



Annual Report

2023

Asia Nanotechnology Leaders

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

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

AUSTRIA



JAPAN



KOREA



MALAYSIA



MALAYSIA



THE PHILIPPINES



TAIWAN



THAILAND



VIETNAM



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Preface

With my deep gratitude, I would like to extend my heartfelt appreciation to all representatives from 9 organizations of the ANF. Your unwavering support in providing invaluable insights and sharing experiences on nanotechnology for our Annual Report has been truly indispensable. Furthermore, I wish to express my profound thanks to the ANF Working Groups Coordinators for their pivotal role in enhancing the visibility of the ANF through their tireless efforts in spearheading various nanotechnology initiatives.

In 2023, ANF had many activities to promote collaboration among peers such as ANF Executive Committee Meeting 2023 in Tokyo, Japan (back-to-back with the nano tech 2023 in Japan), during 1-2 February 2023, the 6th EU-Asia Dialogue on Nanosafety in Berlin, Germany on 21 June 2023, and the 20th Asia Nano Forum Summit (ANFoS2023) (in conjunction with ANF Commercialization Workshop and NANO KOREA 2023) at Seoul, Korea on 6 July 2024. These gatherings were distinguished by their remarkable success and dynamic exchange of ideas.

Your collective contributions have not only enriched our Annual Report but have also fortified the foundation of our collaborative endeavors. As we reflect on the achievements of the past year, it is evident that your dedication and commitment have propelled the ANF forward in its mission to foster advancements in nanotechnology.

Having done our part in the two-year term, I would like to thank all members for their continued support and also expressed sincere thanks to my teammates including two Vice Presidents Dr. Annabelle V. Briones and Dr. Rezal Khairi Ahmad, two Secretaries Dr. Jason Chang and Dr. Pavadee Aungkavattana, and Treasurer Dr. Shuhei Numazawa. Their invaluable contributions have been instrumental in propelling the Asia Nano Forum (ANF) forward during the past two years. As we embark upon the new year of 2024 under the leadership of Dr. Rezal from Malaysia, we stand at the threshold of a new beginning. With optimism and determination, we anticipate a year of renewed vigor and unprecedented achievements.



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 9 organization members from 8 economies including Austria, 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) Japan Science and Technology Agency (JST), Japan
- 3) Korea Nano Technology Research Society (KoNTRS), Korea
- 4) NanoMalaysia Berhad, Malaysia
- 5) National Nanotechnology Centre (NNC), Malaysia
- 6) Industrial Technology Development Institute (ITDI), Department of Science and Technology (DOST), Philippines
- 7) Institute of Physics, Academia Sinica, Taiwan
- 8) National Nanotechnology Center (NANOTEC), Thailand
- 9) 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

Junichi SONE

JST, Japan

Changhwan CHOI

KoNTRS, Korea

Rezal Khairi AHMAD

NanoMalaysia, Malaysia

Ruslinda RAHIM

NNC, Malaysia

| Executive Committee

Annabelle V. BRIONES

DOST-ITDI, Philippines

Chia-Seng CHANG

Academia Sinica, Taiwan

Wanee CHINSIRIKUL

NANOTEC, Thailand

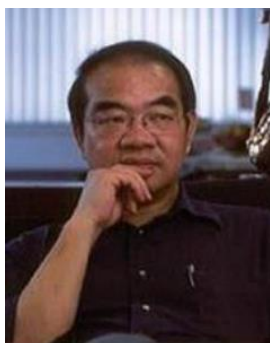
Tran Dai LAM

VAST, Vietnam

(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 NIALL

Australia



Hong Khoi PHAN

Vietnam



Wiwut TANTHAPANICHAKOON

Thailand



Halimaton HAMDAN

Malaysia

Coordinators:

Dr. Tsing-Tang SONG (ITRI, Taiwan)

Prof. Ali BEITOLLAHI (INIC, Iran)

The standardization working group aims to facilitate and coordinate the nanotechnology standardization among ANF. ANF participates in ISO/TC 229 and IEC/TC 113 meetings to stay updated with nanotechnology standardization for responsible development of nanotechnology. To promote the commercialization of nanoproducts, we encourage mutual recognition of nanoproduct certification to facilitate harmonized standards among ANF members. The following are the recent activities of ANF in ISO/TC 229 and IEC/TC 113, as well as reports on events related to nanotechnology standards.

Activities in IEC/TC 113

The two published IEC/TC 113 standards led by ANF, IEC/TS 62844:2016 ED1 "Guidelines for quality and risk assessment for nano-enabled electrotechnical products" and "IEC TS 62607-4-4:2016 ED1 Nanomanufacturing - Key control characteristics - Part 4-4: "Nano-enabled electrical energy storage – Thermal characterization of nanomaterials, nail penetration method", will be under review for amendment or revision process in 2024 and 2025 respectively. The project leader, Dr. Bin-Cheng Yao (Taiwan) who is ANF's liaison officer to IEC/TC 113, will continue the collaborative effort between IEC and ANF by actively participating the review process.

Activities in ISO/TC 229

The ANF-led ISO/TC 229 standard, ISO/TS 4971:2023 "Nanotechnologies Performance Evaluation of Nanosuspension Containing Clay Nanoplates for Quorum Quenching" was published in June 2023. The project leaders of this standard are Dr. Tsing-Tang Song from ITRI Taiwan and Prof. Jiang-Jen Lin from National Taiwan University. The purpose of this standard is to provide information on the characteristics and measurement methods of clay nanoplates, including their chemical and mineral composition, specific surface area, cation exchange capacity, hydrodynamic size, and zeta potential. Additionally, this standard describes the performance of clay nanoplates when interacting with bacterial signaling molecules and surfaces, including their quorum quenching ability, minimum inhibitory concentration, and minimum bactericidal concentration. These characteristics are essential in understanding the quality of clay nanoplates, as the clay nanoplate suspension is designed to inhibit the growth of pathogenic bacteria. This helps to protect crops from diseases and increases harvesting yields.

Voluntary Certification System

Four members of the ANF have established a voluntary certification system to manage their nanoproducts in the market. These members include Taiwan (nanoMark, 2004), Iran (nanomeghyas, 2009), Thailand (Nano Q, 2011), and Malaysia (NanoVerify, 2015; NANOTrust, 2023). In 2018, Taiwan's nanoMark and Malaysia's NanoVerify collaborated to create a platform of mutual recognition for nanoproduct certification. This platform promotes and harmonizes standards to accelerate the development of good nanoproducts. In 2019, JM Material Technology Inc. received the nanoMark and NanoVerify certificates. In 2023, ZANY Materials Technology Ltd received the nanoMark and NANOTrust certificates.

Code	Title	Published
INSO 23221	Nanotechnology – Hard nanoscale coatings – Assessment of wear resistance – Specifications and test methods	2023, Iran
INSO 23219	Nanotechnology – Hard nanoscale coatings – Assessment of adhesion strength – Specifications and test methods	2022, Iran
INSO 23169	Nanotechnology – Hard nanoscale coatings – Classification based on geometric and hardness characteristics	2022, Iran
INSO 23143	Nanotechnology – Hard nanoscale coatings – Characterization and test methods	2022, Iran
INSO 23138	Nanotechnologies – Labelling of nanotechnology products – Principals and requirements	2022, Iran
INSO 23137	Nanotechnologies – Printed electronics – Characterization of conductive inks containing nanomaterials and nanolayers – Specification and test methods	2022, Iran
JIS R 1750:2012	Fine ceramics -- Light source for testing semiconducting photocatalytic materials used under indoor lighting environment	2022, Japan (Reviewed and Confirmed)
JIS R 1751-1:2013	Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for air purification performance of photocatalytic materials under indoor lighting environment -- Part 1: Removal of nitric oxide	2022, Japan (Reviewed and Confirmed)
JIS R 1751-2:2013	Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for air purification performance of photocatalytic materials under indoor lighting environment -- Part 2: Removal of acetaldehyde	2022, Japan (Reviewed and Confirmed)
JIS R 1751-3:2013	Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for air purification performance of photocatalytic materials under indoor lighting environment -- Part 3: Removal of toluene	2022, Japan (Reviewed and Confirmed)
JIS R 1751-4:2013	Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for air purification performance of photocatalytic materials under indoor lighting environment -- Part 4: Removal of formaldehyde	2022, Japan (Reviewed and Confirmed)
JIS R 1751-5:2013	Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for air purification performance of photocatalytic materials under indoor lighting environment -- Part 5: Removal of methylmercaptan	2022, Japan (Reviewed and Confirmed)
JIS R 1753:2013	Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for self-cleaning performance of photocatalytic materials under indoor lighting environment -- Measurement of water contact angle	2022, Japan (Reviewed and Confirmed)

Code	Title	Published
JIS Z 2801:2010	Antibacterial products -- Test for antibacterial activity and efficacy	2022, Japan (Reviewed and Confirmed)
JIS R 1704:2007	Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for water-purification performance of photocatalytic materials by measurement of forming ability of active oxygen	2022, Japan (Reviewed and Confirmed)
JIS R 1712:2022	Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for antialgal activity of semiconducting photocatalytic materials	2022, Japan
KS C 8015:2022	Carbon Nanotube (CNT) Plane Light Sources for General Lighting - Performance Requirements	2022, Korea
KS D 2717:2008	Evaluation of metallic/semiconducting ratio of single-walled carbon nanotube soots using UV-VIS — NIR absorption spectroscopy	2023, Korea (Reviewed and Confirmed)
KS D 2712:2006	Evaluation of content of single-walled carbon nanotube using UV-VIS-NIR absorption spectroscopy	2023, Korea (Reviewed and Confirmed)
KS D 2711:2006	Evaluation of carbon nanotube soots and non-carbon content — Thermogravimetric analysis	2023, Korea (Reviewed and Confirmed)
KS D 2716:2023	Nanoparticle Diameter Measurement Method — Transmission Electron Microscope	2023, Korea
3343- 2564:2022	Black ginger extract nano-encapsulated particles	2022, Thailand
TCVN 13712:2023	Pesticides – Determination of silver nanoparticle content by atomic absorption spectrometry method	2023, Vietnam

Standardization Activities

Standardization activities were carried out in ANF in the year 2023.

- **The 20th ANF Summit 2023**

The 20th ANF Summit was held in Seoul, Korea on July 6, 2023. Participants from ANF member economies gather annually to share information on the latest nanotechnology developments, such as policy, standardization, nanosafety, commercialization, and education.

- **The 6th EU-Asia Dialogue on Nanosafety**

The 6th EU-Asia Dialogue on Nanosafety was held in Berlin, Germany on June 21, 2023. This dialogue has facilitated collaboration between ANF and the European NanoSafety Cluster, which is working towards developing standard test guidelines that can serve as reference documents for countries in Asia and Europe.

- **ANF events at the Nano tech 2023 (Japan)**
The International Nano Tech Exhibition and Conference 2023 took place in Tokyo from February 1-3, 2023. The event included several activities such as the ANF ExCo Meeting 2023, ANF Workshop on Commercialisation, and ANF Symposium on User-Facility Network in Asia, all hosted by ANF. In addition, AIST and the Japanese Mirror Committee for ISO/TC 229 organized a workshop named "Workshop on International Standardization for Nanotechnology 2023" as part of this event.
- **ANF events at NANO KOREA 2023**
The NANO KOREA 2023 took place from July 6 to July 8, 2023. Along with it, the 20th ANF Summit 2023 was also held. There was also a technical workshop called "Nano-EHS and Standardization of NT" that addressed various sustainable nanotechnology issues such as nanosafety, standardization, and nano ESG.
- **Standard Developing Organizations 2023 (Thailand)**
As a Standards Developing Organizations (SDOs), NANOTEC collaborated with the Thailand Industrial Standard Institute to develop new guidelines for Thailand's national standards. The SDOs held their first committee meeting on June 9, 2023, to review the draft for the National Industrial Standard of Emblica Extract and Pueraria Extract Nano-Encapsulated Particles.
- **NanoThailand 2023**
NanoThailand 2023 was held at Dusit Thani Pattaya in Thailand from November 29 to December 1, 2023. The ANF Working Group on Nanosafety & Risk Management is organizing a one-day workshop entitled "Nanosafety & Standard".
- **nanoMark certification system (Taiwan)**
Taiwan NanoMark has certified 14 companies, and there are 1770 nano products with certification in 2023. Taiwan NanoMark and Malaysia NanoVerify are collaborating for mutual recognition.
- **NanoVerify and PT Nanotech Indonesia Global signed a strategic agreement on nanotechnology**
On June 6, 2023, NanoVerify Sdn Bhd (Malaysia) and PT Nanotech Indonesia Global signed a strategic agreement to collaborate on nanotechnology commercialization. The partnership aims to establish a "Gold Standard" for nanotechnology certification in the region. The signing ceremony took place in Kuala Lumpur, and it is a significant milestone towards the commercialization of nanotechnology in Malaysia and Indonesia. NanoVerify seeks to create a regional standard for nanoprodut certifications in the ASEAN region.
- **Launch of NANOTrust and GRAPHENEVerify Programme (Malaysia)**
NanoMalaysia Berhad launched two product certification schemes, NANOTrust and GRAPHENEVerify on May 15, 2023. These schemes are part of the NANOVerify Programme, which promotes the growth of nanotechnology in Malaysia and enhances consumer trust in nanotechnology products.

Coordinators:

Dr. Yasuo Koide (NIMS, Japan)

Prof. Ruslinda RAHIM (NNC, Malaysia)

1. The 2023 Symposium on User-Facility Network

The 2023 Symposium on User-Facility Network in Asia at Tokyo Big Site (hybrid symposium) was held on 2 February 2023 by User-Facility Network Working Group. The objective of the symposium is to share information on initiatives, networks and activities of nanotechnology laboratories in ANF member countries. The details of the session are as follows. User-Facility Network Working Group Chairman, Prof. Dr. Yasuo KOIDE from NIMS Japan gave a briefing on the symposium and UFN initiatives in Asia. Dr. Ruslinda A. RAHIM from NNC Malaysia as Exco and Coordinator of User-Facility Network Working Group started the symposium by inviting speaker Dr. Chihiro J UCHIBORI from NIMS Japan regarding the ARIM program and the concept of Hubs & Spokes. The next speakers are Dr. Toshiyuki TSUCHIYA from Kyoto University Japan, Prof. Dr. Mohd Rafie JOHAN from University Malaya, Malaysia, Dr. Pavadee AUNGKAVATTANA from NANOTEC, Thailand, Dr. Persia Ada YRO from DOST-ITDO Phillipines and Dr. Mojtaba NASAB from Iran Hi-Tech Laboratory Network who presented the development of nanotechnology laboratory network initiatives in their respective countries. The symposium ended with a summary from Dr. Ruslinda A. RAHIM and the presentation of souvenirs and a photo session. The symposium was very successful.

The program of the User-Facility Network in Asia 2024 was announced, which consists of 2 programs as follows:

- 1) Program 1: Symposium User-Facility Network in Asia during ANF Summit Meeting 2024 (Hybrid event). The objective of this program is to share information on user-facility-activities and nano-characterization technologies in Asia.
- 2) Program 2: Hands On Training – Nanoelectronics Fabrication (Onsite event) at the MIMOS Berhad, Semiconductor Technology Centre, Bukit Jalil, Selangor. The objective of this program is to enhance nanoelectronics fabrication skills and techniques. The tentative date is the 1st week of September 2024 (3-4 days). The budget requested from ANF is approximately USD 3,000 for facility rental.

Coordinators:

Dr. Wannee CHINSIRIKUL (NANOTEC, Thailand)

Dr. Paul WRIGHT (RMIT, Australia)

1. NANOTEC – KMITL Nanosafety online workshop

On 28 February 2023, NANOTEC and the College of Nanotechnology at King Mongkut's Institute of Technology Ladkrabang (KMITL) organized Nanosafety workshops to help build students and faculty understand issues related to nanotechnology. This year the workshop is arranged in a physical setting under the precaution. 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 safe and sustainable nanotechnology Nanosafety topics 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 participating in the question, and answer session.



Nanosafety workshop at KMITL

2. NSTDA Annual Conference (NAC 2023) Seminar Session on Nanosafety: legislation on submicron particles

On 30 March 2023, 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 seminar was focused on 4 topics as follows.

1. Measurement and analysis method of submicron particles in the air.
2. Combustible Dusts: Law and Regulation.
3. Managing Chemical Hazards in the workplace.
4. Health and safety practices occupational settings relevant to nanomaterials

NANOTEC speakers together with the speaker from Department of Industrial Works and Department of Labour protection and welfare also answer the questions from the participants. The objective of this seminar is to share information about submicron particles in the out-door environment and workplace including the law regulation and related guideline to all

stakeholders. The participants are including but not limited to the nine Nanosafety Network for Industry partners, academia, research agencies, and private sectors.



*NSTDA Annual Conference (NAC 2023)
Seminar on Nanosafety: legislation on submicron particles*

3. MOU Ceremony between NANOTEC and 10 partner organizations on Nanosafety Network for Industry phase 2.

On 25 April NANOTEC and 10 partner organizations celebrate MOU on Nanosafety Network for Industry phase 2. Due to the first phase of the Nanosafety Network, which ends in December 2022, being successful. In the initial stage, nine organizations—NANOTEC, Thailand Food and Drug Administration, Thai Industrial Standards Institute, Office of the Consumer Protection Board, Department of Industrial Work, National Institute of Metrology, Federation of Thai Industries, Council of Scientific and Technological Associations of Thailand, and Nanotechnology Association of Thailand—worked together to establish various activities related to nanosafety. Phase 2 of the collaboration was approved by all alliance groups, and two additional agencies—the departments of labour safety and welfare and pollution control—joined in this phase. The "The Nanosafety and Ethics Strategic Plan of Thailand" will unite all organizations in phase 2 to establish nanosafety knowledge for all stakeholders for the sustainability of nanotechnology development in Thailand. The honorable guests during the ceremony including the representatives from Secretary of Ministry of Higher Education, Science, Research and Innovation, Dr. Junpen Meka-apiruk and President of National Science and Technology Development Agency, Prof. Dr. Sukit Limpijumnong.



MOU ceremony on Nanosafety Network for Industry phase 2

4. PROPAK Asia Seminar on “Technology and biological processes for food and food packaging”

On 15 June 2023, NANOTEC and Council of Scientific and Technological Associations of Thailand (COSTAT) joined the 30th International Processing and Packaging Exhibition for Asia (PROPAK Asia) to organize a seminar on “Technology and biological processes for food and food packaging”.

Maj. Gen. Dr. Chainarong Cherdchu, President of COSTAT and Chairman of Nanosafety Network for Industry, NANOTEC gave the opening remarks. The seminar topics included the following:

- “Bioprocessing: From Thai Bioresources to Application”
by Dr. Kobkul Laoteng, Director of Functional Ingredients and Food Innovation Research Group, BIOTEC/NSTDA Core Business Director, Service Platform for Food and Functional Ingredients (FoodSERP).
- “Nanomaterials and Nanoplastics: Perspectives on Food Safety and Environment”
by Dr. Sasitorn Aueviriyavit, Researcher, NANOTEC
- “Zero food waste”
by Mr. Wattanapong Petcharat, Wiangsra Industrial and Community Education College, Surat Thani.



ProPak Seminar on “Technology and biological processes for food and food packaging”

5. Standard Developing Organization 2023

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 9 June the SDOs committee started the 1st meeting on the National Industrial standard draft of Emblica Extract and Pueraria Extract Nano-Encapsulated Particles.

6. The 6th Eu-Asia dialogue

On 21 June 2023, the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and BioNanoNet Forschungsgesellschaft mbH (BNN) organized the 6th EU-Asia Dialogue on Nanosafety entitled “The role of characterisation and how it is addressed in International Network Initiative on Safe and Sustainable Nanotechnology (INISS-nano)” Dr. Waluree Thongkam was invited as a chair of the break-out session of “Societal and Ethical Considerations – Policy Framework for Characterization” supported by ANF Nanosafety & Risk Management Working Group. In this session, Dr. Waluree shared her idea on the safety and sustainability of nanomaterials and advanced materials. The result of the discussion is that there will be collaboration work between Pillar 1 “Characterization Items in Standardization” and Pillar 4 “Societal and Ethical Considerations – Policy Framework for Characterization” of INISS-nano and the webinar between EU and ANF will be planned and hosted by NANOTEC, Thailand in the future. In addition, they discussed that the key for driving the societal and ethical consideration on policy framework for characterization are language barrier solution, two-way communication, and mutual learning.



