tz-Jium Liu, the chairman of Amber Nanotech, actively organized a technical team. By adhering to the three concepts of 'non-toxic, decomposable, and recycled', creating the unique BNT to produce selenium of SUPEROSELEN with high biological

activity, and working together with Erlin Town Farmers Association and local farmers, Chairman Liu trust him to promote precise, refined, and smart agriculture in Erlin Town, and set a milestone in agricultural product innovation!

3. The International Conference on Precision Nanomedicine in Theranostics

The International Conference on Precision Nanomedicine in Theranostics was held in conjunction with the 2022 Annual Meeting of Taiwan Nanomedicine Society (TNS) in Hsinchu, Taiwan on 22-23 July 2022. This event consists of Industry-Academia-Research Forum, Precision Health Trend Forum, and Alternatives to Animal Testing Forum, and attracts more than 350 participants including researchers, clinicians and industry partners who gathered to share about 150 research reports through poster oral briefing and poster exhibition. In addition to Prof. Kazunori Kataoka, Director General of Innovation Center of NanoMedicine (iCONM) and Editor of Journal of Biomaterials Science, Polymer Edition, more than 10 researchers and experts from United States, Japan, Australia, and Singapore were also invited to join this event via Webinar to give presentations about the latest development and trend of nanomedicine.



Prof. Jenn-Hwan Tarng, Vice President of National Yang Ming Chiao Tung University, indicated in the Opening Ceremony that the global nanomedicine market is expected to reach US\$ 40 billion by 2030 at a compound annual growth rate (CAGR) of 13% from US\$ 20 billion in 2020. Furthermore, Asia-Pacific area is growing faster than other regions. This June, TLC BioSciences (Taiwan Liposome Company, TLC), one of sponsors of this event, announced one of the largest deals seen in Taiwan's biotech sector that it has entered a commercialization agreement with Endo International plc (Nasdaq: ENDP) for rights in the United States to TLC599, a proprietary BioSeizer® sustained release injectable in Phase 3 development for the treatment of osteoarthritis pain.

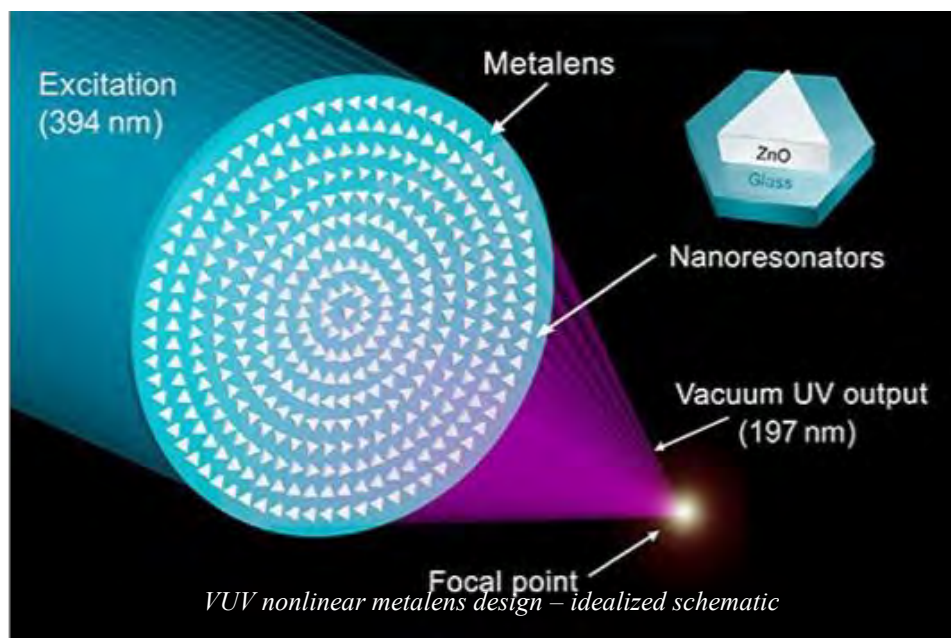
TNS was founded in 2019 and aims to promote the nanomedicine exchanges between researchers and practitioners, improve research study and industry technology, and create a sustainable environment. Prof. Chen-Sheng Yeh of National Cheng-Kung University was re-elected the Chairman at the 2022 TNS General Assembly on 22 July 2022. Prof. Yeh expressed that he will continue the talent cultivation of medicine generation, deepen the collaboration between nanomedicine societies of Japan and Korea, and broaden international exchanges.