The 6th EU-Asia Dialogue on Nanosafety entitled “The role of characterisation and how it is addressed in International Network Initiative on Safe and Sustainable Nanotechnology (INISS-nano)”

7. The Nano label (NanoQ) slogan award

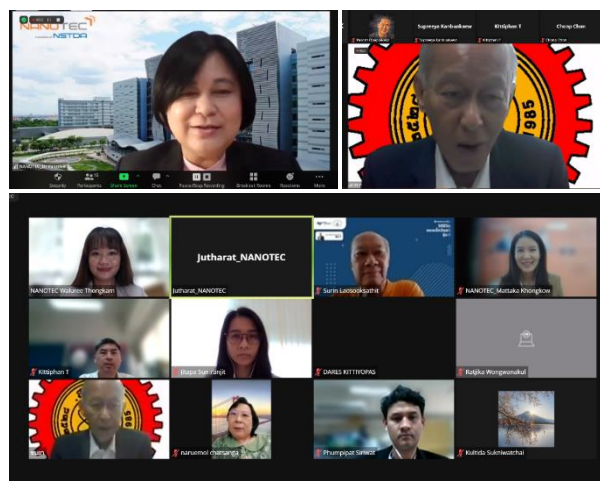
NANOTEC and Nanotechnology association of Thailand (NAT) receive the financial support from the Council of Scientific and Technological Associations of Thailand (COSTAT) to organize the NanoQ slogan competition the objective of this project is to promote the understanding of Nanotechnology for public and support the sustainable development of nanotechnology in Thailand. The company that receives the NanoQ from Nanotechnology association of Thailand not only complies with national nanotechnology standard but also must show the society the awareness on nanosafety as well. The submission to this competition ended on 15th July and the total submitted slogan is 30 slogans. The two groups of expert committees from the various organizations including representative from Nanosafety Network for Industry (NSNI) consider all slogans and select only 3 awards for the final which consisted of the 2nd runner-up, the 1st runner-up and the winner. The winning slogan will be used for promoting NanoQ in various campaigns. The award ceremony was held at the opening ceremony of NANOTHAILAND 2023 on 29th November 2023. In the award ceremony the Deputy Permanent Secretary of Ministry of Higher Education, Science, Research and Innovation was presented the token for all 3 awards and the president of COSTAT, the deputy director of NANOTEC and the chairman of NanoQ committee also join the ceremony on the stage. Moreover, the representatives from the Department of Industrial Works and Department of Labour Protection and Welfare also joined this event as the witness and guest of honor.



Webinar on Food Slow Release

On 21st September 2023, NANOTEC and The Council of Scientific and Technological Associations of Thailand (COSTAT) together with Nanosafety Network for Industry organize the seminar that Focus on Nanoencapsulation for food industry. Dr. Pavadee Aungwattana, Deputy Director of the National Nanotechnology Center open the seminar and Maj. Gen. Dr. Chainarong Cherdchu, President of COSTAT and Chairman of Nanosafety Network for Industry, NANOTEC gave the remarks. The seminar topics included the following:

- “Thailand industrial standards for herbal extract nano-encapsulated particles and How to apply for NanoQ (Nanoencapsulation)” by Dr; Jitapa Sumranjit Senior Researcher, NANOTEC.
- “The research and benefit related to food slow-release particles” by Dr. Mattaka Khongkow, Senior Researcher, NANOTEC.
- “Safety and efficacy test on nanoencapsulation in the different testing models” by Dr. Ratjika Wangwanakul, Researcher, NANOTEC.
- “Regulations and legislations for supplementary notification in Thailand” by Miss Narumon Chatsanga, Food Safety Expert from Food and drug Administration Thailand.



NANOTEC – KMUTT Nanosafety lecture (Online)

On 15th November 2023, NANOTEC and King Mongkut’s University of Technology Thonburi organized Nanosafety lectures for international students. To help students understand issues related to nanotechnology in Thailand. The lecture includes 4 main topics 1. Nanomaterials Production 2. Exposure to Nanomaterials 3. Toxicity and safety of Nanomaterials 4. Regulation

Nanosafety

Dr. Waluree Thongkam

Senior Technical Officer , Nano-Safety Alliance Section (NSA)

National Nanotechnology Center (NANOTEC)

National Science and Technology Development Agency (NSTDA)

NANOTEC
Move Forward To Better Future

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and guideline related with nanotechnology in Thailand. At the end of the lecture students were very active participating in the Q&A session and discuss about Nanosafety issue.

NANOTHAILAND 2023

During 29th November – 1st December 2023, the Nanotechnology Association of Thailand, in collaboration with Vidyasirimedhi Institute of Science and Technology (VISTEC) and the National Nanotechnology Center (NANOTEC), hosted the 8th Thailand International Nanotechnology Conference (NANOTHAILAND 2023) under the theme “Nanotechnology for a Sustainable World at Dusit Thani Pattaya, Chonburi Province, Thailand. The event aims to stimulate the development of nanotechnology communities and create a network of nanotechnology research and innovation among peers. Leading scientists and researchers from renowned institutes, universities, companies, and startups in nanoscience and nanotechnology will engage at these events to exchange knowledge about the advancement of nanotechnology and undertake wide and deep multi-dimensional cooperation. Oral and poster presentations will be set for the opportunity to exchange research ideas and knowledge and, at the same time, identify opportunities for research collaborations. In addition, exhibitions and showcases from the private sector will present innovative products.



The session 3 : Nanosafety and Standard got financial support from the ANF for 4 speakers from the member country. Four speakers from ANF are as follows: Professor Dr. Ying-Jan Wang from Taiwan, Mr. Toshiki Nagano from Japan, Mr. Dominic Geruka from Malaysia, and Dr. Jaeseok Kim from Korea.

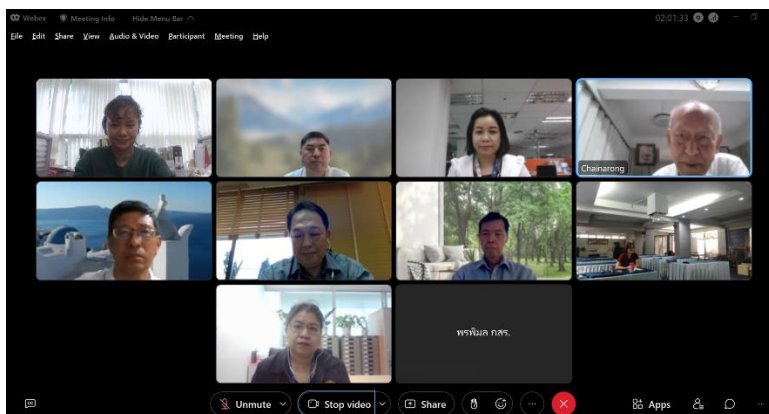
Session 3 topics are related to nanosafety and standards. Regarding nanosafety and nanostandards, they are multidisciplinary in nature and open to a wide variety of themes. Experiments conducted in vitro, in vivo, ex vivo, in silico, cohort studies, and AI relevance to standard development, risk

analysis, and nanotoxicology are all accepted. The human health and environmental impacts of nanomaterials, nanoplastics, and ultrafine particles are of interest. In the session, there were a total of 7 speakers, 1 oral presentation, 3 posters, and 30 participants. Nanothailand 2023 had 13 sessions and 401 participants in total from various countries and many regions around the world.



Nanosafety Network for Industry phase 2 annual 2023 meeting

On December 13, 2023, the Nanosafety Network for Industry will arrange the annual meeting. All the representatives from 11 organizations attended the meeting. The network resulted in various activities, as follows: 5 seminars, 162 participants, and the development of 2 national nanotechnology standards. After reporting all the activities, the network discusses the working plan for 2024 to implement the national nanotechnology standard and raise awareness of nanosafety among the industry and public sector.



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 2023 Commercialization Workshop

The Asia Nano Forum (ANF) Workshop on Commercialization 2023 was organized during the 20th Asian Nano Forum Summit 2023 (ANFoS2023) on 6 July 2023 hosted by KoNTRS and co-organized by ANF Secretariat, Commercialization Working Group, and NanoMalaysia.

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

Korea Time July 6 (Thu)	Program for Working Group Workshop (Korea Time 10.00 – 12.30 hrs)
10.00am – 10.10am	Welcome Remark by Dr. Rezal Khairi Ahmad, ANF Vice President and CEO of NanoMalaysia
10.10am – 11.00am	Session I – Physical presentation Policy Presentations by Members, Business/Tech Presentation, IP Presentation (Each Presentation at 10 mins each)
11.00am -11.10am	Coffee Break
11.10am -12.10pm	Session II – Virtual Presentation Business/Tech Presentation, Company/Product Presentations (Each Presentation at 10 mins each)
12.10pm – 12.20pm	Discussion
12.20 pm	Closing Remark CWG Coordinator (Dr. Rezal Khairi Ahmad)
12.30 pm	Session Ends



Minutes of the 16th Annual General Meeting

The 20th Asia Nano Forum Summit (ANFoS2023)

in conjunction with ANF Commercialization Workshop and
NANO KOREA 2023 at KINTEX Exhibition Center, Seoul, Korea

OFFICE BEARERS

(by designation and alphabetical order of name)

President

Wanee 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)

Changhwan CHOI (Hanyan University, Korea)

Rezal Khairi AHMAD (NanoMalaysia, Malaysia)

Ruslinda A. RAHIM (NNC, Malaysia)

Annabelle V. BRIONES (ITDI, The Philippines)

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

Wanee CHINSIRIKUL (NANOTEC, Thailand)

Tran Dai LAM (VAST, Vietnam)

Date	Thursday, 6 th July 2023
Time	14:00 – 17:40 (KST, GMT+9:00)
Venue	KINTEX Exhibition Center, Seoul, Korea and online meetings via WebEx
Chair	Wanee CHINSIRIKUL, President
Prepared by	Pavadee AUNGKAVATTANA, Secretary
Vetted by	All members present
Approved by	Wanee CHINSIRIKUL

Members present (by alphabetical order of economies)

Alexander POGANY (BMK, Austria)
 Andreas FALK (BNN & INISS-Nano, Austria)
 Andrea HAASE (BfR, Germany)
 Yukio KIMURA (AIST, Japan)
 Jun'ichi SONE (JST, Japan)
 Shuhei Numazawa (JST, Japan)
 Changhwan CHOI (Hanyan University, Korea)
 Jinho AHN (KoNTRS/Hanyan University, Korea)
 Jiyun JUNG (KoNTRS, Korea)
 Hojeong YOO (KoNTRS, Korea)
 Byoung Hun LEE (POSTECH, Korea)
 Seyoung KIM (POSTECH, Korea)
 Hak Min KIM (Seoul National University, Korea)
 Miso KIM (Sungkyunkwan University, Korea)
 Rezal Khairi AHMAD (NanoMalaysia, Malaysia)
 Noor Hanim Hani bt Mohd ARIFFIN (NanoMalaysia, Malaysia)
 Ruslinda A. RAHIM (NNC, Malaysia)
 Yusrizam SHARIFUDDIN (NNC, Malaysia)
 Annabelle V. BRIONES (ITDI, The Philippines)
 Jason C.S. CHANG (Academia Sinica, Taiwan)
 Tsing-Tang SONG (ITRI, Taiwan)
 Wanee CHINSIRIKUL (NANOTEC, Thailand)
 Pavadee AUNGKAVATTANA (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. Wannee CHINSIRIKUL, ANF President, welcomed all ANF members to the 16th Annual General Meeting (AGM), the 20th Asia Nano Forum Summit (ANFoS2023) in conjunction with NANO KOREA 2023 at KINTEX Exhibition Center, Gyeonggi-do, Korea (hybrid meeting). She expressed her sincere appreciation to Korea Nanotechnology Research Society (KoNTRS) for being careful and thorough in hosting this auspicious and successful event. She also highlighted that this is the second time for Korea to host ANF Summit since the first time was in 2016.

Dr. Wannee CHINSIRIKUL informed the meeting that there were 6 ANF member economies namely Academia Sinica (Taiwan), Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) (Austria), Japan Science and Technology Agency (JST) (Japan), KoNTRS (Korea), National Nanotechnology Centre (NNC), NanoMalaysia (Malaysia), and National Nanotechnology Center (NANOTEC) (Thailand) joined this meeting onsite at KINTEX, Korea. There were 3 ANF member economies namely National Institute of Advanced Industrial Science and Technology (AIST) (Japan), Industrial Technology Development Institute (DOST-ITDI) (Philippines), Industrial Technology Research Institute (ITRI) (Taiwan) joined the meeting virtually. Moreover, there were representatives from BNN & INISS-Nano (Austria), BfR (Germany), Hanyan University, Pohang University of Science and Technology (POSTECH), Seoul National University, and Sungkyunkwan University (Korea) observed the meeting.

Dr. Wannee CHINSIRIKUL stated that there was also the Workshop on Commercialization with the theme of “Sustainable Commercialization of Nanotechnology for People, Planet and Profit” in the last morning which was organized by the Commercialization Working Group coordinated by Dr. Reza Khairi Ahmad (NanoMalaysia), Dr. Junichi Sone (JST) and Mr. Pogany Alexander (BMK). At the event, ANF members and participants from research organizations and private companies shared the experiences on the economic value of Nanotechnology Research & Development through commercialization. It was a very productive and insightful experience. We have a lineup of insightful presentations, interactive discussions, and networking opportunities that will undoubtedly enrich your experience and broaden your perspectives. Their esteemed speakers had graciously agreed to share their expertise and insights, and we are grateful to them for their contribution.

Focusing the AGM, Dr. Wannee CHINSIRIKUL encouraged all participants to actively engage in the discussions, asking questions, and making the most of this opportunity to help the committee springboard the continuous work of ANF to help foster collaboration



in research, development, and the economic uptake of nanotechnology within the regions. In addition, according to the AGM's agenda, the ANF Office Bearers 2024-2025 would be elected, and the results would be announced in the meeting accordingly. The ANF Office Bearers 2024-2025 will oversee ANF management for the next two years starting in January 2024. Dr. Wannee CHINSIRIKUL also expressed her gratitude to all 11 eligible ANF members because their votes are important to the new chapter of ANF in the future. She hoped this event would be informative, inspiring, enjoyable, and an incredible opportunity to learn, collaborate, and create positive change together.

II. Opening Remarks

Prof. Jinho AHN, President of KoNTRS and Vice President of Hanyang University welcomed all ANF members and observers to the AGM, ANFoS2023. On behalf of president of KoNTRS, he expressed his pleasure and honor to deliver the opening remarks at ANFoS2023 and his gratitude to all the participants for visiting NANO KOREA 2023 in this hot and humid weather. In addition, he expressed his sincere appreciation to all those involved in making this ANFoS2023 proper and successful, especially Dr. Wannee Chinsirikul, the president of ANF, and all the delegates from ANF member organizations.

According to Prof. Jinho AHN, ANF is a network organization founded in 2004 to promote responsible development of nanotechnology, the benefits, and each economy by fostering international network collaboration. It's important to acknowledge that collaboration entails significant sacrifice and effort. Therefore, leading the ANF is an arduous undertaking, and Prof. Jinho AHN expressed his sincere gratitude to all ANF committee members.

As everyone knows, through our collaboration, the annual general meetings and the activities of various working groups have achieved valuable results in exchanging policy trends in Nanotechnology research fields, extending far beyond Asia. These efforts have led to the formulation of prospective collaboration and cooperation plans. It is extremely gratifying for everyone working in the scientific field to witness the revival of international cooperation activities, which had been put on hold for three years or more during the pandemic era. Hopefully, ANF will emerge as a prominent international community once again. ANF can play a pivotal role in achieving the development of nanoscience and technology in the future. Lastly, Prof. Jinho AHN expressed his special thanks to the museum of Science and ICT and the sponsor for their active support and asking for continued interest and support in this valuable event.

In addition, Prof. Jinho AHN mentioned that in couple of days ago, the current president of Republic of Korea expressed his opinion about the importance of international collaboration. The president also asked to share at least ten percent of the R&D funding for international



collaboration. As a result, all the government officers now have to make a new plan to encourage international collaboration on R&D projects. Prof. Jinho AHN stated that he thought that ANF could play an important role by arranging those very important internal collaboration programs. Lastly, he hoped that everyone had a good and memorable time while staying in Korea.

III. Roll Call

A roll call was conducted. 9 member organizations out of 14 member organizations presented and introduced themselves. Apart from ANF members economies, there were observers from BNN (Austria), BfR (Germany), and etc.

IV. Annual General Meeting (AGM, by Secretariat)

1. Introduction of the Agenda for the 16th AGM of ANFoS2023

Dr. Pavadee AUNGKAVATTANA, ANF secretary, introduced the agenda for the 16th AGM of ANFoS2023. There were 11 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 the 15th AGM of ANFoS2022 and ANF ExCo Meeting 2023

Minutes of the last AGM which was held hybrid in Malaysia on 19 July 2022 were sent to all the members on 23 December 2022. There were some requests to correct the typo in the minutes by Ms. Emi TAKENAKA (AIST). After that, the minutes were accepted without any amendments. In the meeting, Dr. Pavadee AUNGKAVATTANA concluded the highlight of the Minutes of the 15th AGM of ANFoS2022 which consisted of *Financial Statement of Year 2022 (January-July 2022), ANF Membership Current Status, and the Updating the proposed initiatives from ANF ExCo Members*.

She also concluded some highlight of the Minutes of the ANF ExCo Meeting 2023 in Japan dated on 1 February 2023. Minutes of the ANF ExCo Meeting 2023 were sent to all the members on 3 April 2023. The highlight of the Minutes consists of *Update on the Coordinator of User-Facility Network Working Group, ANF Annual Activities, Financial Statement of Year 2022, Status of Payment/ANF Membership Current Status, Revision of Membership Fee, and Updating on Initiatives from ANF ExCo Members*. The details of both minutes are attached in ANNEX B and C.

Dr. Pavadee AUNGKAVATTANA requested all committees to adopt these two meeting minutes. The minutes of the 15th AGM of ANFoS2022 and ANF ExCo Meeting 2023 were accepted without any amendments. In the meeting, the acceptance was proposed by Dr. Rezal Khairi AHMAD and seconded by Dr. Jason C.S. CHANG.



3. Financial Statement of Year 2022-2023 (as of 6 July 2023)

Dr. Shuhei NUMAZAWA, ANF treasurer, expressed his gratitude to all the organizers who invited him to attend the conference. This is the first time for him to visit the Republic of Korea and he really enjoyed the very interesting presentations at the conference. Before summarizing the ANF financial statement of year 2022-2023 as of 6 July 2023, Dr. Shuhei NUMAZAWA shared some information about the Japanese status. As Prof. Jinho AHN pointed out, the Japanese government also recognized the importance of the international cooperation and as a result, JST has established the funding program for international cooperation called “ASPIRE” and he thought that ANF will be a good platform for this program.

Subsequently, Dr. Shuhei NUMAZAWA summarized the balance of all ANF bank accounts updated as of 6 July 2023, which consisted of SGD & USD accounts in Singapore and USD & JPY accounts in Japan. The total was USD 82,228.46. The total budget was quite different from the previous report in January. It reflected that this budget allowed ANF membership to organize and attend the activities on-site after the COVID-19 situation. The income in DBS accounts in Singapore came from the ANF membership fee. The expenses consisted of account fees and a budget for organizing ANF activities. The details of the January 2022 – June 2023 financial statement are attached in the ANNEX A. In addition, Dr. Shuhei NUMAZAWA also informed the committee that the ANF Office Bearers had planned to close all ANF bank accounts in Japan as soon as possible. Dr. Yukio KIMURA (AIST) will be responsible for this duty.

4. ANF Budget Statement & Plan for 2022-2023

Dr. Pavadee AUNGKAVATTANA reported the ANF Budget Statement & Plan for 2022-2023 to the committee. As of June 28, 2023, the total expected income for the year 2022-2023 amounted to USD 40,019.22, while the expected expenditure was USD 29,257.98. Consequently, the projected surplus for the fiscal year 2022-2023 is USD 10,761.24.

The main source of income was derived from ANF membership fees. On the expenditure side, most funds were allocated for routine ANF administration fees, travel expenses related to the management and administration of the ANF ExCo Meeting and ANFoS2023, salary for Ms. Jin Hongfang, website maintenance costs, and financial support for ANF working groups and ANF activities. The details are shown in ANNEX A.

Dr. Wannee CHINSIRIKUL addressed the ANF Budget Statement & Plan for 2022-2023 and emphasized the dedication of ANF Office Bearers in facilitating activities through the organization's four working groups. These efforts have yielded tangible results, as evidenced by some of the ANF activities that were organized and financially supported by ANF. Dr. Wannee CHINSIRIKUL encouraged members and delegates to



actively participate in furthering ANF's mission of promoting responsible nanotechnology development through these working groups. She stressed that the working groups remain open to new ideas and initiatives, welcoming contributions from all members. She also mentioned that discussions on these topics will be continued in future issues and agendas. Dr. Wannee CHINSIRIKUL concluded her statements by inviting comments or questions from the attendees, demonstrating an open and collaborative approach within the organization.

Dr. Rezal Khairi AHMAD, ANF Vice President expressed satisfaction with the positive balance in the expected income and expenditure for the year 2022-2023. He suggested that, as a non-profit organization, ANF should consider utilizing the planned budget for the year effectively. He mentioned the President's call to utilize this opportunity, particularly as there are six months remaining in the year. Dr. Rezal Khairi AHMAD encouraged all the working groups to apply for their respective support. This approach aims to maximize the utilization of available resources to support ANF's initiatives and projects effectively.