Sources:

1. About the Conference <https://www.tnsociety.com/Conference/>
2. 奈米生醫國際研討會 產學界回響熱 <https://money.udn.com/money/story/5724/6482070>
3. TLC Announces TLC599 Agreement with Endo <https://ir.tlcbio.com/news-releases/news-release-details/tlc-announces-tlc599-agreement-endo>

4. Vacuum Ultraviolet Metalens

A fundamental study on vacuum ultraviolet metasurface lens (metalens) with a potentially disruptive technology for the ultraviolet optics market is published in *Science Advances* this April. This work provides a useful platform for developing low-loss VUV components and increasing the accessibility of the VUV regime. Dr. Ming-Lun Tseng, one of the three co-first authors and Professor of National Yang Ming Chiao Tung University, expressed that vacuum ultraviolet (VUV) light are photons with higher energies compared to visible light and is applicable to state-of-the-art technology like Photochemistry, materials analysis, and lithography by operating in a vacuum chamber. Nevertheless, it is strongly absorbed by regular optical materials. How to both generate the VUV light and manipulate it is always a critical issue and a limitation for scientists to explore the undiscovered potential.



The study demonstrates a metalens that both generates—by second-harmonic generation—and simultaneously focuses the generated VUV light. The metalens consists of 150-nm-thick zinc oxide (ZnO) nanoresonators that convert 394 nm (~3.15 eV) light into focused 197-nm (~6.29 eV) radiation, producing a spot 1.7 μm in diameter with a 21-fold power density enhancement as compared to the wavefront at the metalens surface. The reported metalens is ultracompact and phase-matching free, allowing substantial streamlining of VUV system design and facilitating more advanced applications.

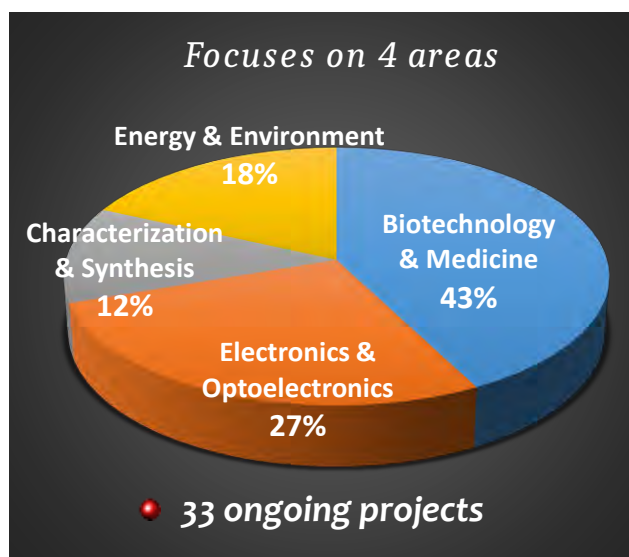
This research was funded by Taiwan's Ministry of Science and Technology, National Taiwan University, the Shenzhen Science and Technology Innovation Commission, the University Grants Committee/Research Grants Council of China's Hong Kong Special Administrative Region, the Department of Science and Technology of China's Guangdong Province, the Department of Electrical Engineering of City University of Hong Kong, the Taiwan Ministry of Education's Yushan Young Scholar Program, the Research Center for Applied Sciences at Taiwan's Academia Sinica, the Robert A. Welch Foundation, the National Science Foundation, the Air Force Office of Scientific Research and the Defense Threat Reduction Agency.

Sources:

1. 應用半導體曝光微影！陽明交大與跨國團隊開發「真空紫外超穎透鏡」
<https://technews.tw/2022/06/28/metasurface-lens/>
2. Vacuum ultraviolet nonlinear metalens <https://www.science.org/doi/10.1126/sciadv.abn5644>
3. Rice 'metalens' could disrupt vacuum UV market <https://news.rice.edu/news/2022/rice-metalens-could-disrupt-vacuum-uv-market>

5. Government Funding for Nanotechnology R&D

The Innovation and Application of Nanoscience Thematic Program (IANTP) is aimed at increasing research impact of Taiwan's National Nanotechnology Program by encouraging scholars to engage in translational research based on scientific discoveries.



Project Types

(1) Advanced Nanotechnology Research Project (2021~)

- For cutting-edge scientific discoveries
- Project fund: ca. USD 100,000 / year
- Project period: 2 years

13 ongoing projects (2021-2022)

(2) Innovation and Application Project (2014~present)

- From concept development to prototype validation (TRL 1-4)
- Project fund: ca. USD 230,000 / year
- Project period: 3 years

20 ongoing projects (2020-2022)

Encourage the PIs of 2-y project to continue a next 3-y Innovation and Application Project.