5. ANF Membership Current Status

Dr. Pavadee AUNGKAVATTANA reported that currently, ANF has 14 active member institutes from 10 member economies, which the details are in the ANNEX A. She highlighted that the ANF secretariat team had sent the invoices for membership fees 2023 to all ANF member economies since March 2023 and followed up diligently on the collection of ANF membership fees from them. Dr. Pavadee AUNGKAVATTANA expressed her gratitude to the members who have already settled their invoices. The details are in the ANNEX A.

6. Updating the proposed initiatives from ANF ExCo Members

Dr. Rezal Khairi AHMAD expressed gratitude for representing ANF Vice Presidents and presented updates on proposed initiatives. The Vice Presidents established portfolios to support the ANF president, with Dr. Rezal Khairi AHMAD overseeing Commercialization, User-Facility Network, and ANF Growth Strategy. Dr. Annabelle V. BRIONES will manage Standardization, Nanosafety & Risk Management, and ANF Organizational Excellence. This structure allows the Vice Presidents to support the President and Office Bearers by managing key activities through dedicated working groups. Dr. Rezal Khairi AHMAD discussed aligning the Commercialization working group with the User-Facility Network to provide access to facilities for startups and SMEs, reducing innovation costs. He also volunteered to explore ANF's membership growth and branding.

Dr. Annabelle V. BRIONES will focus on harmonizing certification activities, such as



nanoMark, NanoQ, and NANOVerify, within the Standardization working group, aligned with nanosafety and risk management, and enhancing internal organizational excellence. She will focus on standardization to harmonize existing certification programs, facilitating the movement of goods among member economies. This aligns with the goal of nanotechnology development to improve lives, the environment, and the economy. Emphasis will be on inter-lab comparison and testing of common nanoparticles for safety, starting with TIO_2 and Gold nanoparticles used in cosmetics. The aim is to establish regional and global safety standards, promoting transparency and common practices. Additionally, efforts will extend beyond workshops at ANF summits and nano tech Japan, exploring ways to expand activities beyond these events.

Dr. Rezal Khairi AHMAD clarified the reason for not seeking financial support from ANF for the Commercialization Working Group. The expenses associated with organizing ANF Commercialization workshops during ANF summits and nano tech Japan were already encompassed in the overall budget, eliminating the need for a separate application for financial assistance. He cited successful examples of economic partnerships, such as Foodie Box Group Malaysia, a Malaysia-based seed capital investor that has invested in AniTech (a start-up in the Philippines), which looks into some of the advanced materials based on Biomass. In addition, they also have invested in Avalon Technologies (a start-up in India) which focuses on graphene-based green energy. These ventures, resulting from ANF Commercialization workshop outcomes in 2020 and 2021, exemplify cross-boundary investments aimed at facilitating market penetration.

Dr. Rezal Khairi AHMAD also expressed the intention to use workshops as a platform for similar activities, emphasizing the creation of tangible values and outcomes. Additionally, he highlighted the critical role of the User Facility Network, emphasizing the need for an Asian-wide network to grant access to nanotechnology facilities for small businesses and industry players, thereby reducing investment costs for innovation and development.

Dr. Rezal Khairi AHMAD discussed a new initiative, specifically addressing Prof. Byoung Hun LEE. He highlighted the Public of Korean government's consideration of establishing a fund for international collaboration, as mentioned by Prof. Jinho Ahn in his opening remarks. Exploring opportunities to create cross-border R&D projects was emphasized, building on findings from the previous ExCo meeting. The proposed approach involves using existing funding sources, such as ANF funding (USD 2,500) or Asian COSTI funding, as seed capital.



The focus is on aligning research objectives for common projects with a mission-oriented, technology transfer to the market. Key areas of interest include Green hydrogen technology from biomass, Applied graphene, Next-generation nanomaterials (MXene), Functional and safe-assembling nanomaterials, and Quantum dots. Projects are envisioned to have a maximum duration of two years, with approval initiated through bilateral or multilateral discussions and subsequent presentation to the ExCo meeting for endorsement and member feedback.

Dr. Rezal Khairi AHMAD discussed the strategies for enhancing the value of ANF membership, as presented in the recent Executive Committee (ExCo) meeting. The key criteria for eligibility were emphasized, requiring member economies must have settled their current year's membership fees to maintain a healthy cash flow.

In addition, members are expected to actively participate in ANF activities, including Summits, ExCo meetings, working group workshops, and relevant forums aligned with ANF interests. The scope of sponsorship or support has been expanded to include students residing in member economies under ANF, with a specific focus on second-year PhD students and above. These individuals must demonstrate a clear research course and objectives, having achieved a certain level of scholarly contribution, such as one publication in a peer-reviewed journal that aligns with at least one of ANF's joint research projects. The committee aims to ensure efficiency in spending and research alignment, fostering a collaborative environment for the advancement of nanotechnology.

Dr. Rezal Khairi AHMAD indicated the Funding Support Approval Process for ANF activities which consists of the process as shown below.

- 1) The Working Group or Subcommittee will escalate funding requests based on the following criteria.
 - New activities, programs, tasks, or assignments relevant to the core business of working groups or sub-committees.
 - Pre-planned activities, programs, tasks, or assignments relevant to the core business of working groups or sub-committees.
 - Incidental Strategic Directive(s) issued by ExCo
- 2) A proposal containing the following must be submitted to ANF Secretariat
 - Title, Scope, Goals & Objectives
 - Planned Activities, Expected Outcomes
 - Budget, Timeline
- 3) ANF Secretariat will conduct check-list screening (administrative process)
- 4) Upon Fulfillment, the ANF Secretariat will forward to the relevant Approval Authority for decision. Otherwise, the proposal will be returned to the applicant



for amendments or refinement. Finally, ANF Office Bearers will make a consideration whether to approve it or not.

Dr. Rezal Khairi AHMAD presented clear guidelines on the key criteria for financial support for working groups. It was emphasized that these guidelines should be prominently visible and well-published for ANF members who have paid the fees. Members are encouraged to apply to host or attend activities that represent or promote ANF, such as program support initiatives. The criteria of ANF Financial Support to ANF Working Groups and Member Economics is as follows.

- 1) ANF members who pay for ANF membership fee are eligibility to apply for ANF support to host/attend activities/meetings to represent/promote ANF *i.e. Joint Research Programmes, Student Thesis Support, Young Researchers Exchange, Travel Grant for Members to attend ANF Summit, Exco Meetings, International Meetings tied to WG activities.*
- 2) Each ANF Working Group will be eligible to propose activities related to their Working Groups for ANF Financial Support (not more than USD 2,500/Year/WG)
- 3) Each ANF member will be eligible to propose for ANF Partial Financial Support to host the activities/meeting to promote collaboration among ANF members (not more than 50% of their membership fees/year)
- 4) ANF financial support for ANF activities could be:
 - a) Roundtrip Economy Ticket b) Accommodation c) Meeting Venue & Facility*
- 5) Working Group Coordinators or ANF members who plan to propose for ANF Financial Support have to submit proposal to the ANF Office Bearers at least 1-month prior the event.
- 6) ANF will reimburse Working Group or ANF members with ANF Financial Support based on actual costs which evidence include:
 - a) Receipts b) Flight Economy Tickets c) Proposal for ANF Financial Support*

These guidelines aim to provide transparency and a structured approach to financial support for working groups, fostering collaboration and active participation among ANF members.

Dr. Rezal Khairi AHMAD also presented the new initiatives under ANF which is the “Inter-Economy Joint Research Project.” This project allows for harmonization between the Young Research Exchange Program and the Ph.D. Thesis Funding supports to have better efficiency in terms of resource management, especially financial and talent. This mini-pilot initiative project was actively discussed among Dr. Rezal Khairi AHMAD, Dr. Wannee CHINSIRIKUL, and Dr. Annabelle V. BRIONES. We look forward to



getting all the ANF members to participate in this project. The details of the project are as follows.

Mini Pilot Initiative: “ANF Young Researchers Exchange Program: Bridging R&D to Commercialization Exposure”

Host: NanoMalaysia

Period: 3-5 days

Activities: Training, having opportunities to discuss on ANF collaborative projects, get to know each other and aim to develop joint proposal to submit for funding i.e. ASEAN COSTI, UNDP & GEF

Proposed Timing: After ANF Summit 2023 and Approval at AGM

Number of Grants: Up to 5 grants will be awarded.

Fields of Cooperation:

- Technology transfer (for example Steps from R&D to Commercialization)
- Harmonization of Standards & Nanotechnology Product Certifications, Inter-lab comparisons, etc.

According to Dr. Rezal Khairi AHMAD, the proposed timeline for this initiative is upon full endorsement by the ExCo members at today's AGM. Upon receiving their approval, we will commence program activities immediately. The call for proposals will be issued in August onwards. Five grants will be awarded, leveraging the available funding support. The initial USD 10,000 will be allocated towards this program. Additional funding for future iterations will be explored. Dr. Rezal Khairi AHMAD shows the illustration of the milestones of the mini-pilot initiative project which is shown in the ANNEX A.

He also provided the example of a pilot initiative memorandum of understanding (MoU) established between NANOTEC (Thailand), NanoMalaysia (Malaysia), and ITDI, DOST (the Philippines). This MoU serves as a template for collaboration, but an open invitation extends to all existing ANF members to participate in areas of mutual interest. Examples of activities are staff mobilization, symposium/workshop organization, and establishing the early phase of the cooperation.

Dr. Wannee CHINSIRIKUL expressed her gratitude to Dr. Rezal Khairi AHMAD and Dr. Annabelle V. BRIONES for their hard work. She also emphasized the importance of this pilot initiative and supplemented more information that ANF Office Bearers will have a call for proposal after this summit. She asked all participants to share thoughts about the pilot initiative project.

Prof. Jinho AHN emphasized the critical importance of aligning funding structures in



international collaborations. He highlighted the challenge posed by variations in time schedules and budget sizes across different countries, particularly in the context of R&D funding for academia and research initiatives, typically distributed through national research foundations.

In the case of Korea, adherence to the international R&D program of the National Research Foundation of Korea is imperative, as they operate on their own schedule and procedures. This adds a layer of complexity to coordinating international collaboration efforts.

However, there is optimism regarding the potential to secure new funding for international collaboration, given the current emphasis on its significance by the President of Korea. Efforts will be directed towards exploring avenues to capitalize on this opportunity. Professor Jinho AHN expressed curiosity regarding the detail of the call for applications process and requested a more detailed explanation.

According to Dr. Rezal Khairi AHMAD, regarding the upcoming call for applications, the objective is to mobilize talent, enabling their participation and physical presence at NanoMalaysia. This program will give the key to the best practice in commercialization models in terms of the bigger picture of the international collaboration of R&D. There are three funding options as follows.

- 1) ANF members can co- apply for regional funding support at the Asian COSTI
- 2) ANF members can align existing projects. Project are already activated in respective economies, which have very strong common interests and alignment, they can start to share research findings.
- 3) ANF members can use some of those internal funds at the ANF to initiate early discussions with USD 2,500 for each working group.

Dr. Wannee Chinsirikul expressed her gratitude to Prof. Jinho AHN for his question and informed him that he could consider ANF as a gateway to discuss the possibilities of research collaboration further. ANF can help align research directions of interest of this initiative among ANF members.

Dr. Shuhei NUMAZAWA asked that only researchers belonging to the ANF member can apply to this program or anyone recommended by a member can apply because JST and KoNTRS are Society of researcher, not the researcher institutes. Researchers in JST and KoNTRS came from other research institutes or universities. Dr. Rezal Khairi AHMAD shared his opinion on this matter that JST or KoNTRS can nominate researchers from other research institutes or universities to submit the proposal.



Dr. Andrea HAASE also shared her experience when she was in charge of organizing the International Young Scientist Forum in conjunction with the International Particle Conference some years ago. Basically, this forum allowed the young scientist to attend the meeting. It was a large international conference that encouraged the young researchers to train how to put together a research proposal because they may not even know. The young scientists were encouraged to engage in small teams that mixed up them with the different nationalities and up to their background, such as material science or toxicology. Therefore, the young scientists had the opportunity to develop some ideas and pitch their proposal.

Dr. Andreas FALK (BNN & INISS-Nano, Austria) suggested on potential networking opportunities for ANF members through the EU Nano Safety Cluster's Early Career Researchers (ECRs) program and Young Scientist Forum. The ECRs program website provides information on various resources and initiatives. The Young Scientist Forum holds an annual event. The ECRs group actively collaborates across diverse fields, including chemistry, biology, engineering, economics, law, and physics. He also encouraged ANF members to visit the EU Nano Safety Cluster website and explore the ECRs program resources and join the LinkedIn and Facebook groups associated with the ECRs program for knowledge sharing and networking. He emphasized the potential benefits of direct interaction and collaboration between ANF members and the ECRs community.

Dr. Wannee CHINSIRIKUL expressed her sincere appreciation for the valuable suggestions provided by Dr. Andrea HAASE and Dr. Andreas FALK. She additionally recommended the exploration of an online forum as a means of fostering preliminary dialogue in advance of the planned onsite conferences.

7. Summary of the 6th EU-ASIA Dialogue on Nanosafety

Dr. Wannee CHINSIRIKUL expressed her sincere appreciation for the valuable suggestions provided by Dr. Andrea HAASE and Dr. Andreas FALK. She additionally recommended the exploration of an online forum as a means of fostering preliminary dialogue in advance of the planned onsite conferences.

Mr. Alexander POGANY (BMK, Austria) stated that the 6th EU-Asia Dialogue on Nanosafety is a best practice on how to collaborate on Nanosafety between Asia and Europe. He also expressed his gratitude to Dr. Andreas FALK from BioNanoNet and his team for organizing and hosting the meeting in Berlin, Germany two weeks ago. He hoped that the 7th EU-Asia Dialogue on Nanosafety will be held in Asia next year.

Dr. Andreas FALK presented the summary of the 6th EU-Asia Dialogue on Nanosafety which was held on the 21st of June 2023 in Berlin. It was a very nice event. First of all,



he indicated the agenda of the event which all information which is shown in the ANNEX A.

The welcome address was given by Dr. Tobias SCHAEFFTER, head of the Berlin PTB Institute, Germany which this institute was the host of the meeting. In their facilities really very nice facilities and we had also the pleasure to have a guided tour through the facilities. They are specialized in the methodology and characterization field. Then, Dr. Anita BREYER Head of Directorate General C, Federal Ministry for the Environment, Germany and Dr. Wannee CHINSIRIKUL, Executive Director of NANOTEC, Thailand and ANF President also gave their welcome address as well.

The list of speakers is shown as follows.

- 1) Dr. Helme HELAN, National Nanotechnology Centre (NNC), Ministry of Science, Technology & Innovation (MOSTI) MALAYSIA presented in the topic of “Recap of the 5th EU-Asia Dialogue.”
- 2) Dr. Kathrin SCHWIRN, German Environment Agency / Umweltbundesamt Dessau-Roßlau, Germany presented in the topic of “Safe and Sustainable by Design at OECD.”
- 3) Dr. Vladimir LOBASKIN, Associate Professor, University College Dublin, School of Physics, Dublin, Ireland presented in the topic of “EU-US-Communities of Research – Characterization Initiatives.”
- 4) Dr. Wannee CHINSIRIKUL, President of ANF 2022-2023, Executive Director of National Nanotechnology Center, Thailand in the topic of “Characterization Research Efforts in Asian Countries.”
- 5) Dr. Andrea HAASE, Head of Unit Fibre-and Nanotoxicology at the German Federal Institute for Risk Assessment (BfR), Department Chemical and Product Safety, Berlin, Germany presented in the topic of “German Interagency Working Group on Advanced Materials.”

Dr. Andreas FALK also briefly presented the status of the INISS-Nano-Action plan, which has overarching goals as follows:

- 1) Create a collaboration ecosystem.
- 2) Gain new knowledge / competences.
- 3) Knowledge transfer to maximize the impact of scientific work for society.
- 4) Contribute to creating solutions for societal challenges.
- 5) Expand the community globally.
- 6) Overcome “artificial” barriers towards scientific collaboration globally.

Dr. Andreas FALK indicated the next steps of the INISS-Nano-Action plan to continuously implement the actions from each pillar and to elaborate on the “UNITWIN/UNESCO-



network” which we also have Dr. Patricia Faris, a professor and a Brazil University volunteer already. She also joined INISS-Nano to better connect on a global level.

Dr. Andreas FALK explained the objectives of the breakout sessions as follows:

- 1) To reflect on outputs for checking the actual status of implementation
- 2) To evaluate the actions for prioritizing, changing / delete / adding actions.
- 3) To decide on activities for the next months including responsibilities / volunteers

There were 4 breakout sessions as follows.

Group 1: Characterization Items in Standardization

Group 2: Industrial Characterization Needs

Group 3: Characterization Facilities and Infrastructures

Group 4: Societal and Ethical Considerations – Policy Framework for characterization

The details of each breakout session were indicated in the summary of the breakout group presentations. Dr. Andreas FALK also presented the wrap-up of the Action Plan which is shown below.

- 1) European Data Portal (upcoming EC-initiative)
- 2) Global Summit on Regulatory Science, Parma, 27-28 September 2023
- 3) Share tutorials – EU-Academy as potential platform.
- 4) Pillar 2 – new name, new actions; web-meeting in October/November 2023
- 5) Presentation on data management by ANF-members
- 6) Place and timing for the 7th EU-Asia Dialogue on Nanosafety will be discussed in ANF beginning of July 2023; information provided then to all INISS-Nano colleagues.

8. ANF’s participation in nano tech 2024, Japan

Dr. Pavadee AUNGKAVATTANA 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 2024 will be held on January 31 – February 2, 2024 (3-days event) at the East Halls & Conference Tower, Tokyo Big Sight, Japan. The theme of the event is the “Social Transformation through Nanotechnology.” She asked all ANF member to discuss and make the decisions that ANF should have booth at the nano tech Japan or have only the ExCo Meeting and Working Group Workshop. Following thorough deliberation, the committee reached a consensus to prioritize the internal events by opting for the ExCo Meeting and Working Group Workshop only. The responsibility for organizing all aspects of these events, including logistical details and decision-making, will be entrusted to the ANF Office Bearers.



9. Call for application of Host Country for the ANFoS2024

Dr. Pavadee AUNGKAVATTANA reported on the history and timeline of ANF Summit host countries since 2004. Dr. Jun'ichi SONE proposed that the Japanese community host the ANFoS2024 during nano tech Japan 2024. All ANF committees agreed to his proposed proposal. Dr. Wannee CHINSIRIKUL stated that the details of ANFoS2024 can be discussed among ANF Office Bearers and let all ANF members know.

10. Others

1) Secretariat activities between January to July 2022

Dr. Pavadee AUNGKAVATTANA reported the secretariat activities between January to June 2023. There are 13 activities within 6 months. Dr. Wannee CHINSIRIKUL added that the 4th ANF Office Bearers Meeting would be held to follow up on management of ANF Summit 2023.

2) 2023 ASEAN Innovation Week & 50th Anniversary of ASEAN-Japan Friendship and Cooperation 21-25 August 2023, Bangkok, Thailand

Dr. Pavadee AUNGKAVATTANA invited ANF members to participate in the two international conferences that will be held in Bangkok, Thailand, as follows:

- The 2023 ASEAN Innovation Week and the 50th Anniversary of ASEAN-Japan Friendship and Cooperation during 21-25 August 2023
- The ASEAN-Japan Consortium on Nanopore Technology during 21-23 August 2023.

V. Working Group Activities

1) Standardization Working Group

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

4 main topics were reported by Dr. Tsing-Tang SONG as follows.

1.1 Project led by ANF at ISO TC 229 (Nanotechnologies):

Dr. Tsing-Tang SONG presented the status of the 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. We spent four years on ISO TS 4971. Finally, we got 100 percent support from members on 5 May 2023. Therefore, ISO TS 4971 is now under publication.



1.2 Project led by ANF at IEC TC 113 (Nanotechnologies)

According to Dr. Tsing-Tang SONG, a project led by ANF at IEC TS 62607-4-4 with the title of Nano-enabled electrical energy storage – Thermal characterization of nanomaterials have been published in 2016. The title will modify as IEC TS 62607-4-4 “Nanomanufacturing – Key control characteristics – Part 4-4: Nanomaterials for nano-enabled electrical energy storage – Thermal runaway characteristics.”

The project leader 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). Thermal characterization of nanomaterials, nail penetration method will under review (maintenance) process. ANF plans to continue contribution to IEC procedure by leading the maintenance process.

This document provides a method for assessing thermal runaway behavior for nano-enabled battery energy storage system (NE-BESS). This method uses comparative measurement to enable a manufacturer to decide whether or not the NE-BESS is resilient against the thermal runaway caused by a accidental faulty or short circuit between two or several internal points depending on the number of stacking electrode layers of the test sample.