6. Taiwan in M-ERA.NET Joint Call

More than 30 funding agencies participate with a total budget of approximately 25 million €. Taiwan's National Science and Technology Council (NSTC) joined as a member with 0.75 million (2022) euros to support joint research projects every year.

Six Topics: (1) Materials for energy; (2) Innovative surfaces, coatings and interfaces; (3) High performance composites; (4) Functional materials (5) New strategies for advanced material-based technologies for health applications; (6) Materials for electronics.

Proposals Funded in 2021:

- 1) Semi-transparent PV coatings for greenhouse application (Coordinator, National Taiwan University)
- 2) Development of novel Li ion BATTERY solid electrolyte separators based on Metal organic frameworks (Partner, National Taiwan University)
- 3) Foamed Geopolymer Made by Additive Manufacturing for the Construction Technology Applications (Partner, National Ilan University)

7. Taiwan/ USAF Topological and Nanostructured Materials Program

The new joint program “NSTC-AFOSR Taiwan Nanoscience Basic Research Topological and Nanostructured Materials Synthesis and Discovery” was initiated by Taiwan National Science and Technology Council (NSTC) and US Air Force Office of Scientific Research (AFOSR) from 2021.

This program announced every 3 years has the Technology Readiness Level (TRL) between 1 and 1.5 and mainly focuses on materials research:

- Topological and Qubit Materials
- Novel Multifunctional Materials
- Biocompatible Nanomaterials
- Machine Learning Guided Materials Research

Cooperation between Taiwan and USAF could be traced back to 2004. 10 ongoing projects in 2021.



Taiwan held annual review meeting 9-12 August 2022 in Taipei (hybrid)

8. Nanotechnology Standards

ISO TS 4971: Project Leader Dr. Tsing-Tang Song and Prof. Jiang-Jen Lin

Title: Nanotechnologies – Performance evaluation of nanosuspensions containing clay nanoplates for quorum quenching.

Scope: This document specifies performance evaluation of nanosuspension containing clay nanoplates for quorum quenching in crop production. This document does not cover safety and environmental aspects. **Now advance to DTS ballot stage.**

9. NanoMark in Taiwan

Initiated nanoMark system by the Ministry of Economic Affairs in 2004. NanoMark system moved system to the TANIDA since 2017.

- 52 testing specifications
- 14 certification testing labs with 156 testing items
- 14 certified firms with 67 product types and 1456 product models (2022)

Total 14 firms:

- Sanitary Equipment (4 firms): Antifouling Sanitary Ceramic Ware; Antibacterial Sanitary Ceramic Ware.
- Paint (4 firms): Self-Cleaning Paint; Photocatalytic Deodorization Coating; Antibacterial Paint.
- Textile (2 firms): Far Infrared Textiles; Antibacterial Textiles.
- Building material (3 firms): Antifouling Ceramic Tiles; Anti bacterial Steel.
- Others (1 firms): Lubricants for Wear.



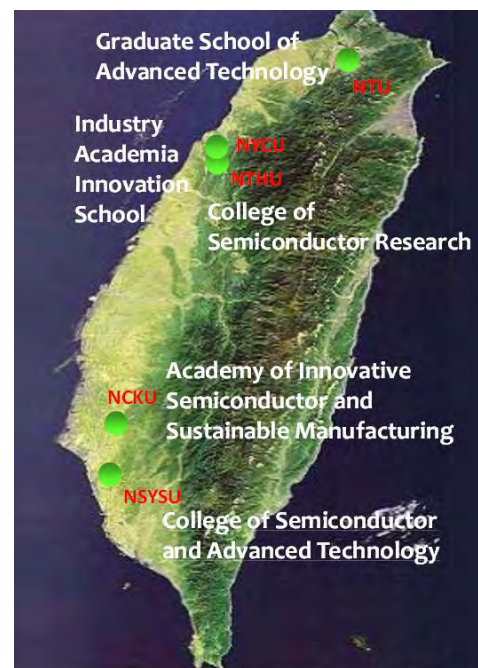
nanoMark Charter Ceremony 2019

10. Talent cultivation for Semiconductor Industry

The act of “National Key Fields Industry-University Cooperation and Skilled Personnel Training” was enacted by the government on 28 May 2021.

Goal: To ensure the leading position of Taiwan’s semiconductor industry, cultivating the next generation of high-tech talent. 5 semiconductor research institutes were established by public universities according to this act in 2021:

- National Taiwan University (NTU), Graduate School of Advanced Technology
- National Yang Ming Chiao Tung University (NYCU), Industry Academia Innovation School
- National Tsing Hua University (NTHU), College of Semiconductor Research
- National Cheng Kung University (NCKU), Academy of Innovative Semiconductor and Sustainable Manufacturing
- National Sun Yat-sen University (NSYSU), College of Semiconductor and Advanced Technology



11. Taiwan Pavilion in nano tech 2023

<https://unifiedsearch.jcdbizmatch.jp/nanotech2023/en/nanotech/details/Nr1K6JyP1w>

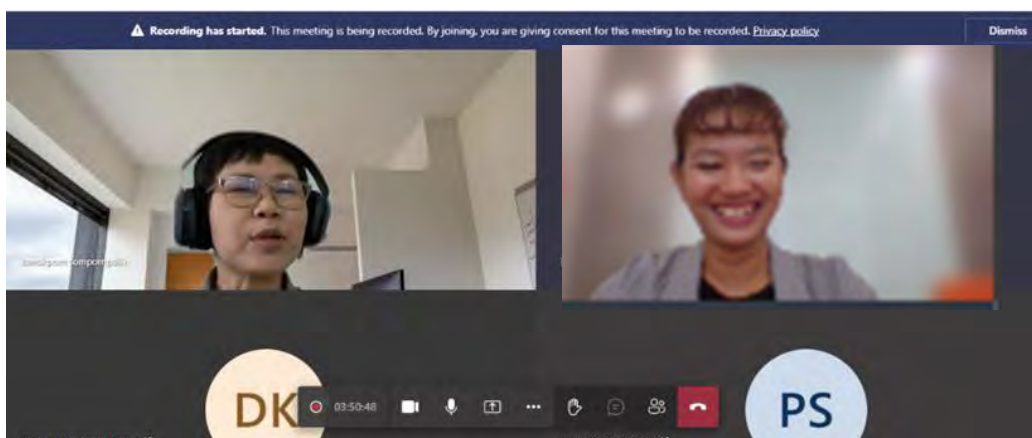
- Center for Nanoscience and Nanotechnology, National Sun Yat-sen University

- Full-color GaN micro LED display
- National Chung Hsing University
 - Comprehensive SERS Platform for Biomedicine and Food Safety Detection
- Biomedical Translation Research Center (BioTReC), Academia Sinica
 - Development and Applications of Portable, Low-Cost, and High-Throughput Nanostructure-Based Surface Plasmon Resonance Imaging Platforms
- Core Facility Center, National Cheng Kung University
 - 2D semiconductor material products and imaging technology
 - In-Situ Detection Nanotechnology for Liquid-State Samples
- Harvard Medical School Mclean Hospital / Taipei Medical University Shuang-Ho Hospital
 - Postintubation dysphagia management in COVID-19 patients and aging people using a novel nutrient supplement
- ZANY Materials Technology Ltd.
 - Nano-scale antibacterial and antiviral coating technology is applied to aviation fastener parts
 - ZANDEC Antiseptic & Disinfectant Solution
- STRONG NANO TECH.CO.,LTD.
 - Nano gold catalyst additives (Diesel fuel additives, Gasoline additive, Engine oil additives)
- Agspring Corporation
 - Nano Application of various masterbatches.
- ACOTECH INC.
 - Synthesis and Applications of metal oxide nano particles
- Nanovie Co., Ltd.
 - Nanovie HPAS Mono - High-precision alignment stacking system for 2D materials & heterostructures
 - Nanovie Metal Xano - Metal Nanoparticle Generator & Spray Coating
- Protrustech Co., Ltd.
 - SERS ID
- Luxor Thermal LTD.
 - The technology to implant functional groups on CNT and Graphene surfaces
- HOU CHI CHEMICAL CO., LTD.
 - NT Nano Ceramic Bead Mill
- Molsentech
 - Ultrahigh-sensitive Semiconductor Biosensor and Analyzer
- Institute of Physics, Academia Sinica
 - Human-organ-scale 3-Dimensional Electrospun Fibrous Scaffolds for Tissue Engineering Applications
 - Electroanalytical sensing for COVID-19 Causative Virus SARS-CoV-2 by Antibody immobilized Screen-Printed Graphene-COOH Biosensor
 - High-throughput and label-free system by a metallic nanostructure-based optical imaging technique