1.3 Financial support for invited speakers for the 6th EU-Asia Dialogue on Nanosafety

Dr. Tsing-Tang SONG reported on the financial support for invited speakers for the 6th EU-Asia Dialogue on Nanosafety through Working Group of Standardization. The objective is to propose for support of travel grant / financial assistance for invited speaker to participate at the 6th EU-Asia Dialogue on Nanosafety, 21 June 2023 in Berlin, Germany. The invited speaker from ANF that the coordinator proposed is Dr. Pavadee AUNGKAVATTANA, who is the replacement of Mr. Ramjitti INDRAPRASET.

1.4 Inter-laboratory Comparison test

Dr. Tsing-Tang SONG indicated the generic process for nano-Marks Certification. Things to do for mutual recognition consist of 3 processes as follows:

- 1) Accreditation Process modification for mutual recognition
- 2) Testing document standardized; Testing labs compatibility verified.
- 3) Product available in each market

Dr. Tsing-Tang SONG referred to the Inter-lab comparison activities such as NanoMalaysia – Tanida (Taiwan) inter-laboratory comparison on size measurement of gold nanoparticles (10 nm and 30 nm) by Transmission Electron Microscopy



(TEM) and NANOTEC (Thailand) on nanoparticle size characterization of polystyrene latex, TiO_2 and gold. ANF hoped to harmonize testing standards and mutual recognition of testing lab.

Dr. Tsing-Tang SONG also indicated the history of developing Mutual Mark Recognition between NanMark (Taiwan) and NanoVerify (Malaysia) since 2016, starting by signed MOU in May and cooperation agreement in November. The details are shown in the ANNEX A.

He informed the ANF members that OECD called for an inter-laboratory comparison test, and the objective is to call for interested laboratories to participate in an inter-laboratory comparison test on the dissolution of metal nanomaterials in aquatic media. The deadline for submission is by 7th July 2023. The WNT project 3.0 led by Germany, is developing a Test Guideline for determining the dissolution of nanomaterials in aqueous environmental media. To validate the procedures for accurate measurement and data reduction. If any ANF members interested in this project can participate for more information in the online Q&A sessions: 12th July and 9th August (at 15:00 CET) or on-site training on the 6th September at Fraunhofer IME, Schmallenberg, Germany. For more information, please contact to mar.Gonzalez@oecd.org no later than 7th July 2023.

2) User-Facility Network

Coordinators: Dr. Yasuo KOIDE (NIMS, Japan) and
Dr. Ruslinda A. RAHIM (NNC, Malaysia)

Dr. Ruslinda A. RAHIM reported on the 2023 Symposium on User-Facility Network in Asia at Tokyo Big Site (hybrid symposium) on 2 February 2023. The event was organized by User-Facility Network Working Group. The summary of the program is indicated in the ANNEX A. We had a very comprehensive sharing session on the facility. We also reflected the research that has been conducted on each of the economic countries.

The objective of the symposium is to share information on initiatives, networks and activities of nanotechnology laboratories in ANF member countries. The details of the session are as follows. User-Facility Network Working Group Chairman, Prof. Dr. Yasuo KOIDE from NIMS Japan gave a briefing on the symposium and UFN initiatives in Asia. Dr. Ruslinda A. RAHIM from NNC Malaysia as Exco and Coordinator of User-Facility Network Working Group started the symposium by inviting speaker Dr. Chihiro J UCHIBORI from NIMS Japan regarding the ARIM program and the concept of Hubs & Spokes. The next speakers are Dr. Toshiyuki TSUCHIYA from Kyoto University Japan, Prof. Dr. Mohd Rafie



JOHAN from University Malaya, Malaysia, Dr. Pavadee AUNGKAVATTANA from NANOTEC, Thailand, Dr. Persia Ada YRO from DOST-ITDO Phillipines and Dr. Mojtaba NASAB from Iran Hi-Tech Laboratory Network who presented the development of nanotechnology laboratory network initiatives in their respective countries. The symposium ended with a summary from Dr. Ruslinda A. RAHIM and the presentation of souvenirs and a photo session.

Dr. Ruslinda A. RAHIM stated that it was a very successful symposium. and we are looking forward to leverage further on the next coming event this year. The next coming event, Malaysia by NNC, MOSTI is going to host the seminar on User-Facility Network in Asia 2023 on 6th September 2023 (Hybrid) at NanoKebangsaan (NanoKEB) 2023, Selangor Malaysia. The objective of this seminar is to share information on User-Facility activities, advanced nanoelectronics fabrications, nanoelectronics failure analysis and nano-characterization technologies in Asia.

She also indicated the program planning of the User-Facility Network in Asia 2024 which consist of 2 programs as follows:

- 1) Program 1: Symposium User-Facility Network in Asia during ANF Summit Meeting 2024 (Hybrid event). The objective of this program is to share information on user-facility-activities and nano-characterization technologies in Asia.
- 2) Program 2: Hands On Training – Nanoelectronics Fabrication (Onsite event) at the MIMOS Berhad, Semiconductor Technology Centre, Bukit Jalil, Selangor. The objective of this program is to enhance nanoelectronics fabrication skills and techniques. The tentative date is the 1st week of September 2024 (3-4 days). The budget requested from ANF is approximately USD 3,000 for facility rental.

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, Ms. Benyapa SUWAN (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.

- Coordinate nanosafety activities in the region through the Asia Nano Safety networks
- Training on nanosafety
- Design approach to nanotechnology development and translational nano



research to the marketplace.

- Coordinate and engage with nanosafety and risk management issues.

Ms. Benyapa SUWAN also highlighted three activities which some of them completed and the upcoming activities. The working group activities are as follows.

1) Industrial Network Development Project in Nanosafety (Phase 2)

This activity showed the law of Nanotechnology in Thailand. Ms. Benyapa SUWAN highlighted some presentations to emphasize that in terms of NANOTEC, Thailand, as a coordinator of the Nanosafety & Risk Management working group of ANF, we give importance to nanosafety. Especially, we aim to promote awareness and nanotechnology standards to public awareness, encourage the adoption of industrial product standards in the field of nanotechnology, and build confidence in Thai products toward the world market. In addition, NANOTEC also has partners from government agencies. There are 11 organizations; one is NANOTEC, and the others are regulators, technical support, and users. We have the MOU signing Ceremony in April 2023 to confirm that we are important for Nanosafety's industrial network development project.

2) EU-Asia Dialogue on Nanosafety 2023 (21 June 2023 in Berlin, Germany) with the support from ANF WH: USD 1,500.

Dr. Waluree THONGKUM (NANOTEC) was invited as a chair of the group 4: Societal and Ethical Considerations-Policy Framework for Characterization. During the break session, there are a lot of ideas and comments that we could elaborate more among ANF members and our European country. The conclusion is shown in the ANNEX A. Ms. Benyapa SUWAN also stated that Thailand is pleased to host the webinar between EU and ANF to discuss more in detail related to Societal and Ethical Considerations-Policy Framework for Characterization.

3) Nanosafety Symposium in NANOTHAILAND 2023 with the support of ANF WG: USD 1,000

The upcoming event that will be organized on behalf of the Nanosafety & Risk Management Working Group by Dr. Waluree THONGKUM is the Nanosafety and Standard Session in conjunction with NANOTHAILAND 2023 on 30 November 2023. NANOTHAILAND 2023 will be hosted by NANOTEC and Vidyasirimedhi Institute of Science and Technology (VISTEC) from 29 November – 1 December 2023 at Dusit Thani Hotel,



Pattaya, Thailand. There are some speakers from ANF members economies, such as Prof. Dr. Ying-Jan WANG (Taiwan), Dr. Dominic GERUKA (Malaysia), and so on. All ANF members are welcome to participate in this event.

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), nano tech 2023 (Japan, hybrid), and ANF Summit 2023 (South Korea, hybrid).

According to Dr. Rezal Khairi AHMAD, Workshop on Commercialization in 2023 was organized two times. First, the Workshop on Commercialization was organized in conjunction with the ExCo Meeting 2023 and nano tech Japan on 1 February 2023 with the theme of "Nanotech Innovation to Industrialization & Internationalization" at Tokyo Big Sight, Japan. According to Dr. Rezal Khairi AHMAD, the participation came from various ANF members economies and we have a wider participation and greater dimensions where we had presentation from the intellectual property evaluation to assist SME and startups to understand how best they can protect their respective technologies.

Second, the Workshop on Commercialization was organized in conjunction with the 20th Asian Nano Forum Summit 2023 on 6 July 2023 which hosted by KoNTRS and co-organized by ANF Secretariat, Commercialization Working Group, and NanoMalaysia. Dr. Rezal Khairi AHMAD expressed his gratitude to all speakers who were present in the workshop.

VI. ANF Office Bearers 2024-2025 Election

According to Dr. Pavadee AUNGKAVATTANA, the ANF Office Bearers for the years of 2024-2025, including ONE President, TWO Vice Presidents, TWO Secretaries, and ONE Treasurer. The online ballots were cast via an online voting software (Election Runner) confidentially during 28 – 30 June 2023. Announcement of results will be made in the



Annual General Meeting on 6 July 2023.

Nominees and electoral votes by 11 eligible voters:

Nominees	Votes
President:	
1) Dr. Rezal Khairi Ahmad, NanoMalaysia / Malaysia (recommended by Academia Sinica, DOST-ITDI, and NANOTEC)	9
2) Prof. Changhwan Choi, KoNTRS / Korea (recommended by NNC)	2
Vice President:	
1) Dr. Jason Chang, Academia Sinica / Taiwan (recommended by NanoMalaysia, NANOTEC, and Academia Sinica)	4
2) Dr. Annabelle V. Briones, DOST-ITDI / The Philippines (recommended by Academia Sinica, NNC, and DOST-ITDI)	8
3) Dr. Jun'ichi SONE, JST (Emeritus) / Japan (recommended by NANOTEC and NNC)	9
4) Dr. Yasuo Koide, NIMS / Japan (recommended by NanoMalaysia)	1
Secretaries:	
1) Dr. Ruslinda A. Rahim, NNC / Malaysia (recommended by NANOTEC, NanoMalaysia)	7
2) Dr. Jason Chang, Academia Sinica / Taiwan (recommended by DOST-ITDI)	2
3) Dr. Pavadee Aungkavattana, NANOTEC / Thailand (recommended by Academia Sinica)	10
4) Mr. Alexander Pogany, BMK / Austria (recommended by NNC)	0
5) Dr. Tran Dai LAM , VAST / Vietnam (recommended by NNC)	3
Treasurer:	
1) Dr. Ruslinda A. Rahim, NNC / Malaysia (recommended by DOST-ITDI and NanoMalaysia)	4
2) Prof. Changhwan Choi, KoNTRS / Korea (recommended by NANOTEC)	6
3) Dr. Jason Chang, Academia Sinica / Taiwan (recommended by NNC)	1



Elected ANF Office Bearers for the years of 2024-2025 is as follows.

President

Dr. Rezal Khairi Ahmad, NanoMalaysia / Malaysia

Vice President

1) Dr. Jun'ichi SONE, JST (Emeritus) / Japan

2) Dr. Annabelle V. Briones, DOST-ITDI / The Philippines

Secretary

1) Dr. Ruslinda A. Rahim, NNC / Malaysia

2) Dr. Pavadee Aungkavattana, NANOTEC / Thailand

President

Prof. Changhwan Choi, KoNTRS / Korea

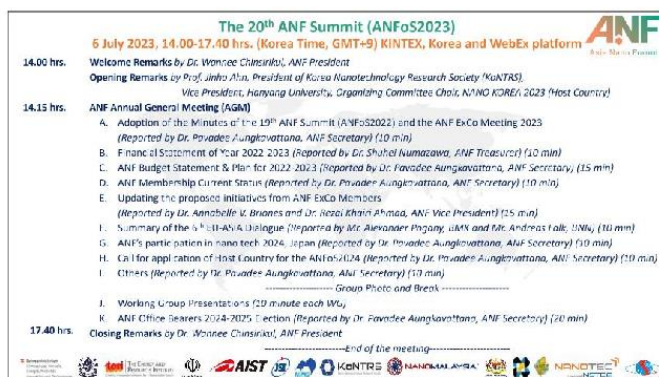
VII. Closing Remarks.

Dr. Wannee CHINSIRIKUL expressed her deepest gratitude to all ANF members for their valuable participation, suggestions, and engagement during the ANF Summit. She also extended her heartfelt appreciation to the host institute, KoNTRS, and the organizing team for supporting this summit. She congratulated the new ANF Office Bearers 2024–2025. We look forward to meeting you again next year in Japan.

There being no further proposals, the meeting upon motion adjourned at 17:40 (KST, GMT+9:00).



Annex A The Material for the 20th Annual General Meeting





Annex A (Cont'd) The Material for the 20th Annual General Meeting

Opening Remarks

Prof. Jinho Ahn
President of Korea Nanotechnology Research Society (KoNTRS) and Vice President, Hanyang University

Annual General Meeting

- A. Adoption of 19th ANF Summit Meeting Minutes (ANFoS2022) (10 min)
- B. Financial Statement of Year 2022-2023 (10 min)
- C. ANF Budget Statement & Plan for 2022-2023 (15 min)
- D. ANF Membership Current Status (10 min)
- E. Updating the proposed initiatives from ANF ExCo Members (15 min)
- F. Summary of the 6th EU-ASIA Dialogue (10 min)
- G. ANF's participation in nano tech 2024, Japan (10 min)
- H. Call for application of Host Country for the ANFoS2024 (10 min)
- I. Others (10 min)
- J. Working Group Presentations (10 minute each WG)
- K. ANF Office Bearers 2024-2025 Election (20 min)

A. Adoption of the Minutes of the 19th ANF Summit (ANFoS2022) and the ANF ExCo Meeting 2023

A. Reported by Dr. Pavadee AUNGKAVATTANA, ANF Secretary



Annex A (Cont'd)

The Material for the 20th Annual General Meeting

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)"

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 Wansee CHINSIRIKUL, President
Prepared by Pavadee AUNGKAWATTANA, Secretary
Vetted by All members present
Approved by Wansee CHINSIRIKUL

ANF Secretariat 2022 – 2023 has circulated the Minutes of the 19th Asia Nano Forum Summit in Malaysia to ANF members on 23 December 2022.

Conclusion the highlight of the Minutes of the 19th ANF Summit (ANFoS2022)

Financial Statement of Year 2022 (January-July 2022)
The total was **USD 87,770.62**. 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.

ANF Membership Current Status
Currently, ANF has 14 active members from 10 countries.

Updating the proposed initiatives from ANF ExCo Members

- 1) Vice Presidents will support the ANF president by look after ANF Working Group
 - Dr. Resai - Commercialization working group, User-Facility Network working group
 - Dr. Annabelle - Standardization working group, Nanosafety & Risk Management working group
- 2) Review of the structure and members of the working groups.
- 3) Joint R&D among the ANF member countries (TBC)
- 4) The criteria and approval process for Travel grant/sponsorship to ANF Activities
- 5) Thesis Grant for PhD students (TBC)

Minutes of the ANF ExCo Meeting 2023
in conjunction with
ANF Workshop on Commercialization 2023
2023 ANF Symposium on User-Facility Network in Asia at nano tech 2023, Japan

Date Wednesday, 1st February 2023
Time 12:00 – 14:00 (Tokyo, GMT+9:00)
Venue Room 609, Conference Tower,
Tokyo Big Sight, Japan and
Hybrid meeting via WebEx
Chair Wansee CHINSIRIKUL, President
Prepared by Pavadee AUNGKAWATTANA, Secretary
Vetted by All members present
Approved by Wansee CHINSIRIKUL

ANF Secretariat 2022 – 2023 has circulated the Minutes of the ANF ExCo Meeting 2023 in Japan to ANF members on 3 April 2023



Annex A (Cont'd)

The Material for the 20th Annual General Meeting

Conclusion the highlight of the ANF ExCo Meeting 2023 in Japan

Update on the Coordinator of User-Facility Network Working Group
Prof. Ruslinda RAHIM from NNC, Malaysia, join as another coordinator for the User Facility Network Working Group

ANF Annual Activities

- Prof. Changhwan CHOI informed that KONTRES, Korea will be host of the 20th Asia Nano Forum in July 2023
- Mr. Alexander Pogany stated that the 6th EU-Asia Dialogue on Nanosafety will be held on 21 June 2023, in Berlin, Germany, back-to-back event with the International Conference: "How the world deals with materials on the nanoscale". The host of the 6th EU-Asia Dialogue on Nanosafety this year is the German Federal Ministry for the Environment (BMUV).
- Dr. Ali BEITOLLAH informed that INAC decided to organize the online workshop on "International Nanosafety and Nano standardization: Status, Gaps, Needs, and the Role of the INISS-nano" which will be held on 16 February 2023, 8-11:50 a.m. (CET).

Financial Statement of Year 2022
Dr. Shuhei NUMAZAWA provided updated information on the ANF financial statement. The total budget of USD 93,404.26 for future activities.

Conclusion the highlight of the ANF ExCo Meeting 2023 in Japan

Status of Payment / ANF Membership Current Status
 Currently, ANF has 14 active members from 10 countries. 11 of 14 organizations paid the ANF Membership Fees.

Revision of Membership Fee
 The new rate of ANF membership fee (SGD 700 and SGD 2,000) will be implemented from this fiscal year 2023 onwards. However, if there is any issues which concerned ANF members, the secretariat team will examine those issues and report the ExCo meeting again.

Updating on Initiatives from ANF ExCo Members

- 1) New Initiatives under ANF - The 1st Inter-Economy Joint Research Project will harmonize between the Young Researchers Exchange Programme and the PhD Thesis Funding Support.
- 2) Criteria for ANF Financial Support to ANF Working Group - Each ANF Working Group will be eligible to propose activities related to their Working Groups for ANF Financial Support (not more than USD 2,500 /Year/WG)

B. Financial Statement of Year 2022-2023 (January 2022 – June 2023)

**Reported by Dr. Shuhei NUMAZAWA,
ANF Treasurer**



Annex A (Cont'd)
The Material for the 20th Annual General Meeting

Financial Statement during January 2022 – June 2023 (Overall)

Accounts Singapore Japan

ANF A/C	ODS SGD	ODS USD	Sumitomo Mitsui USD	Sumitomo Mitsui JPY	Total (1)+(2)+(3)+(4)		
	(1)	(2)	(3)	(4)	In SGD	In USD	In JPY
Balance 6 July 2023	40,908.67	34,343.69	16,739.22	123,638.00	111,065.98	82,228.46	11,840,722.92

USD 17,592.32

Update the latest status of the Japanese Bank Account on 6 July 2023

	USD	SGD	JPY
1 USD	1.0000	1.3517	143.9970
1 SGD	0.7396	1.0000	109.6096
1 JPY	0.0069	0.0074	1.0000

* AN: as of 6 July 2023 14:00 JST (JPY) (https://www.finance.yahoo.com/quote/JPYUSD/)

Confidential

C. ANF Budget Statement & Plan for 2022-2023)
*Reported by Dr. Pavadee Aungkavattana,
ANF Secretary*

D. ANF Membership Current Status
*Reported by Dr. Pavadee AUNGKAVATTANA,
ANF Secretary*



Annex A (Cont'd) The Material for the 20th Annual General Meeting

ANF Membership Current Status

14 Institutes/10 Economies

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
KoNTRIS / 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
NANOTEC / National Nanotechnology Center, T-AILAND
VAST / Vietnam Academy of Science and Technology, VIETNAM



Status of ANF Membership Payment 2023 (As of 28 June 2023)

No.	ANF Member	Country	ATTN/Invoice*	Default (SGD)	2020	2021	2022	New Default (SGD)	2023
1	BMK	Austria	M. Alexander POLANYI	4,000	USD 2,950.50	USD 3,390.00	USD 2,930.00	2,500	USD 5,450.50
2	NIT	India	Dr. M. A. Shar	967	—	—	—	700	—
3	TERI	India	Prof. Pooja Singh	700	—	USD 514	—	700	—
4	INIC	Iran	Prof. ABBASDOLAHI	2,000	x ¹⁰	x ¹⁰	—	2,000	—
5	AIST	Japan	M. Y. Ito KIMURA	4,000	USD 2,957	567,400.00	SGD 4,070	2,500	—
6	JST	Japan	Dr. Junichi SONE	4,000	SGD 4,000	SGD 4,000	SGD 4,070	2,500	—
7	NIMS	Japan	Dr. Yuki KODAI	4,000	SGD 4,000	SGD 4,000	SGD 4,070	2,500	—
8	KoNTRIS	Korea	Ms. Hojong DO	4,000	USD 2,957	x ¹⁰	USD 2,951	2,500	USD 1,451
9	NanoMalaysia	Malaysia	Dr. Reza Khairi AHMAD	2,000	USD 1,459	USD 1,509	USD 1,475	2,000	—
10	NNC	Malaysia	Dr. Razli da RAHIM	2,000	USD 1,459	USD 1,509	SGD 2,000	2,000	—
11	ITDI	Philippines	Dr. Annabelle V. BRIONES	700	USD 494	USD 515	USD 501	700	USD 515
12	Academia	Taiwan	M. Reza CHANG	4,000	USD 2,957	USD 3,017	USD 2,971	2,500	USD 1,451
13	NANOTEC	Thailand	Ms. Denysa SILLAN	2,000	USD 1,459	USD 1,509	USD 1,475	2,000	USD 1,451
14	VAST	Vietnam	Dr. Tran Da LAM	700	x ¹⁰	x ¹⁰	USD 514	700	—
Total				SGD 34,567			SGD 21,230.51	SGD 22,800	SGD 8,571

* Exchange Rate as of 14 June 2023: 1 USD = 0.71911 SGD (https://www.finance.yahoo.com/finance/quote/USD/SGD?lang=en)



E. Updating the proposed initiatives from ANF ExCo Members Reported by ANF Vice President Dr. Annabelle V. BRIONES Dr. Reza Khairi AHMAD





Annex A (Cont'd) The Material for the 20th Annual General Meeting



Dr. Annabelle, VP Asia Nano Forum

To oversee the activities of the working groups

1. Standardization
 - Mutual recognition of nano-enabled products certification among ANF members (other countries)
 - Interlab Comparison and Proficiency Testing for nanoparticle characterization of microplastics, gold nanoparticles (updates)
2. Nanosafety & Risk Management
 - Standards and Harmonization of Methods for nanoparticle characterization and analysis in Asian region on TiO₂, Ag nanoparticles (based on EU-ASEAN safety dialogue updates),
 - Collecting/surveying of data; Database; Sharing of best practices

Dr. Reza, VP Asia Nano Forum

To oversee the activities of the working groups

1. Commercialization
 - Organizing workshops at ANF Summits and Nanotech Japan
 - Inter-economy commercial partnerships and/or joint-ventures – Example
 - Foodie Box Group (Malaysia) invested in AniTech (Philippines)
 - Facilitating Market penetration – Via Commercialization Workshops
2. User Facility Network
 - Supporting Nanosafety and Standards on nanoparticle characterization testing via facility access
 - Database of facilities under ANF
 - Facilitate access to assist universities, research institutes and industry players to innovate using available laboratories



Annex A (Cont'd) The Material for the 20th Annual General Meeting

New Initiatives under ANF

Inter-Economy Joint R&D Programme

Funding Options:

- Own or Parallel
- ANF
- other funding institutions (ASEAN-COSTI, EU Green Horizon)

Minimum number of participating countries: 2
Type of R&D: Mission Oriented Research – For higher potential of transfer to market R&D areas:

- Green Hydrogen Technology from Biomass
- Applied Graphene
- Next-Generation nanomaterials (MXene);
- Functional and Self-assembling nanomaterials;
- Quantum Dots

Duration: Maximum of 2 years
Approval: Bilateral or Multilateral discussions between willing partners followed by a presentation at ExCo Meeting.