The National Nanotechnology Center (NANOTEC) is the leading agency on nanotechnology development in Thailand. Established on 13 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:

1. NANOTEC – KMITL Nanosafety online workshop

On 16 March 2022, NANOTEC and the College of Nanotechnology at King Mongkut's Institute of Technology Ladkrabang (KMITL) have been organizing Nanosafety workshops to help build students and faculty understand of issues related to nanotechnology. Since 2020 due to the Covid 19 pandemic the workshop was conduction via webinar. The workshop goal is to introduce Nanosafety not only in the laboratory or research setting but also about the manufacture process the environmental concern, the related guidelines and Thailand national standard as well as the good governance on nanotechnology. To develop the safe and sustainable nanotechnology Nanosafety topic need to be include at the beginning of the research as well as the future advance materials related with Nanotechnology. At the end of the seminar students were very active to participate on the question-and-answer session.



2. NSTDA Annual Conference (NAC 2022) Webinar on Knowledge management:

Guidance on specifying manufactured nanomaterials, Guidance on nanomaterial risk evaluation and how to apply for volunteer industrial standard

On 29 March 2022, NANOTEC (Thailand) a member of National Science and Technology Development Agency (NSTDA) organizer the webinar Under the NSTDA Annual Conference (NAC 2022). The topic of the webinar on Knowledge management was focus on 3 topics as follow.

- 1) Guidance on Specifying Manufactured nanomaterials
- 2) Guidance on nanomaterial risk evaluation
- 3) How to apply for volunteer industrial standard.

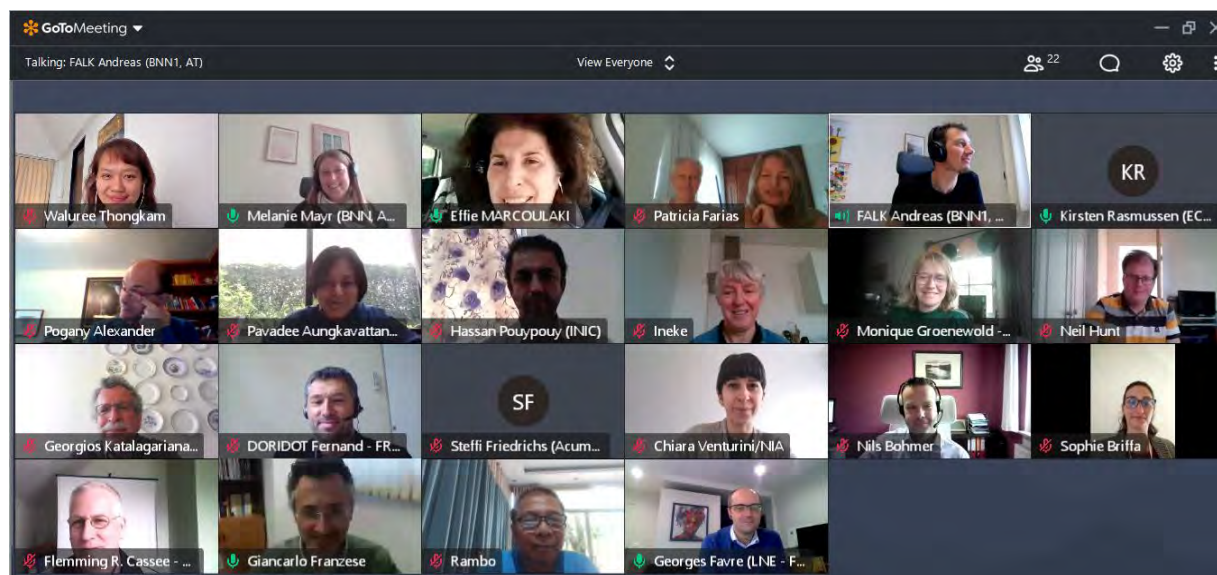
NANOTEC speakers together with the speaker from Thailand Industrial Standard Institute (TISI) also answer the question from the attendee. The objective of this webinar is to transfer the knowledge about standard and support the implementation of Thailand nanotechnology national standard to all stakeholders. Attendees of the webinar included participants from the nine Nanosafety Network for Industry partners, academia, research agencies, and private sectors groups



3. Concept paper of “International Network Initiative on Safe and Sustainable Nanotechnologies (INISS-nano)”

On 8 April NANOTEC join the INISS-nano meeting as one of contributors for a concept paper “International Network Initiative on Safe and Sustainable Nanotechnologies (INISS-nano)” with the concept on “Network of the Network”. The goal of the meeting is to implement concept to the stage plan of action and the possible activities that will implement in four pillars as follow

- 1) Harmonisation
- 2) Support industrial understanding
- 3) Sharing/Facilitated Sharing or Resources/Infrastructures
- 4) Ethical Aspects.