Adding Value to ANF Membership: Travel grant/sponsorship of members

Criteria:

Directly affiliated to or an employee presenting Member Economy
Member Economy must have paid current year membership fee at the time of application
Attending ANF related activities such as:
ANF Summits
ANF ExCo Meetings
Working Group Workshops
Forum/Conferences/Workshops relevant to ANF's interests

Thesis Assistance grant for PhD students

2nd Year of PhD and above with clear research goals and objectives
At least 1 publication in a peer reviewed journal
Current research work aligns with at least one of ANF's active Joint Research Project
In the absence of an active Joint Research Project, current work is on nanotechnology fundamental and applied research for climate resilience (ESG/SDG)

**Funding
Support
Approval
Process**

Funding Support Approval Process for ANF activities

4

- Upon fulfilment, ANF Secretariat will forward to relevant Approval Authority for decision. Use, the proposal will be returned to applicant for amendments or refinement
- ANF Office Bearers for Consideration and Approval

3

ANF Secretariat will conduct check-list screening (administrative process)

2

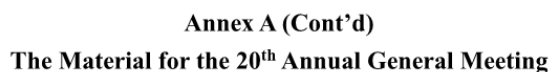
A proposal containing the following must be submitted to ANF Secretariat:

- Title, Scope, Goals & Objectives
- Planned Activities, Expected Outcomes
- Budget, Timeline

1

Working Group or Subcommittee will escalate funding request based on the following criteria:

- New activities, programs, tasks or assignments relevant to the core business of working groups or sub-committee
- Pre-planned activities, programs, tasks or assignments relevant to the core business of working groups or sub-committee
- Incidental Strategic Directives issued by ExCo



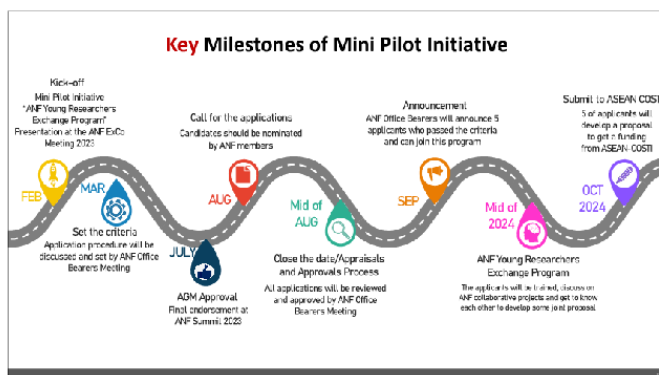
- 1) ANF members who pay for ANF membership fee are eligible to apply for ANF support to host/attend activities/meetings to represent/promote ANF i.e. Joint Research Programmes, Student Thesis Support, Young Researchers Exchange, Travel Grant for Members to attend ANF Summit, Exco Meetings, International Meetings tied to WG activities.
- 2) Each ANF Working Group will be eligible to propose activities related to their Working Groups for ANF Financial Support (not more than USD 2,500/Year/WG).
- 3) Each ANF member will be eligible to propose for ANF Partial Financial Support to host the activities/meeting to promote collaboration among ANF members (not more than 50% of their membership fees/year).
- 4) ANF financial support for ANF activities could be:
a) Roundtrip Economy Ticket; b) Accommodation; c) Meeting Venue & Facility
- 5) Working Group Coordinators or ANF members who plan to propose for ANF Financial Support have to submit proposal to the ANF Office Bearers at least 1-month prior the event.
- 6) ANF will reimburse Working Group or ANF members with ANF Financial Support based on actual costs which evidence include:
a) Receipts b) Flight Economy Tickets c) Proposal for ANF Financial Support





Annex A (Cont'd)

The Material for the 20th Annual General Meeting



Inter-Economy Joint R&D&C and Thought Leadership Programme

Funding Options:

- Own/Parallel
- ANF
- Other funding Institutions (ASEAN-COSTI, EU Green Horizon, UNDP, GEF)

Minimum number of participating countries: 2 (or 3 to qualify for external funding such as ASEAN-COSTI)

Type of R&D&C: Mission Oriented Research – For higher potential of transfer to market
Thought Leadership: Forums/Symposia/Workshops/Conferences

Proposed Areas of Common Interest:

- Green Hydrogen, Energy Storage & Renewable Energy Technologies
- Biomass based nanomaterials & Applications
- Graphene Applications
- Functional, Self-assembling & Next-Generation nanomaterials (MXene);
- Quantum Dots

Duration for R&D&C: Maximum of 2 years
Approval: Bilateral or Multilateral discussions between willing partners followed by a presentation at ExCo Meeting.

Pilot Initiative Memorandum of Understanding Thailand, Malaysia, and The Philippines

AREAS OF COOPERATION

- Joint development and implementation of programs and projects on nanotechnology and advanced materials, particularly on green hydrogen and nanomaterials from biomass.
- Exchange of staff, visiting, lecturers/professors, and students for knowledge and hands-on experience.
- Organize joint academic activities such as symposia, workshops, conferences, and seminars on nanotechnology and Advanced Nano Materials and other specialized training courses.
- Implement other areas of cooperation and collaboration deemed appropriate among institutions, and
- Other forms of cooperation as the Participants may mutually agree.

Own or Parallel funding on Research Projects – To justify the pilot initiative, Thailand, The Philippines and Malaysia are expected to align existing active projects relevant to the research area(s) funded separately and internally by respective organizations.

Outputs and outcomes of the projects are shared in confidence throughout and at the end of project execution.

Complementary intellectual properties may be created on mutual and/or payment basis for further development and commercialization on joint venture basis.

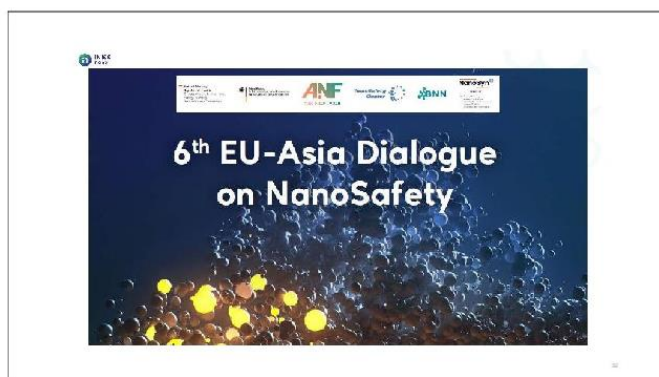
Appoint initiatives below can be harmonized to maximize:

- *ANF Young Researchers Exchange Programme funded to support the above area(s) of cooperation
- *ANF Thesis Grant for Students funded to support the above area(s) of cooperation at USD10,000 per year budget

Travel Grant to support face to face meetings and lab visits.



Annex A (Cont'd)
The Material for the 20th Annual General Meeting





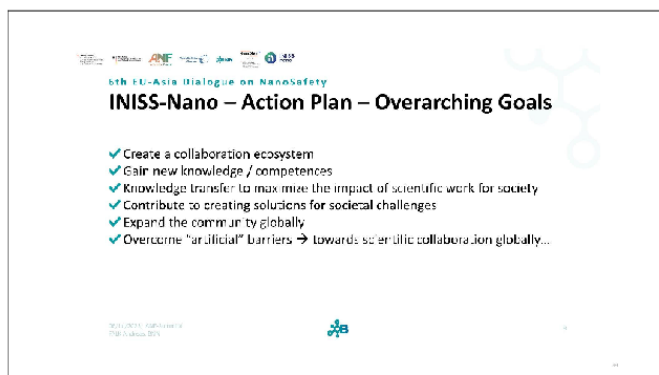
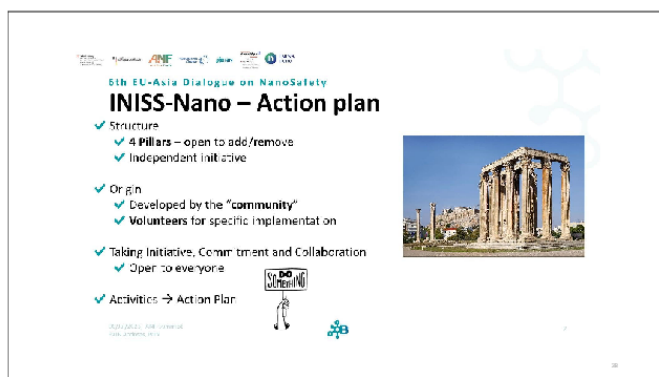
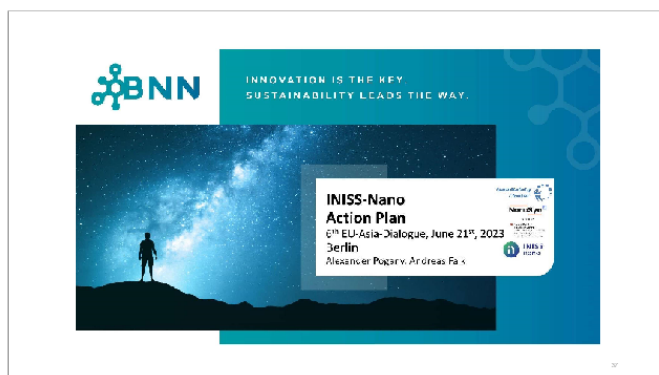
Annex A (Cont'd)

The Material for the 20th Annual General Meeting





Annex A (Cont'd) The Material for the 20th Annual General Meeting





Annex A (Cont'd) The Material for the 20th Annual General Meeting

6th EU-Asia Dialogue on NanoSafety

Next Steps

- ✓ **Ongoing Items:**
 - Continuously implement the actions from each pillar
 - Elaborate on "UNITWIN/JNESCO-network" (Fernand Decroix et al.)
- ✓ **Today's items for the breakout session:**
 - to reflect on outputs – check the actual status of implementation
 - to evaluate the actions – prioritize, change/delete/add act. ones
 - to decide on act. series for the next months incl. responsibilities/volunteers

ANF 2022-2023 AGM Summary
19th January 2023

6th EU-Asia Dialogue on NanoSafety

Breakout Sessions

- ✓ **Group 1: Characterization: Items in Standardization**
Steffi FRIEDRICH, Georges FAYRE
- ✓ **Group 2: Industrial Characterization Needs**
Patricia FARIAS, Poochaita SINGH, Gottlieb JINDNER
- ✓ **Group 3: Characterization: Facilities and Infrastructures**
Jörg RADNIK, Pavadee AUNG-KAWATTANA
- ✓ **Group 4: Societal and Ethical Considerations – Policy Framework for Characterization**
Ineke MALSCH, Waluree THONGKAM, Eric BLEEKER

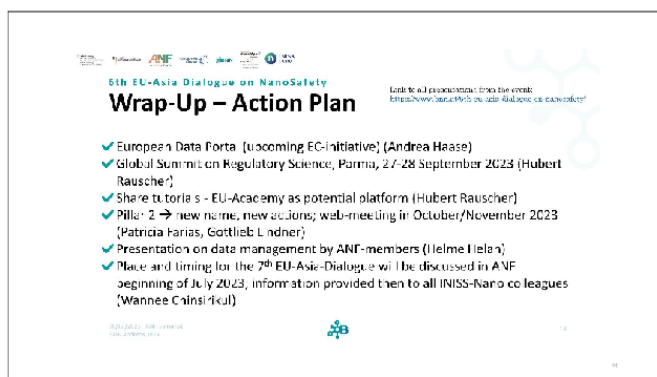
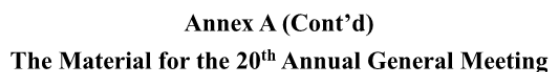
ANF 2022-2023 AGM Summary
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ANF 2022-2023 AGM Summary
19th January 2023





Annex A (Cont'd)

The Material for the 20th Annual General Meeting

EVENTS

- ✓ **26th International Conference on the Environmental Effects of Nanoparticles and Nanomaterials ICEENN 2023**, Sept 5th – 8th, 2023 Plymouth, UK
More information: <https://www.sciencedirect.com/science/article/pii/S0925646023000000>
- ✓ **NanoTrust-Meeting**, Sept 14th – 15th, 2023, Vienna, Austria
More information: <https://www.nano-trust.eu/>
- ✓ **14th European and Global Summit for Clinical Nanomedicine CUNAM**, Oct 8th–11th, 2023, Basel, Switzerland
More information: <https://www.cunam.eu/>
- ✓ **5th NanoSafety Forum for Young Scientists**, Oct 19th – 20th, 2023, Greece
More information: <https://www.nano-safety-forum.eu/>
- ✓ **BNN-days 2023**, March 4th – 8th, 2024, Vienna, Austria
More information: <https://www.bnn-days.eu/>
- ✓ **NanoTox2024**, Sept 23rd–25th, 2024, Venice, Italy
More information: <https://www.nano-tox.eu/>

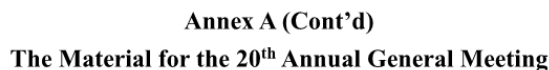
2023-2024 AGM agenda
19th January 2024

6th EU-Asia Dialogue on NanoSafety

Thank you!

G. ANF's participation in nano tech 2024, Japan
*Reported by Dr. Pavadee AUNGKAVATTANA,
ANF Secretary*

Logos: ANF, Asia Nano Forum, and various international organizations.





nano tech
The 23rd International Nanotechnology Exhibition & Conference



Outline	
Name	nano tech 2024 The 23rd International Nanotechnology Exhibition & Conference
Main Theme	Social Transformation through Nanotechnology
Date & Time	Onsite: January 31 (Wed.)- February 2 (Fri.), 2024 Venue: East Halls & Conference Tower, Tokyo Big Sight, Japan
Deadline for application	29 September 2023



Sponsored by



Organized by

[illegible]

ANF Exhibition

Exhibition Fees

• **Raw Space Only (booth not included):**



The below table lists the according fee to the exhibitor for the raw space of the exhibition.

Minimum transaction fee for the raw space on the Lab Area: MYR 30,000 (10' x 10').

Minimum transaction fee for the raw space on the Lab Area: MYR 30,000 (10' x 10').

*Minimum fee is applicable when the space is rented as a single booth only.

*Minimum space is 10' x 10'.

The below table lists the according fee to the exhibitor for the raw space of the exhibition.

Minimum transaction fee for the raw space on the Lab Area: MYR 30,000 (10' x 10').

Minimum transaction fee for the raw space on the Lab Area: MYR 30,000 (10' x 10').

• [Optional] Package Booth



Package Booth with Table and Chair is available for the exhibitor.

Minimum transaction fee for the package booth on the Lab Area: MYR 30,000 (10' x 10').

Minimum transaction fee for the package booth on the Lab Area: MYR 30,000 (10' x 10').

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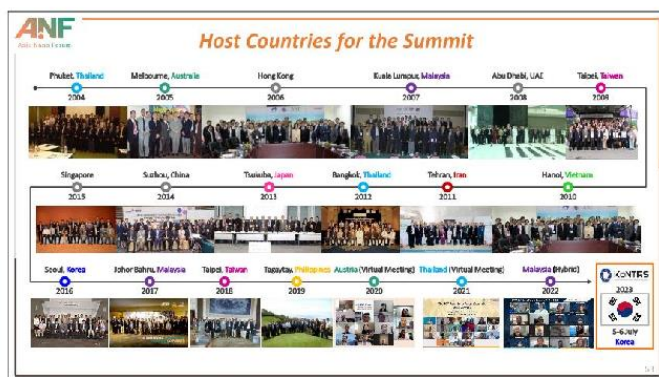
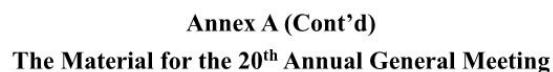
Company **MYR374,000 (tax included) /9m²**

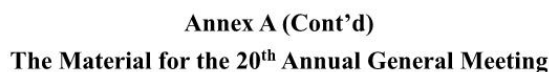
Public Registration / Overseas Pavilions / University Lab Area **MYR198,000 (tax included) /9m²**

Plans start from: **MYR43,000 (tax included)-**

Applies to all exhibitors who are not a member of the ANF Association.

ANF Association of National Fabricators



50th Anniversary of ASEAN-Japan Friendship and Cooperation

OBJECTIVES

1. To commemorate the 50th Anniversary of ASEAN-Japan Relations
2. To strengthen the relations between ASEAN Member States and Japan on STI agenda
3. To exhibit achievements and best practices through projects and programs between ASEAN and Japan
4. To explore and discuss the future collaborations on science, technology, and innovation between ASEAN and Japan



Annex A (Cont'd) The Material for the 20th Annual General Meeting

Group photo and Break
We will be back at 16.30 hrs. (KST, GMT+9)

ANF Asia Nano Forum

J. Working Group Presentations
Reported by ANF Working Group Coordinators

ANF Asia Nano Forum

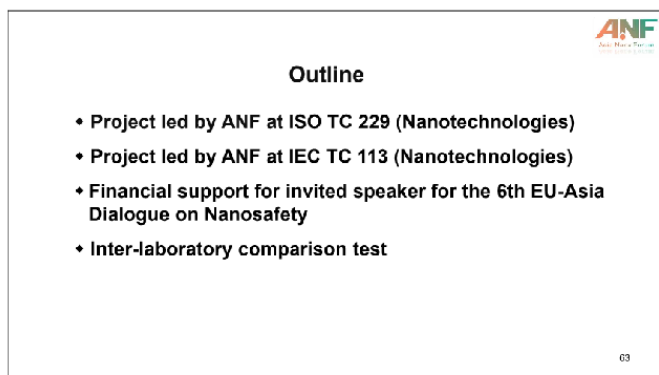
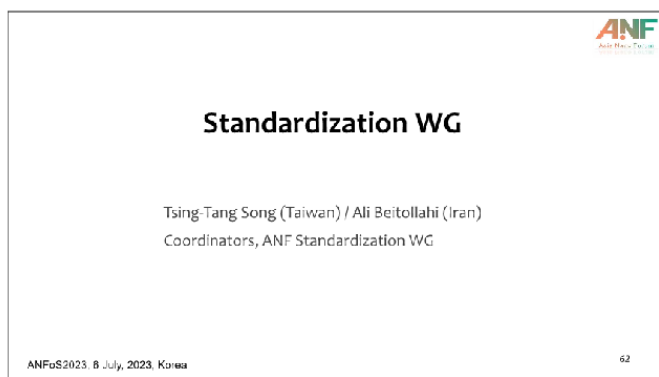
ANF Working Groups

- 1. Standardization**
Dr. Tsing-Tang SONG (ITRI, Taiwan)
Dr. Ali BEITOLLAHI (INIC, Iran)
- 2. User-Facility Network**
Dr. Yasuo KOIDE (NIMS, Japan)
Dr. Ruslinda A. RAHIM (NNC, Malaysia)
- 3. Nano Safety & Risk Management**
Dr. Wannee CHINSIRIKUL (NANOTEC, Thailand)
Dr. Paul WRIGHT (RMIT, Australia)
- 4. Commercialization**
Dr. Rezai Khairi AHMAD (NanoMalaysia, Malaysia)
Dr. Alexander POGANY (BMK, Austria)
Dr. Jun'ichi SONO (JST, Japan)

ANF Asia Nano Forum



Annex A (Cont'd)
The Material for the 20th Annual General Meeting





Annex A (Cont'd)

The Material for the 20th Annual General Meeting

ANF Project at ISO TC 229



• Project registration

ANF submitted proposal to ISO/TC 229 on Jan. 2020 and ISO approved for registration as **ISO PWI 4971** on April 2020.
PL: Tsing-Tang Song and Jiang-Jen Lin (Taiwan)

• Title

Performance Evaluation of Nanosuspension 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.