4. Standard Developing Organization 2022

NANOTEC acting as a Standards Developing Organization (SDOs), has collaborated with the Thailand Industrial Standard Institute (TISI) to develop new Thailand National Standards Guidelines. On 28th April the SDOs committee start the 1st meeting on the National Industrial standard draft of Plai Extract and Capsicum Extract Nano-Encapsulated Particles.

5. Webinar on NanoQ and Nanosafety



On 31 May 2022, Nanotechnology association of Thailand and NANOTEC together with King Mongkut's University of Technology Thonburi organizer webinar on "**NanoQ and Nanosafety**". The objective of this seminar was to disseminate knowledge and understanding related to the procedure of 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 the safety measure during production process including the National standard and guideline related with risk evaluation.

The seminar was focusing on 2 topics as below:

- 1) How to request NanoQ Label.
- 2) The principle of Nanosafety for entrepreneurs

Speakers included Dr. Tanakorn Osotchan, Chairman of NanoQ, Nanotechnology Association of Thailand and acting deputy executive director, NANOTEC and Dr. Waluree Thongkam Senior Technical Officer at Nanosafety Alliance Section, NANOTEC. Attendees for the webinar were students, researchers, and start up enterprise.

6. 22nd Meeting of the Working Party on Manufactured Nanomaterials (WPMN) and the International NanoHarmony & NANOMET Workshop on nano-related OECD Test Guideline Development at OECD Conference Centre, Paris.

During 27–30 June 2022 the events were organized by the Organization for Economic Co-operation and Development (OECD). Dr. Pavadee Angkawatana presented the status of nanotechnology in Thailand in Tour de Table report and on 29 June 2022 presented on the topic “Regulation and Use of OECD TGs in Thailand” at the International NanoHarmony & NANOMET Workshop. Both event are the international dialogue and the cooperation on health and environmental policies relating to manufactured nanomaterials (MNMs) and other novel materials as well as discussed the challenges and best practice approaches for the development of Test Guideline. There was a special focus on the use of TGs in regulation from an international point of view.



7. NANOTEC attended the 5th EU-Asia Dialogue on Nanosafety in conjunction with the 19th ANF Summit Meeting (ANFoS2022)

Dr. Wannee Chinsirikul and Dr. Pavadee Aungkavattana, Executives of NANOTEC participated virtually in the 5th EU-Asia Dialogue on Nanosafety which was organized in conjunction with the 19th ANF Summit Meeting (ANFoS2022) during 18-19 July 2022 at Hilton Kuala Lumpur, Malaysia (Hybrid Conference).

On 18 July 2022, National Nanotechnology Centre (NNC), Ministry of Science, Technology, and Innovation (MOSTI), Malaysia hosted the 5th EU-Asia Dialogue on Nanosafety led by Assoc. Prof. Dr. Ruslinda A. Rahim, Director of NNC and ANF Executive member. Dr. Wannee Chinsirikul, Executive Director of NANOTEC and President of Asia Nano Forum (ANF) was invited to deliver a welcome remark on behalf of Asia Nano Forum (ANF).



Dr. Pavadee Aungkavattana, Deputy Executive Director of NANOTEC was invited as a Keynote Lecture on INISS-nano to share information and experience on the topic of “Infrastructures across ASEAN to support Nanosafety (Thailand case)”. The objective of this event is to create exchanges and understanding between policy makers, researchers, and non-governmental organizations from Europe and Asia on the significance of nanosafety.



The EU-Asia Dialogue was initiated in 2017 with the effort of ANF working group on Standardization and Nanosafety and Risk Management in collaboration with the European NanoSafety Cluster (NSC). The aim of the EU-Asia Dialogue on Nanosafety is to exchange information, knowledge, and experience, as well as sharing resources between the key players from Europe and Asia. The 1st EU-Asia Dialogue on Nanosafety was held in Iran in November 2017. It is the mechanism to initiate and link the collaboration on Nanosafety between Europe and Asia and explore granting opportunities. Since the first meeting was very fruitful, the 2nd meeting and the 4th meeting were held in Austria in 2018 and 2020 respectively, whereas the 3rd meeting was held in Bangkok, Thailand in 2019.