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Result of Ballot (NWIP)



Form 4: New Work Item Proposal

Initiation date: 2021-01-01	Reference number: ISO/TC 229
Closing date for voting: 2021-04-29	Reference number: ISO/TC 229
Proposer: (e.g. ISO member body or A-Team representative) ANF INC.	Reference number: N 1843
Technical area: ISO	

Approved as ISO TS 4971

Form 6: Result of voting on New Work Item Proposal

Date: 2021-04-29	ISO/TC 229
ISO/TC 229	N 1843
ISO/TC 229	

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Result of Ballot (DTS)

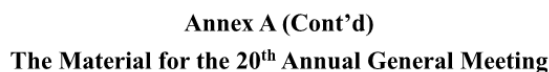


ANF led project: ISO TS 4971

Ballot information (DTS) : Start date 2023-03-10 End date 2023-05-05

Result of voting
P-Members voting: 16 in favour out of 16 = 100 % (requirement >= 86.66%) (P-Members having abstained are not counted in this vote.)
Member bodies voting: 0 negative votes out of 16 = 0 % (requirement <= 25%)
Approved → Under publication

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ANF plans continuing contribution to IEC procedure by leading the maintenance process.

This document provides a method for assessing thermal runaway behavior for nano-enabled battery energy storage system (NE-BESS). This method uses comparative measurement to enable a manufacturer to decide whether or not the NE-BESS is resilient against the thermal runaway caused by a accidental fault or short circuit between two or several internal points depending on the number of stacking electrode layers of the test sample.

2

To propose for support of travel grant / financial assistance
for invited speaker to participate at the 6th EU-Asia Dialogue
on Nanosafety, 21 June 2023, Berlin

-> Pavadee Aungkavattana (Thailand), Invited Speaker
Replacement of Ramiitti Indrapraset

9 March 2023

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27 June 2023 10:03 - 17:00 CEST

Physikalisch-Technische Bundesanstalt (PTB) · Hermann-von-Helmholtz-Platz,
Abbestraße 2-33, 10585 Berlin, Germany

moderated by Andreas FALK (BNN)

[Registration link](#)

Welcoming Address

10:00 Tobias SCHÄFFER, Head of the Berlin PTB Institute, Germany
10:10 Ando HIROKI, Head of Directorate General C, Federal Ministry for the Environment, Germany
10:20 Wanee CHAISRIKUL, President of JNENKOTEC, Thailand

• **THE JUDGE**

 UNIVERSITY OF CAMBRIDGE
Faculty of Education
Department of Curriculum Studies

100

doi:10.1017/S0022292412001709
 In the name of Cambridge University Press

Environment

100%



Annex A (Cont'd)

The Material for the 20th Annual General Meeting

Program on the 6th EU-Asia Dialogue on Nanosafety

14:00 INISS-nano Action Plan
The role of INISS-nano Authority and the Global Collaboration
Andreas REIF, BNL Austria - INISS-nano Co-Coordinator

14:10 Break-out Session
Goal: to develop concrete actions that can be initiated by INISS-nano

Group 1: Characterization: Items in Standardization
Chair: ARIE STOLLMEIER, STEFAN FRISCHBACH
Representative: Georges "AVP"

Group 2: Industrial Characterization Needs
Chair: Patricia FARIAS, Pooja Singh
Representative: Sushobh LUDNER

Group 3: Characterization: Facilities and Infrastructure
Chair: ARIE MARJON, EMILIO MARCOLLARI
Representative: Parag JHARGAONKAR

Group 4: Socio-economic Considerations - Policy framework for Characterization
Chair: Ines MALSCH, Andrea THORNDORF
Representative: Marique GIGENLOU

Expected Outcomes

- As this is the 6th Dialogue meeting by the participants, we will assume that various nano standardization discussions and initiatives have already taken place.
- With this in mind the expected outcome on the development of nano standardization will be to identify initiatives that are working well in specific nations, why they work, and how other nations can learn from their experiences.
- Doing so will help leapfrog the overall developmental process of nano standardization.
- The discussion will also look at the short and long term goals that are realistic and achievable given the various research and budgetary constraints.
- In addition, the discussion will confirm the need for continued coordination by ANF and respective member countries, eventually catching the interest of potential strategic partners that will enhance and strengthen the drive for nanosafety initiatives.

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The 6th EU-ASIA Dialogue on Nanosafety, Berlin, Germany 21 June 2023



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Annex A (Cont'd) The Material for the 20th Annual General Meeting

Breakout Session



Pillar 1: Characterization Items in Standardization



Pillar 3: Characterization Facilities and Infrastructures

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INNIS-nano: Goals



- Cooperation between science, industry and government from world-wide partners
- connecting different networks (NSC, ANF, OECD, Standardisation bodies, ECHA etc.)
- common activities (training, standardization efforts, test-guideline development, commercialisation, supporting governance, regulatory guidance, etc...)
- transfer of scientific results into policy, regulation, standardisation, etc...
- collection and analysis of available information worldwide

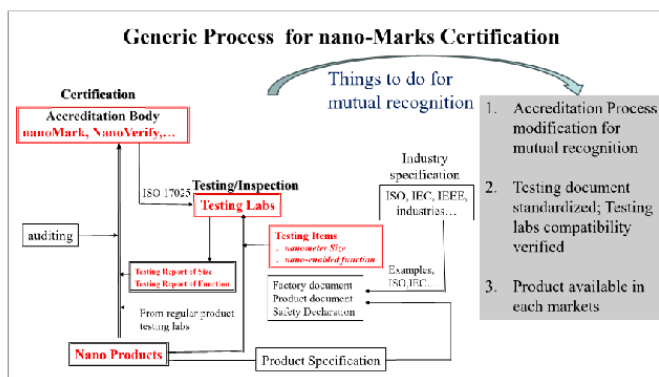
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Inter-laboratory comparison test

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Annex A (Cont'd) The Material for the 20th Annual General Meeting



Inter-lab comparison activities

1. NanoMalaysia – Tanida(Taiwan) inter-laboratory comparison on size measurement of gold nanoparticles (10 nm and 30 nm) by Transmission Electron Microscopy (TEM). (done)
2. Nanotec (Thailand) on nanoparticle size characterization of polystyrene latex, TiO₂ and gold.

harmonized testing standards and mutual recognition of testing lab.

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**NanoMark(Taiwan) – NanoVeriy (Malaysia)
Mutual Mark Recognition**

2016 TANIDA and Neno Malaysia signed MOU (May) and cooperation agreement (Nov) to strengthen the cooperation in nanotechnology products certification and standardization programs;

2017 Start interlaboratory comparison between registered NanoMark testing lab. (ITRI) and registered NanoVeriy testing lab. (MIMOS) comparison on size measurement of Au nanoparticles (10 nm and 30 nm) by TEM

2017 Exchange operation SOP between mark systems and mutual SOP for non-domestic companies' application

2018 Agree the registered testing laboratory for both NanoMark & NanoVeriy system from the interlaboratory comparison result.

a. Industrial Technology Research Institute (ITRI), Taiwan
b. MIMOS Semiconductor Sdn Bhd, Malaysia

2018 Initiate the pilot program of mutual application of NanoMark & NanoVeriy

2019 JM Material Technology Inc. (Taiwan) submit modified docs. for NanoVeriy (Nov)

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Annex A (Cont'd)

The Material for the 20th Annual General Meeting



OECD Call for an inter-laboratory comparison test

Object: Call for interested laboratories to participate in an inter-laboratory comparison test on dissolution of metal nanomaterials in aquatic media

Deadline for responses by 7th July 2023

The WNT project 3.0 led by Germany, is developing a Test Guideline for determining the dissolution of nanomaterials in aqueous environmental Media.

To validate the procedures for accurate measurement and data reduction

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Inter-laboratory comparison test on dissolution of metal nanomaterials in aquatic media

We are looking for laboratories that can support an inter-lab comparison test, which will take place between October and December 2023.

- A draft Standard Operation Procedure (SOP) on nanomaterials solubility and dissolution rate has been prepared to allow interested parties to estimate the needed equipment and work effort. To further support their participation, 2 online sessions are planned to explain the SOP.
- These sessions will also provide an opportunity for responding to questions that interested laboratories might have.
- Based on the questions, the SOP could be further refined. Finally, a training session is also offered to ensure all the participants are ready for the launch.



The dates for these sessions are as follows:

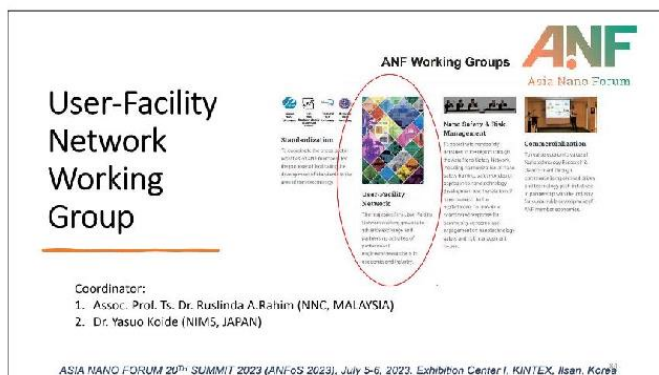
- Online Q&A sessions: 12th July and 9th August (at 15:00 CET)
- On-site training on the 6th of September at Fraunhofer IME, Schmallenberg, Germany
 - Timing may not suit some countries (e.g. Korea, Japan, Australia, etc.), thus we ask you to contact us so we can offer the alternative time.

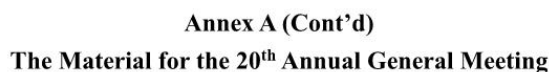
Contact: mar.gonzalez@oecd.org no later than **7th July 2023**
CC: Frank von der Kammer (frank.von.der.kammer@univie.ac.at)
Boris Meisterjahn (boris.meisterjahn@ime.fraunhofer.de)

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Annex A (Cont'd) The Material for the 20th Annual General Meeting







User-Facility
Network
Working Group
2023

UPCOMING EVENT:

SEMINAR ON USER-FACILITY NETWORK IN ASIA 2023

September 6, 2023
Hybrid online/onsite, Day 2 @ NanoKEB 2023, Selangor Malaysia
Bangi Resort Hotel, Selangor MALAYSIA
Organised by NNC MOSTI

Objective: The purpose is to share information on user-facility activities, advanced nanoelectronics fabrications, nanoelectronics failure analysis and nano-characterization technologies in Asia






NanoKebangsaan

nano



Bangi Resort Hotel



Bangi Golf Course Hotel, Selangor MALAYSIA



Annex A (Cont'd) The Material for the 20th Annual General Meeting

User Facility Network Working Group 2024

USER FACILITY NETWORK IN ASIA 2024 : Program Planning in 2024

Program 1: Symposium UFN in Asia During ANF Summit Meeting 2024
Mode : Hybrid [Online / Onsite]
Objective: The purpose is to share information on user-facility activities and nano-characterization technologies in Asia.
Date / Location : TBA

Program 2: Hands On Training - Nanoelectronics Fabrication
Mode : Onsite
Location: MIMOS Berhad, Semiconductor Technology Centre, Bukit Jalil, Selangor
Objective: The purpose of the training is to enhance the nanoelectronics fabrication skills and techniques
Tentative Date: 1st week September 2024 (3-4 days)
Budget requested from ANF: approximately USD 3000 (facility rental)

**KEMENTERIAN SAINS,
TEKNOLOGI DAN INOVASI**

Terima Kasih 감사합니다
Thank you

National Nanotechnology Centre (NNC)
Ministry of Science, Technology & Innovation (MOSTI)
Level 4, Block C7, Complex C, Federal Government Administrative Centre 62002 Putrajaya, MALAYSIA
Tel : (+603) 8885 8661
E-mail : nanokebangaan@mesti.gov.my

National Nanotechnology Centre Malaysia nncmo2023

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



Annex A (Cont'd) The Material for the 20th Annual General Meeting

**ANF Nanosafety & Risk Management
Working Group WG Coordinators:**

Dr. Wannee Chinsirikul, NANOTEC, Thailand
Assoc. Prof. Paul Wright, RMIT University, Australia

**Prepared by Dr. Waluree Thongkam
NANOTEC, Thailand**

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Objectives of ANF Working Group: Nanosafety

To co-ordinate nanosafety activities in the region through the Asia Nano Safety network, including harmonization of nano safety training, safe-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.

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Activities

- Industrial Network Development Project in Nanosafety (Phase 2)
- The 6th EU-Asia-Dialogue on NanoSafety "The role of characterisation and how it is addressed in INISS-nano"
- NANOTHAILAND 2023, Pattaya

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Annex A (Cont'd) The Material for the 20th Annual General Meeting





Annex A (Cont'd)

The Material for the 20th Annual General Meeting

The 6th EU-Asia-Dialogue on NanoSafety :
"The role of characterization and how it is addressed in INISS-nano"
(21st June 2023)

Breakout Sessions

Group 1 Characterization items in Standardization

Group 2 Industrial Characterization Needs

Group 3 Characterization Facilities and infrastructures

Group 4 Societal and Ethical Considerations-Policy Framework for Characterization



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The 6th EU-Asia-Dialogue on NanoSafety



Group 4 Societal and Ethical Considerations-Policy Framework for Characterization



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Group 4 Societal and Ethical Considerations-Policy Framework for Characterization

Chair: Ineker Malsch, Waluree Thongkam Rapporteur: Eric Bleeker

Conclusions

1. Capacity building for nanosafety in developing countries
 - Nano used to be emerging issue: no longer
 - Focus more on "new" issues: advance materials, safe and sustainable
2. Towards international nanoregulation
 - Work with Pillar 1 "Characterization Items in Standardization"
3. Setting standards for quality in nano-communication
 - To some extent cultural
 - Language barrier and need new tools for translation
4. International dialogue on responsible nano research and innovation
 - Two-way communication is essential, mutual learning
 - OECD webinars with simultaneous translation general guidance better than TGs for society
 - Upcoming: Thailand on behalf of ANF Working group on Nanosafety: will host the webinar together with the Working group 4

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Annex A (Cont'd)

The Material for the 20th Annual General Meeting

Upcoming event

NANOTHAILAND 2023

NANOTEC and **VISTEC**

member NSTDA VIDYASIRIMEDHI INSTITUTE OF SCIENCE AND TECHNOLOGY

29 Nov-1 Dec 2023, Dusit Thani Hotel, Pattaya, Thailand

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Nanosafety and Standard Session
Invited speakers (30th November 2023, Afternoon)

ANF

Taiwan : Prof. Dr. Ying-Jan Wang
Malaysia : Mr. Dominic Geruka
Korea : waiting for speaker name
Japan : waiting for speaker name
Thailand : Dr. Sasitorn Aueviriyavit
Japan : Asst. Prof. Dr. Worrador Phaiuang
Switzerland : Prof. Dr. Harald F. Krug

Session Chair: Dr. Waluree Thongkam
Co-Chair: Dr. Sasitorn Aueviriyavit

Registration: **Nano Thailand 2023**
<https://nano-thailand.com/2023/Annual/>

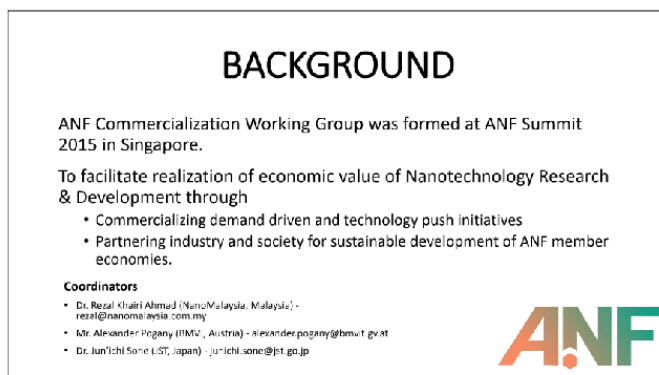
**Thank you very much
for your attention !**

National Nanotechnology Center
130 Thailand Science Park
Phahonyothin Road, Klong 1
Klong Luang, Pathumthani 12120
Thailand

Nano Safety Alliance (NSA)
Tel: +66(0)2-584-7100 ext. 8668
Fax: +66(0)2-584-7100
Email: NSA@nanotec.or.th



Annex A (Cont'd) The Material for the 20th Annual General Meeting





Annex A (Cont'd)

The Material for the 20th Annual General Meeting

Commercialization Workshops Organised

- ANF Summit 2017 (Malaysia) – Pilot
- At Nanotech 2018 (Japan)
- ANF Summit 2018 (Taiwan)
- At Nanotech 2019 (Japan)
- ANF Summit 2019 (The Philippines)
- At Nanotech 2022 (Japan)
- ANF Summit 2020 (Austria – Virtual)
- ANF Summit 2021 (Thailand – Virtual)
- ANF Summit 2022 (Malaysia - Hybrid)
- At Nanotech 2023 (Japan)
- ANF Summit 2023 (South Korea)



2. Commercialization Workshop at Nanotech 2023 Japan

Theme: Nanotech Innovation to Industrialization & Internationalization (NII)
Date: 1 Feb 2024 (Wednesday) | Time: 14:00-17:00 JST (GMT+9)
Venue: Room 509, 6F Conference Tower, Tokyo Big Sight



Time	Topic
14:00-14:15	Registration and Welcome
14:15-14:30	Introduction to the Workshop
14:30-14:45	1. Welcome to the Workshop, introduction, agenda, introduction to the workshop
14:45-15:00	2. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
15:00-15:15	3. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
15:15-15:30	4. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
15:30-15:45	5. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
15:45-16:00	6. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
16:00-16:15	7. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
16:15-16:30	8. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
16:30-16:45	9. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
16:45-17:00	10. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
17:00-17:15	11. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
17:15-17:30	12. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
17:30-17:45	13. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
17:45-18:00	14. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
18:00-18:15	15. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
18:15-18:30	16. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
18:30-18:45	17. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
18:45-19:00	18. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
19:00-19:15	19. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
19:15-19:30	20. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
19:30-19:45	21. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
19:45-20:00	22. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
20:00-20:15	23. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
20:15-20:30	24. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
20:30-20:45	25. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
20:45-21:00	26. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
21:00-21:15	27. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
21:15-21:30	28. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
21:30-21:45	29. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
21:45-22:00	30. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
22:00-22:15	31. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
22:15-22:30	32. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
22:30-22:45	33. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
22:45-23:00	34. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
23:00-23:15	35. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
23:15-23:30	36. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
23:30-23:45	37. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
23:45-24:00	38. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
24:00-24:15	39. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
24:15-24:30	40. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
24:30-24:45	41. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
24:45-25:00	42. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
25:00-25:15	43. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
25:15-25:30	44. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
25:30-25:45	45. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
25:45-26:00	46. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
26:00-26:15	47. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
26:15-26:30	48. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
26:30-26:45	49. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)
26:45-27:00	50. Mr. Toshihiro Nakamura, General Manager of NII, Japan (Japan)

3. Asia Nano Forum (ANF) Summit 2023 Commercialization Workshop

The Asia Nano Forum (ANF) Workshop on Commercialisation 2023 is held during the 20th Asian Nano Forum Summit 2023 (ANFoS2022) on 19 July 2022.

The Workshop was hosted by KoNTRS and co-organized by **ANF Secretariat, Commercialisation Working Group and NanoMalaysia.**



Annex A (Cont'd)

The Material for the 20th Annual General Meeting

COMMERCIALIZATION WORKSHOP at ANFoS 2023, South Korea

Korea Time July 6 (Thu)	Program for Working Group Workshop (Korea Time 10:00 – 12:30 hrs)
10:00am – 10:10am	Welcome remark by Dr. Berni Khairi Ahmad, ANF Vice President and CEO of NanoMalaysia
10:10am – 11:00am	Session I – Physical presentation Policy Presentation by Members, Business/Tech Presentations, IP Presentation (Each Presentation at 10 mins each)
11:00am – 11:10am	Coffee break
11:10am – 12:10pm	Session II – Virtual Presentation Business/Tech Presentation, Company/Product Presentations (Each Presentation at 10 mins each)
12:10pm – 12:20pm	Discussion
12:20pm	Closing Remarks with coordinator (Dr. Berni Khairi Ahmad)
12:40pm	Workshop Ends



COMMERCIALIZATION WORKSHOP at ANFoS 2023, South Korea

Presenter	Position	Title	Status	Participation
1. Dr. Youngchul Choi	General manager	General affairs of the Industrial Promotion Headquarters, Korea Carbon Industry Promotion Agency (KorCarbon)	Speaker	Physical
2. MUHAMMAD ASHARI MOHD ROSMANI	CEO	SARAWAK R&D, Business Unit	Speaker	Online
3. Prof. Dr. Ravi Teja Kumar, M. Eng., PhD.	President & Chairman	Nanotech Indonesia Group	Speaker	Online
4. DR. FOUZIA DOUAH	MANAGING DIRECTOR / SENIOR VICE PRES	MAGNUS INDUSTRIES SDN BHD / UNIVERSITI TEKNIKAL MALAYSIA (UTM)	Speaker	Online
5. Dr. Paudyal Kung'uakuma Mutinda Ngunjiri	Deputy Executive Director / Director	National Nanotechnology Center (NANOTEC), Thailand	Speaker	Physical
6. Dr. Paudyal Kung'uakuma Mutinda Ngunjiri	Deputy Executive Director / Director	National Nanotechnology Center, Ministry of Science, Technology & Innovation	Speaker	Physical
7. Gopikrishna, RARE	Professor	UMT	Participants	Online
8. Ms. Lina Davlanaka	Assoc.	Research Institute of Advanced Industrial Science and Technology	Participants	Online
9. RAHMA, NIKHAT MUNIRAHADAN	RESEARCH PROFESSOR	PUSAT NASIONAL UNIVERSITI	Participants	Physical
10. A. Sultan Jauhar	Research Fellow & SCINTEP-CITEC Project Director	UTM Ocean Thermal Energy Centre	Participants	Online
11. Doreen K. E. Chikwa	Deputy Vice President	NanoMalaysia Berhad	Participants	Online
12. Dr. Ameyash Ramesh	Research Officer	Universiti Putra Malaysia	Participants	Online



NEXT....

Commercialization Workshop at Nano Tech 2024,
Tokyo





Annex A (Cont'd)
The Material for the 20th Annual General Meeting

THANK YOU



K. ANF Office Bearers 2024-2025 Election
Reported by Dr. Pavadee Aungkavattana,
ANF Secretary



All about ANF OFFICE-BEARERS Election



MEMBERSHIP QUALIFICATION AND RIGHTS

- 4.1 Membership is open to any natural person or organisation:
- (a) with an interest in any field of activity of the Society; and
 - (b) whose admission as a member is approved by the Committee.
- 4.2 There shall be two classes of membership. They are as follows:-
- (a) Ordinary Membership
- Ordinary membership is open to any person or organisation with an interest in any field of activity of the Society, who has applied for admission, paid an amount equal to the annual subscription payable and whose admission as a member is approved by the Committee.





Annex A (Cont'd) The Material for the 20th Annual General Meeting

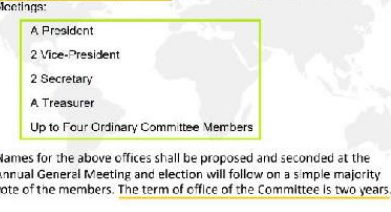
All about ANF OFFICE-BEARERS Election According to ANF Constitution 
According to ANF Constitution, in the article of "Management and Committee" mentioned as follow.

MANAGEMENT AND COMMITTEE

8.1 The administration of the Society shall be entrusted to a Committee, made up of six (6) to ten (10) members, to be elected at alternate Annual General Meetings:

- 1. A President
- 2. Vice-President
- 2. Secretary
- 1. Treasurer
- 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. The term of office of the Committee is two years.

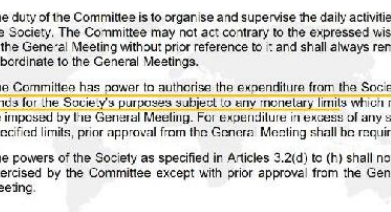



All about ANF OFFICE-BEARERS Election 
MANAGEMENT AND COMMITTEE

8.7 The duty of the Committee is to organise and supervise the daily activities of the Society. The Committee may not act contrary to the expressed wishes of the General Meeting without prior reference to it and shall always remain subordinate to the General Meetings.

8.8 The Committee has power to authorise the expenditure from the Society's funds for the Society's purposes subject to any monetary limits which may be imposed by the General Meeting. For expenditure in excess of any such specified limits, prior approval from the General Meeting shall be required.

8.9 The powers of the Society as specified in Articles 3.2(d) to (h) shall not be exercised by the Committee except with prior approval from the General Meeting.



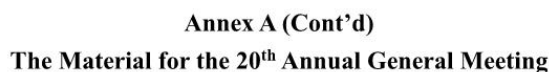

All about ANF OFFICE-BEARERS Election 
Status of Payment/ANF Membership Current Status

ANF Economy Members who paid the ANF membership fee 2022

No.	ANF Member	Country	ATTN/Invoiced*
1	BMF	Australia	Mr. Alexander POSKANY
2	NI	India	Dr. M. A. Umar
3	TFRI	India	Prof. Anil K. S. S. S. S.
4	AIC	Japan	Prof. Dr. B. B. B. B. B.
5	NET	Japan	Mr. Y. Y. Y. Y. Y.
6	NET	Japan	Dr. Y. Y. Y. Y. Y.
7	NIMS	Japan	Dr. Y. Y. Y. Y. Y.
8	KONTES	China	Mr. Y. Y. Y. Y. Y.
9	NANO/2022	Malaysia	Dr. R. R. R. R. R.
10	NAC	Malaysia	Dr. R. R. R. R. R.
11	TDI	Philippines	Dr. A. A. A. A. A.
12	Academia	Taiwan	Prof. J. J. J. J. J.
13	NANO/EC	Thailand	Miss D. D. D. D. D.
14	IAST	Vietnam	Dr. T. T. T. T. T.

11 Eligible Voters



No.	Picture	Name	Organization	Country
1		Mr. Aleksandr POTVINOV	International Energy Agency, Environment, Energy, Policy, Technology and Technology (IRE)	France
2		Mr. Prashant K. S. DHANU	Indian Institute of Space Science and Technology (IIST)	India
3		Dr. In Seon CHOI	Korea Science and Technology Agency (KITA)	Korea
4		Mr. Yoon Seon PARK	Korea University for Science and Technology	Korea
5		Dr. Toshiaki CHIBA	Korea Science and Technology Agency (KITA)	Korea
6		Dr. Roshan Ali AHMAD	National Institute of Space Sciences	Malaysia

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ANF
Axis Nano Group

No.	Position	Details of members
1	President:	Name Organization Country National Representative (5% each) A chairperson of women in Africa
2	Vice President No.1	Name Organization Country
3	Vice President No.2	Name Organization Country
4	Treasurer	Name Organization Country
5	Secretary No.1	Name Organization Country
6	Secretary No.2	Name Organization Country



Annex A (Cont'd)

The Material for the 20th Annual General Meeting

Timeline & Process for ANF Office Bearers 2024-2025 Election

Date	Detail
20-30 June 2023	ANF Executive Members nominate the list of the ANF Office Bearers 2024-2025 to the ANF Secretariat by sending the nominee's CV (CV and Vision for the ANF President position).
1-4 July 2023	Election Date

How to vote for ANF Office Bearers 2024-2025
"The Election Runner: Build a Secure Online Election for Free"

ANF Office Bearers for 2024-2025
Nominees List as of 30 June 2023

President:

- Dr. Rezal Khairi Ahmad, Nanomaterials / Malaysia (recommended by Academia Sinica, DOST-ITD, and NANOTEC)
- Prof. Changhwan Choi, KONTROS / Korea (recommended by NNC)

Vice Presidents:

- Dr. Jason Chang, Academia Sinica / Taiwan (recommended by Nanomaterials, NANOTEC, and Academia Sinica)
- Dr. Annabelle V. Briones, DOST-ITD / The Philippines (recommended by Academia Sinica, NNC, and DOST-ITD)
- Dr. Junichi SONE, JST (Smelting) / Japan (recommended by NANOTEC and NNC)
- Dr. Yasuo Kaida, NIMS / Japan (recommended by Nanomaterials)

Secretaries:

- Dr. Ruzinda A. Rahim, NNC / Malaysia (recommended by NANOTEC, Nanomaterials)
- Dr. Jason Chang, Academia Sinica / Taiwan (recommended by DOST-ITD)
- Dr. Pavee Aungmyethazan, NANOTEC / Taiwan (recommended by Academia Sinica)
- Mr. Alexander Pagen, BMK, Austria (recommended by KNC)
- Dr. Tran Dai LAM, VAST / Vietnam (recommended by NNC)

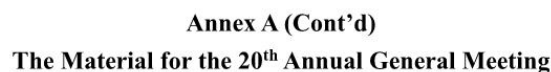
Treasurer:

- Dr. Ruzinda A. Rahim, NNC / Malaysia (recommended by DOST-ITD and Nanomaterials)
- Prof. Changhwan Choi, KONTROS / Korea (recommended by NANOTEC)
- Dr. Jason Chang, Academia Sinica / Taiwan (recommended by KNC)

ANF Office Bearers for 2024-2025
Number of Voters as of 4 July 2023

ANF Office Bearers - 2024-2025 Election

Office	Name	Votes	Rank
President	Dr. Rezal Khairi Ahmad	100	1st
	Prof. Changhwan Choi	100	2nd
	Dr. Junichi SONE	100	3rd
	Dr. Yasuo Kaida	100	4th
	Dr. Ruzinda A. Rahim	100	5th
	Dr. Jason Chang	100	6th
	Dr. Annabelle V. Briones	100	7th
	Dr. Pavee Aungmyethazan	100	8th
	Dr. Alexander Pagen	100	9th
	Dr. Tran Dai LAM	100	10th





Annex A (Cont'd)
The Material for the 20th Annual General Meeting



1. A Solution for Construction of a New Generation of Silicon Nanostructure Anodes in Lithium Batteries

A faculty member of Sharif University of Technology in cooperation with a group of researchers from Shanghai University succeeded in introducing a hybrid structure of carbon nanotubes and silicon nanoparticles as the anode of a lithium battery.



Dr. Esfandiar, assistant professor of the Faculty of Physics, Sharif University of Technology, in cooperation with a group of international researchers, indicated by laboratory and numerical simulation that suitable functional groups on carbon nanotubes cause better contact with surface of silicon nanoparticles.

The huge volume change and unstable interface of the silicon anode usually result in the fracture of the active material and the disconnection with conducting current collector, which would highly hinder the application of silicon in powering battery. Thus, developing a stable interface with good mechanical stability to tolerate huge volume change of the silicon, and keep the robust adhesive property is one of the effective methods.

In their publication, a molecular zipper fastened strategy is designed to provide a dynamic stable interface for fast transportation of both ions and electrons, which can also provide a destroy-rebuilt interface for silicon. Through crosslinking of the binary polymer and lithiated nafion (Li-nafion), the dynamic stable interface was constructed between nano-silicon and carbon nanotubes, leading to long cycling stability at room/freezing temperature as well as high-rate performance. Finite element simulation results also confirm that the uniform electric distributed interface was constructed. The line contact model could minimize the stress caused by deformation during the fast lithiation/delithiation process. This approach offers an effective strategy for the next-generation high capacity, high rate, long lifespan and wide climate range ion battery.

The results of their research were published in Energy Storage Materials entitled “Dynamic stable interface between CNT and nano-silicon for robust anode with large capacity and high rate performance.”

2. Investigation of Fluorinated Metal–organic Frameworks for Gas Separation by Iranian Researchers

Iranian researchers from Arak University in collaboration with Spanish and American universities, published an article on the effects of fluorinated metal-organic frameworks for gas separation in the journal of “Chemical Society Reviews”.

Fluorinated metal–organic frameworks (F-MOFs) have revolutionized the field of gas separation because of their tunable pore apertures, chemical features, as well as excellent stability. A deep understanding of their structure–performance relationships is critical for the synthesis and development of new F-MOFs. This critical review has focused on several strategies for the precise design and synthesis of new F-MOFs with structures tuned for specific gas separation purposes. First, the basic principles and concepts of F-MOFs as well as their structure, synthesis and modification and their structure to property relationships are studied. Then, applications of F-MOFs in adsorption and membrane gas separation are discussed. A detailed account of the design and capabilities of F-MOFs for the absorption of various gases and the governing principles is provided this article. Also, surprising features of stable F-MOFs with engineered pore size and structures are considered to develop selective membranes. Analysis of the position of F-MOFs in gas separation indicated that F-MOFs are good candidates for most of the challenging gas separations.

The future of the science and engineering of F-MOFs and their challenges are also mentioned to tackle the issues of overcoming the trade-off between capacity/permeability and selectivity for a serious move towards industrialization. This research group includes Dr. Ebadi and Dr. Sanaeepour (faculty members of chemical engineering department of Arak University), as well as Rafael Luque, Hermenegildo Garcia, and Banglin Chen from Spanish and American universities. This article was published in Chemical Society Reviews.

3. A Research on Obtaining Hydrogen from Persian Gulf Seawater

A research group including Iranian, Chinese and Italian researchers introduced a highly efficient electrocatalyst for electrochemical reaction of hydrogen production from sea water.



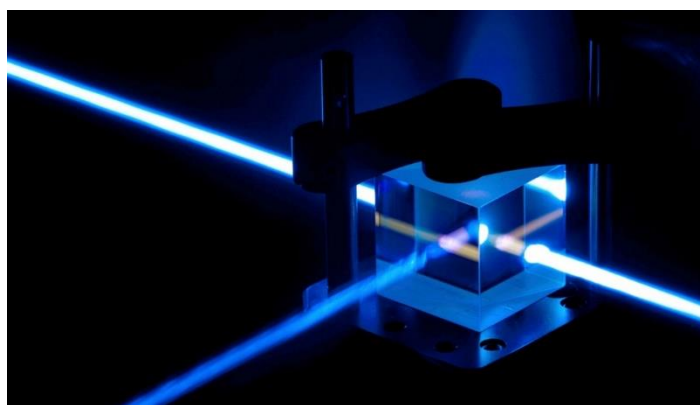
The limitations of common energy sources, such as oil and natural gas have increased the demand for clean energy sources. Hydrogen is a good candidate for a high-density energy carrier. Among various strategies for producing hydrogen, electrochemical water electrolysis powered by electricity produced from renewable sources is noteworthy. Seawater electrolysis has several key advantages over freshwater electrolysis. These advantages include seawater's abundance, ease of integration with emerging ocean technologies, collaboration in the production of safe drinking water, and the ability of its dissolved salts for promoting the ionic conductivity. For seawater electrolysis to be an efficient and economical method of hydrogen production, highly active electrocatalysts made of non-precious metals are required for hydrogen evolution reaction (HER) and the oxygen evolution reaction (OER).

Hydrogen production employing seawater electrolysis is considered as a sustainable strategy for energy prospects. This study reported high-performance bifunctional water electrocatalyst by designing 3-D heterostructured MnCo/NiSe/NF. DFT based modeling rationalized their experiments and indicated the synergistic effects between MnCo and NiSe in their complex.

This project was conducted as a result of an international joint collaboration of researchers from Tarbiat Modares and Ferdowsi Universities (Iran), Southwest Jiaotong University (China), and Padova University (Italy). This research article was published in “Applied Catalysis B: Environmental” in Elsevier Publications in December 2022.

4. New Generation of Nanophotonic Oxygen Sensors

Researchers from Kharazmi University successfully developed a new generation of nanophotonic oxygen sensors using a type of nanoemitter.



Nanophotonic biosensors capable of being excited in the NIR spectrum have applications in various sectors. In the research which was conducted by researchers from Kharazmi university, a 980 nm-excitable nanophotonic sensor for real-time oxygen detection in both water and air by analyzing the photoluminescence lifetime and intensity using a nanocomposite of lanthanide-doped NaYF₄:Yb³⁺,Tm³⁺ upconversion nanoparticles and a PtTFPP platinum porphyrin complex in a polystyrene matrix was developed. Acceptable overlap between the emission of the

upconversion nanoparticles and the excitation band of the PtTFPP guarantees 68% efficient excitation of the PtTFPP molecules with a 980 nm NIR laser. For the first time, the oxygen sensitivity of the upconversion nanoparticles alone was reported, and it was demonstrated that the PL lifetime-based sensitivity slope was boosted more than 10 times by adding PtTFPP oxygen-sensitive molecules due to the energy transfer from the upconversion nano-emitters. “The functionality of the upconversion-based sensor was investigated by analyzing its sensitivity, stability, reversibility, and temperature-dependent lifetime in both water and air, and its performance was compared with that of the sensor exposed to direct excitation at 410 nm” Dr. Heidari, faculty member of Kharazmi University said, “more importantly, the sensor was implanted under the skin of a chicken, and it was demonstrated that the PL intensity was amplified more than 12 times by employing the 980 nm excitation laser instead of 410 nm laser light.” Therefore, excellent emission of the sensor under the skin paves the way for the development of implantable oxygen sensor platforms.

This research was carried out in the laboratory of nanophotonic and optofluidic sensors of the Physics Department of Kharazmi University. Javad Amir Ahmadi, M.Sc. student of Kharazmi University, and faculty members of this university including Dr. Heidari and Dr. Majlesara, conducted this research in a collaboration with researchers from universities of Glasgow, Scotland and Jiliang, China. The results of this collaboration were published in an article entitled “Dual mode nanophotonic upconversion oxygen sensors” in Nanoscale magazine.

5. Winter Issue of Nanomedicine Journal Published

NANOMEDICINE JOURNAL, a peer-reviewed quarterly publication by the Nanotechnology Research Center of Mashhad University of Medical Sciences published its winter issue in January 2023.

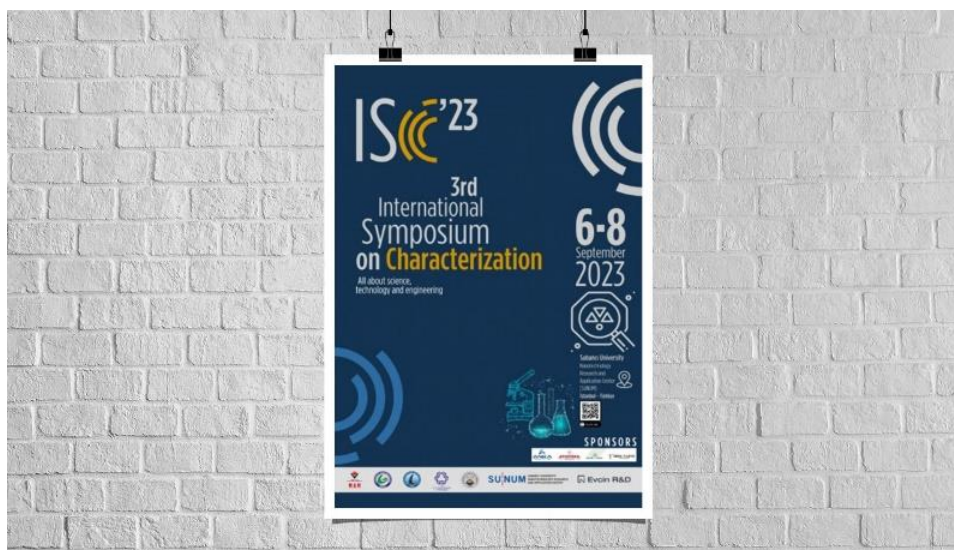


NANOMEDICINE JOURNAL (NMJ), Abbreviated as NANOMED J, is a LIBRE open access peer-reviewed quarterly publication by the Nanotechnology Research Center of Mashhad

University of Medical Sciences (MUMS). Authorized by the Iranian Ministry of Science, Research and Technology as a scientific-research publication, NMJ publishes original research papers, review articles, short communications as well as letters to the editor on empirical and laboratory results, preclinical studies and clinical trials related to the applications of nanotechnology to medical sciences.

6. ISC23 Event Will Be Held in Cooperation with K.N. Toosi University of Technology

Afyon Kocatepe University in cooperation with Iranian K.N. Toosi University of Technology and a number of Turkish scientific research centers held the ISC23 International Event on 4-6 September 2023, in Istanbul, Turkiye.