On 19 July 2022 (morning session), ANF Workshop on Commercialization was organized by Dr. Rezal Khairi Ahmad, ANF Vice President and coordinator of the ANF Working Group on Commercialization. The objective of this workshop is to share experiences in business related to nanotechnology research. Dr. Paisan Khanchaitit, a Team Leader of Nanoneedle Research Team, Responsive Material and Nanosensor Research Group, NANOTEC, was invited as speaker to

give a success story of “Microspike Technology for cosmeceuticals products and medical devices”. This research is scaled up to be the first NANOTEC’s start-up entrepreneur to produce the micro nanoneedles on fabrics with customizable features. Lots of Malaysian companies are interested on this technology.



On 19 July 2022 (afternoon session), Dr. Wannee Chinsirikul, ANF President, and Dr. Pavadee Aungkavattana, ANF Secretary, participated in the Annual General Meeting of the 19th Asia Nano Forum Summit Meeting (ANFoS2022). This meeting is an annual meeting where representatives from all 14 ANF member economies updated the nanotechnology development and discuss related issues such as policy, R&D, and commercialization.



Dr. Waluree Thongkam, Senior Technical Officer of Nano-Safety Alliance Section, NANOTEC, participated physically in Malaysia in this meeting as a representative of NANOTEC, to report the progress of ANF Nanosafety & Risk Management Working Group. The objective of this working group is 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 translational nano research to the marketplace. Also, to provide a coordinated response for community concerns and engagement on nanotechnology safety and risk management issues.

8. Thai NIH and NANOTEC promoted nanopore technology in Thailand

Dr. Archawin Rojanawiwat, Director of National Institute of Health, Department of Medical Sciences, Ministry of Public Health and Dr. Pavadee Aungkavattana, Deputy Executive Director of NANOTEC, NSTDA, presided over the 1st Thailand Symposium on Nanopore technology. The two-day hybrid events were organized during 8-9 August 2022 by Department of Medical Sciences, Ministry of Public Health and NANOTEC, NSTDA.

The first day was the “International Seminar on Development and Application of Nanopore Technology” whereas the brainstorming session on the topic of "Expert Talks and Roundtable Discussion on Current Research and Development of Nanopore Technology in Thailand” was organized on 9 August 2022.





Both events aimed to establish the research network on nanopore technology and to build a consortium both locally and internationally through the integration of knowledge among peers from over the world. Moreover, this is the great opportunity for the academicians, scientists, researchers, from both public and private sectors to disseminate knowledge and to exchange the idea of nanopore technology application in various fields such as medicine and public health, agriculture, and the environment. This will lead to a research ecosystem of nanopore technology from research and development towards a comprehensive and sustainable utilization.

There are more than 10 renowned professors and scientists from well-known institutions/universities including unicorn startup company who had considerable expertise in Nanopore Technology participating the events which comprised of:

- United Kingdom: University of Oxford, University of Cambridge, Imperial College London and Oxford Nanopore Technologies Limited
- Singapore: A*Star
- People's Republic of China: Chinese Academy of Sciences (CAS)
- Japan: University of Tokyo and Osaka University
- Thailand: Faculty of Medicine Siriraj Hospital, Mahidol University, Vidyasirimedhi Institute of Science and Technology (VISTEC), and NANOTEC, NSTDA



On this occasion, Dr. Deanpen Japrungr, Director of Responsive Material and Nanosensor Research Group, NANOTEC, NSTDA gave her talk on “Overview on Nanopore Technology and Research Network in Thailand”. She aimed to use this event as a platform to connect peers in Thailand who apply nanopore technology for nanorobotics and nanopore technology to unravel some healthcare and environmental problems according to global SDG and Thailand BCG policy.

Please follow news and activities on Nanopore technology on Facebook Fanpage: Nanopore Thailand via this link: <https://www.facebook.com/NanoporeThailand>

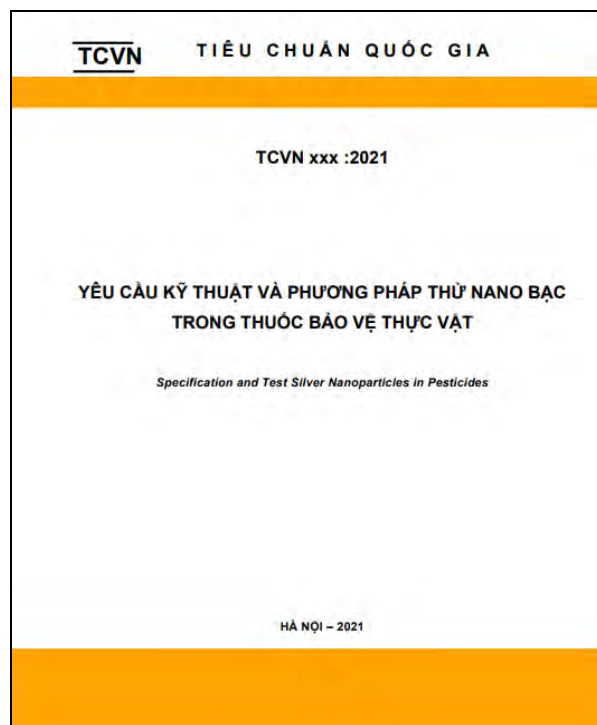


1. Established National Standard Technical Committee on Nanotechnology

On 19 May 2022, the Directorate for Standards, Metrology and Quality (STAMEQ) - Vietnam Ministry of Science and Technology (MOST) established the National Standard Technical Committee on Nanotechnology, TCVN/TC 229 and Prof. Tran Dai Lam was appointed as a chairman. The Committee's mission is to update and introduce the latest issues in nanomaterials, nanotechnology, nanosafety and its hazards.

2. Vietnam standard for specification and test Silver Nanoparticles in Pesticides

The international standard ISO/TC 229 indicated a number of benchmarks on nanotechnology, but there is not one that can quantitatively analyze nanoscale content or size. In Vietnam, there are many plant protection products containing nano-silver at different concentrations (from 100 ppm - 1000 ppm), but their actual content of nano-silver could not be yet determined by a standard method. The safety of nanomaterials for human health and beneficial organisms requires the understanding of the concept and relationship between the characteristics of nanomaterials and the chemical and biological reactions that nanomaterials can cause at the molecular scale in living organisms (humans and animals, plants). Therefore, in 2020, the Plant Protection Department of Vietnam has established a national standard for specification and test Silver Nanoparticles in Pesticides. This standard has been approved in 2021 and will be published at the end of this year. The introduction of this standard provides a method for evaluating and controlling the quality of nano-silver pesticides on the market. Vietnam standard for specification and test Silver Nanoparticles in Pesticides was published in the end of 2022 which show as follows.



3. Workshop on Application of nanomaterials in biomedicine, agriculture, and environment

For the past few years in Vietnam, the use of nanomaterials is not only applied in agricultural farming but is also considered an effective solution to replace traditional pesticides to control plant pests such as insects, microorganisms, and weeds. The growing application of nanomaterials in agriculture raises concerns for the health of consumers and the environment. For this reason, the Institute for Tropical Technology organized an annual workshop on “Application of nano-materials in biomedicine, agriculture and environment”. The 2nd workshop on “Application of nano-materials in biomedicine, agriculture and environment” was held on 30th October 2021. The 3rd workshop will take place on 29th October 2022.



4. Nanomaterials in biomedical: research and commercial

The development of nanomaterials has resulted in a new route for the biomedical field. Many natural active ingredients are produced at nanoscale that have shown better effects than usual such as nano-curcumin, nano-quercetin, nano-rutin, some of them have been combined together to create a new fomular that present better properties. For example, the complexes between β -cyclodextrins and rutin, has a sphere structure with diameter around 30-50 nm, presents a higher antioxidant activity than pure rutin.

Some research results on nanomaterials have been developed for the purpose of commercialization. For example, gold and silver nanoparticles were incorporated into the antibacterial products such as mouthwash, nasalwash, handwas. In the Covid-19 pandemic, the nano-silver particles have been used into commercial products to disinfect masks.

The research on the properties of the complexes between β -cyclodextrins and rutin has been published on Journal of Molecular Liquids which show as follows.



Antibacterial nano-silver in solution for masks, products from the research results of the Vietnam Academy of Science and Technology is show as follows.



Acknowledgment

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

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The TERI-Deakin Nanobiotechnology Centre (TDNBC), India

Iran Nanotechnology Initiative 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), MOSTI, Malaysia

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

Institute of Physics, Academia Sinica, Taiwan

Industrial Technology Research Institute (ITRI), Taiwan

National Nanotechnology Center (NANOTEC), Thailand

Vietnam Academy of Science and Technology (VAST), Vietnam