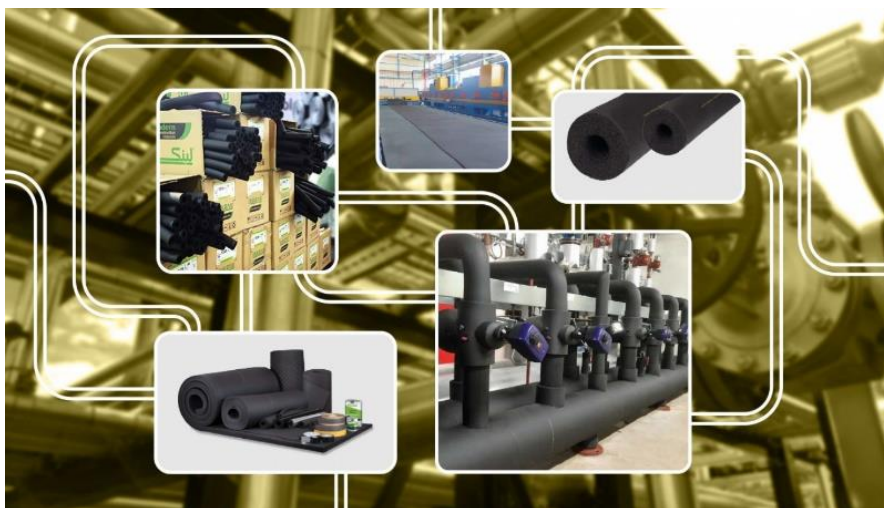
The third International Symposium on Characterization (ISC23) is organized by academics and researchers from different scientific areas of K.N. Toosi University of Technology, the University of Afyon Kocatepe, University of Giresun, NED University of Engineering and Technology, Sabancı University Nanotechnology Research and Application Center (SUNUM) and TUBİTAK Marmara Research Center.

This event aims to create an international forum for academics, researchers and scientists to discuss various issues related to Applied Life Sciences, Medical, Chemistry, Earth and Environmental Sciences, Engineering, Materials Science and Physics. It fosters sound scientific discovery to solve challenges.

In this symposium, an exhibition will also be considered for companies and institutions to present their products, services, and innovations.

7. Considerable Energy Saving Using Nanotechnology-based Insulators.

Sazeh Paidar Elahieh Company successfully produces nanotechnology-based insulators which can reduce energy consumption of heating & utility rooms of building by half.



An Iranian company has successfully produced and marketed an insulator. This product can be used in various construction and industrial projects.

Elastomeric nanocomposite insulators are based on polymers including Nitrile Butadiene Rubber/Polyvinyl Chloride (NBR/PVC) and they are foam-like elastomeric insulators. Sazeh Paidar Elahieh Company utilizes nanotechnology to improve significant properties of the insulator. The insulator can be used in utility rooms of major buildings, towers, factories, hotels, hospitals, petrochemicals, and refineries. Addition of nanoparticles to insulators leads to improvement of their mechanical properties.

These sound and thermal insulators can reduce energy consumption of utility rooms to a large extent. Thus, optimized values would be obtained for energy consumption. They are a considerably suitable choice for insulating heating and cooling pipes, channels, air conditioning systems, and utility rooms.

Standard tests were conducted on closed cell elastomeric nanocomposite foam produced by this company. Also, the results were compared with the ones obtained from simple closed cell elastomeric insulator. The comparison indicated that the nanotechnology-based product does not provide a suitable environment for growth and reproduction of microorganisms. Also, thermal conductivity coefficient is less than those of glass and wool. Closed-cell elastomeric nanocomposite foam has significantly high resistance coefficient against vapor penetration, which is higher than mineral wool insulator. Therefore, it can perform more efficiently for corrosion inhibition of insulated metal surface.

8. Development of A Nanotechnology-based Thermal Belt by An Iranian Company

RTP Company released a flexible nanotechnology-based thermal belt that starts heating quickly after connecting to a power bank.



An Iranian company produces heating sheets with nanometric coatings for various applications. As an example, the bathroom mirror heating sheet prevents the formation of steam on mirrors with nanometric coatings. The flexible heating belt can be used in various applications including medicine, personal care, etc.

The raw materials of this heater contain nanoparticles that can control the temperature without necessarily using other controllers. The company's thermal belt is hypoallergenic and washable. This product is flexible due to the absence of wire elements. It can be used for more than 5 hours using a 10,000-mA standard power bank.

9. Training of trainers (TOT) event in Philippine

Iranian scientists provided a one-month length training program for academics in two Philippine universities.

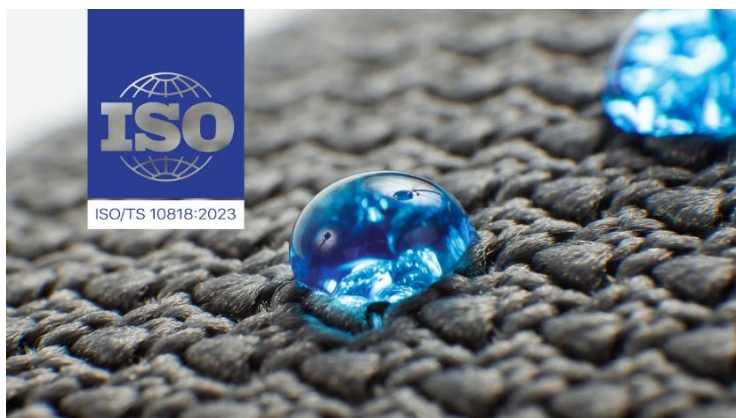
The Training of Trainers (TOT) program in the field of Nanotechnology and Nanomaterials for academic staff of the Philippines was held on 26 June to 10 August (a one-month intensive program) via the online lecturer series and specialized hands-on sessions. The practical part was held at the Materials Science Division, Industrial Technology Development Institute, DOST Compound, Manilla, Philippines.

This program focuses on enhancing the academic faculty members' understanding of the principles, applications, and potential impacts of Nanotechnology and Nanomaterials. Through a combination of lectures, workshops, and hands-on training, participants were equipped with a comprehensive understanding of the latest advancements in this field.



10. The 11th Iranian-led International Nanotechnology Standard was published

An international standard in the field of nanotechnology was developed under the leadership of Iran, titled "Nanotechnologies — Textiles containing nanomaterials and nanostructures — Superhydrophobic characteristics and durability assessment". This standard (ISO/TS 10818:2023), has been developed by a specialized group including experts from industry, university and laboratories with the support of Iran Nanotechnology Innovation Council.



One of the main obstacles affecting the growth of the market for water-repellent textiles containing nanomaterials is their durability in different environmental and usage conditions. From a consumer perspective, the durability of water-repellent and superhydrophobic textiles is of utmost importance. If the superhydrophobic properties are not durable, they will lose their efficacy in long-term applications. Generally, there has been no international standard method for assessing the durability of superhydrophobic textiles and classifying these properties.

The international standard ISO/TS 10818:2023 assesses the properties, performance, and durability of nano-enhanced textiles based on usage conditions (washing, drying, ironing, exposure to light sources, and mechanical abrasion). Superhydrophobic textiles are significant due to their applications for protective clothing, in healthcare, and different industries.

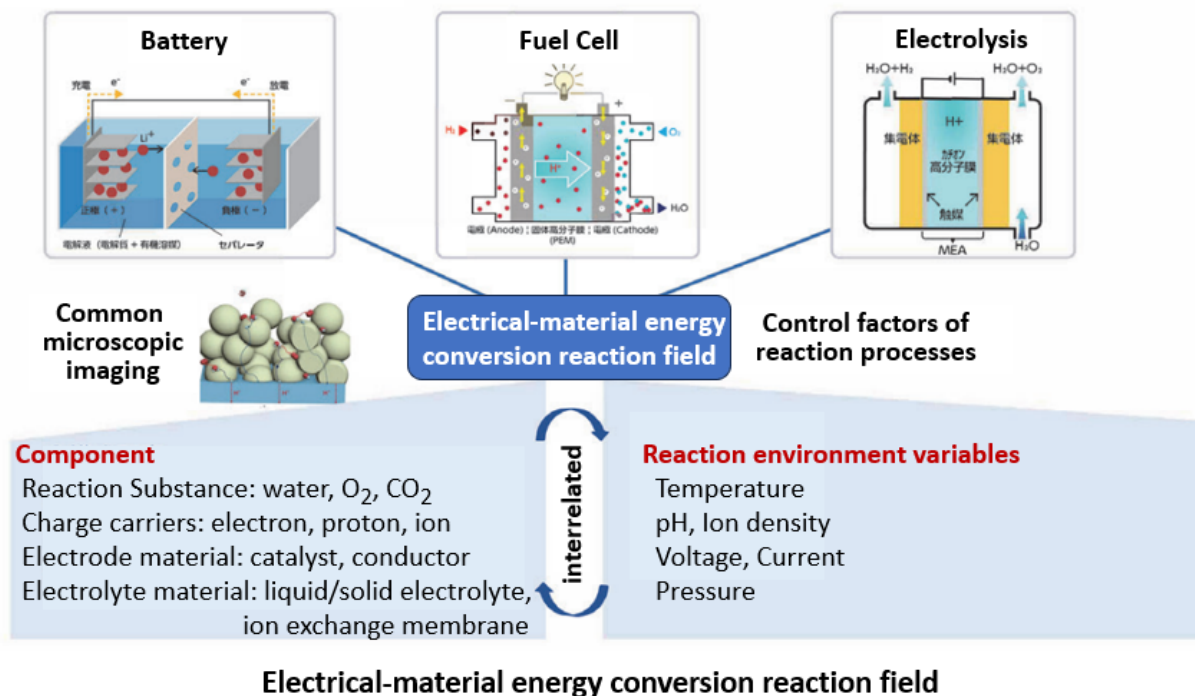
Strategic Proposals on Materials/Nanotechnology in CRDS of JST

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 issues Strategic Proposals in the field of Materials and Nanotechnology every year, which are utilized by the Japanese government for consideration as potential national projects. In 2023, two Strategic Proposals titled “Innovation in the electricity-material energy conversion technology” and “Material development strategy towards innovations in semiconductor devices” were issued. Those executive summaries are provided below.

(Available in Japanese Language at <https://www.jst.go.jp/crds/report/by-category/03/index.html>).

1. Innovation in Electricity-Material Energy Conversion Technologies, -Realization of diverse reaction fields towards massive adoption of renewable energies- (CRDS-FY2022-SP-09, issued in March 2023)

Typical Electrochemical Systems



This proposal discusses how to innovate “electricity-material energy conversion technologies” that can generate, convert, and store electrical energy using interconversion with material energy. The sophistication and diversification of this technology will solve the problems of supply-demand gap due to spatio-temporal variability and localization of suitable locations for renewable energy, and lead to the effective use of renewable energy. The massive adoption of renewable energy will require the massive deployment of devices that enable efficient electrical-material energy conversion, such as storage batteries, fuel cells, and electrolysis. In this proposal,

we focus on the reaction field that governs device characteristics and suggest directions for the development of materials and devices that realize a wider operating environment as an energy infrastructure and a more ideal reaction environment in terms of energy efficiency and reaction rate. Here, we introduce the concept of “electrical-material energy conversion reaction field”. This represents the controlling factors that govern device characteristics, including not only the components such as reaction substances, charge carriers (electrons and ions), electrode materials, and electrolyte materials, but also the reaction environment variables such as temperature, pH, and voltage. By establishing a cross-device science of reaction fields, it is expected to accelerate the creation of new technologies for electrochemical materials and devices. We propose the following strategies:

- 1) Promotion of R&D projects that contribute to the circulation of knowledge among researchers in different fields
- 2) Development of research infrastructure to encourage new entrants from different fields
- 3) Promotion of materials and device development using informatics and establishment of R&D eco-system

In order to realize a carbon-neutral society, renewable energies with low environmental impact must be introduced in large quantities as an alternative energy source to fossil resources. Renewable energies have the disadvantages of mismatches between supply and demand due to their time difference and the suitable geographical difference for supply and utilization. To overcome these problems, electrical energy storage systems and the conversion of renewable energy into material energy as energy carriers have to be introduced on a large scale. However, simple implementation of existing technologies is far from enough to realize these requirements. For example, electrochemical systems such as energy storage batteries, hydrogen fuel cells, and water electrolysis (hydrogen production) often require the use of scarce natural resources when operated in the reaction environments currently in use. It raises concerns about natural resource constraints. To address this problem, it is desirable to make a reaction environment milder and more resource-efficient, and the creation of innovative material and device technologies is inevitable for this end. In addition, from the perspective of massive adoption of renewable energy, a technical requirement is raised for materials and devices that can absorb sudden environmental changes as infrastructure to follow the variability of renewable energy.

Requirements to expand the reaction field are raised in the electrochemical devices to solve the natural resource constraint issues and to meet increasing system demands. For a long time, research and development of electrochemical devices has progressed by increasing the functionality and sophistication of individual devices, but such a conventional approach is becoming less effective, and new ideas to control electrochemical reactions are desired. For example, in high-speed water electrolysis and fuel cells, it is known that the bubbles generated by electrodes determine the performance, but even in such systems, no methodology has been established to understand the complex reaction field from material conversion to mass transfer. We propose to establish a cross-device science for those common technical issues and to promote the creation of new methods for material design and the integration of technologies accumulated in each device. Specifically, the following four R&D approaches should be addressed.

(1) Development of fundamental science for a cross-sectional understanding of the electricity/material-energy conversion reaction field

Electrochemical devices contain many common factors even among devices with different purposes. Currently, materials and devices are being developed that are specialized and subdivided into individual systems. By constructing a science of the reaction field across devices, it is expected to create material design concepts that cross over between devices and to create new methods for materials and device development. Specifically, understanding of interfacial phenomena consisting of heterogeneous materials, understanding of material states placed in various environment of the reaction field (temperature, potential, pH), elucidation of electronic and ionic conduction mechanisms, and search for new conduction mechanisms, should be addressed. Understanding reaction fields confined to the nanoscale, such as near electrode surfaces with complex nanostructures, is essential for the advancement of electrochemical devices. It is also necessary to develop operando measurement techniques, first-principles calculations, multi-scale simulation methods, and data science methodologies to support the understanding of the reaction field. The methodologies constructed here will also contribute to the promotion of R&D in the following.

(2) Development of materials that contribute to expanding the operating environment for electrochemical devices.

Research and development of new materials that realize a completely different operating environment from that of conventional devices or that are adaptable to a wider range of operating environments than conventional devices is required. Another challenge is to control not only electrochemical properties but also mechanical properties, typically as in the case of all solid-state batteries.

(3) Creation of innovative electrochemical devices using novel materials

The realization of a carbon-neutral society requires large-scale deployment of electrochemical devices and their capabilities to respond to diversification of application areas. Energy applications using energy storage and electrolysis devices with low natural resource constraints, electrolytic synthesis of chemical products using CO₂, alcohol synthesis for applications in the chemical and food products, and development in emerging areas such as materials production like steel and cement, are also expected.

(4) Development of electrochemical materials and device informatics

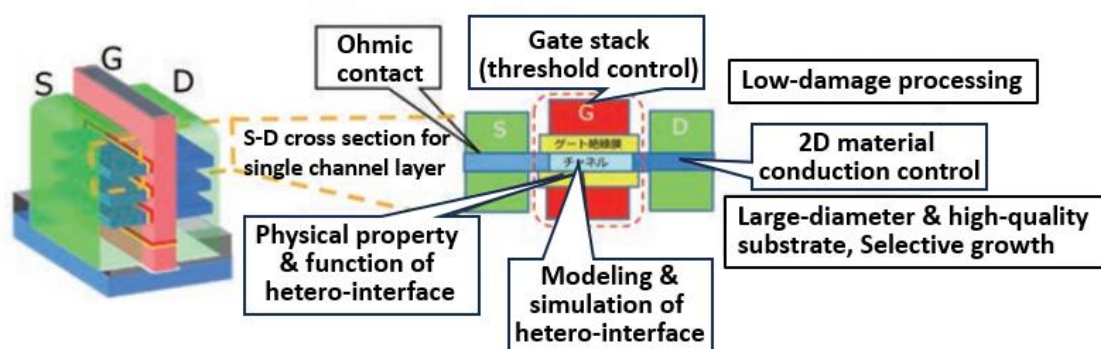
With the diversification of electrochemical devices in the future, it will be necessary to establish technologies to optimize materials, device structures, and operating parameters as early as possible for each application. The electrical-material energy conversion process has a very high degree of freedom in terms of components such as reaction substances/carriers, electrode materials, and electrolyte materials. Informatics approach is effective for rapid research and development of materials and device structures with such a complex reaction field.

In the short term, data-driven materials development method (materials informatics) for electrochemical materials by utilizing large-scale data obtained through high-throughput calculations, high-throughput experiments, and advanced measurements should be established. In the mid- to long-

term, it is desirable to develop device informatics method, in which the combination of heterogeneous materials and device design are conducted by utilizing big data, with the aid of the cross-device science obtained in the research approach shown in 1. For this purpose, it is necessary to make more data accumulation and utilization possible, and to construct a cross-device data utilization method for heterogeneous materials and devices.

The following promotion measures are proposed to effectively address the above R&D issues. Promote projects that address the pursuit of fundamental science across devices, materials exploration, and device development, and encourage new entrants from different fields. Strengthen the research support system to facilitate proof-of-concept of innovative materials and devices and establishment of standard evaluation technologies as an approach to lower the barriers to entry for newcomers from different fields. It is also necessary to establish a research center for the electrochemical material and device informatics method, and to establish a consortium to promote social implementation of innovative electrochemical devices.

2. Material Development Strategy Towards Innovations in Semiconductor Devices, -Utilization of 2D materials as semiconductor channels- (CRDS-FY2022-SP-06, issued in March 2023)



Major R&D tasks for fabrication of transistors with 2D materials

The proposal, entitled "Material Development Strategy Toward Innovations in Semiconductor Devices -Utilization of Two-Dimensional Materials as Semiconductor Channels-, is a research and development strategy designed to develop fundamental technologies required to use two-dimensional materials, such as the evaluation of interfacial characteristics with different types of materials, thin film formation of two-dimensional materials at wafer-scale, device structure production and integration, in preparation for the next generation of semiconductors in which transistor channel materials and manufacturing processes are expected to change dramatically at the level of 1-nm feature size and below. In order to achieve higher performance and lower power consumption of semiconductor integrated circuits, innovations in transistor channel materials, which are the basic component of such circuits, as well as device structures are required in addition to device miniaturization. For this reason, we focus our attention on two-dimensional materials that can form ultrathin channels of less than 5 nm and propose the promotion of research and development subjects on fundamental technologies such as thin film formation technology of two-dimensional materials at wafer-scale with 200mm or 300mm diameters, and evaluation technologies, where Japanese companies can leverage their strengths. To promote such research and development, we also propose measures for enhancing research and development programs, including funding programs that help develop shared facilities where

material and device researchers can collaborate closely, thin films made of two-dimensional materials at wafer-scale can be produced, and semiconductor device structures can be prototyped and evaluated for their characteristics and also help link industrial strategies to research and development strategies in the facility.

Semiconductor integrated circuits, which are important fundamental technologies that support the digitization of the society, are now expected to continue to achieve improved performance and lower power consumption based on miniaturization and enhanced integration in order to meet requirements such as higher speed and lower power consumption in computer operations and AI processing, higher speed, larger capacity and smaller delay in communications as well as higher sensitivity and lower power consumption in IoT devices. On the other hand, miniaturization technologies have already reached the level of 10 nm, which is very close to the limit of planar miniaturization, and it is becoming more difficult to improve performance based on the conventional two-dimensional miniaturization and enhanced integration. To overcome such an issue, it is necessary to reduce the effectively occupied area in wafers and chips by changing the structure of transistors, which are the basic component of circuits, from two-dimensional to three-dimensional. Lamination of transistor channels and vertical stacking of type-p and type-n transistors are believed to be important. The recent trend is the promotion of research and development of transistors in the Gate-All-Around (GAA) structure, using nanosheet channels made of silicon (Si) or silicon-germanium (SiGe). In a further generation, the use of two-dimensional materials made of ultrathin nanosheets (5 nm or less), two-dimensional substances (e.g., transition metal dichalcogenide: TMDC) and multiple one-dimensional substances arranged in two dimensions (e.g., carbon nanotube: CNT) is expected to appear and research and development designed to examine such possibilities are increasing worldwide.

On the other hand, what has been recognized strongly in the midst of the recent decoupling of the world economy and a global shortage of semiconductors is the importance of securing a semiconductor supply chain and retaining semiconductor production facilities and production capabilities in one's own country in terms of economic security. While Japan is internationally in an advantageous position for its materials industry, and process and measurement equipment industries, the country does not have production technologies or production facilities for advanced high-performance semiconductor logic chips of the 40-nm generation and later. In the future, it will become increasingly important for computers, telecommunication, IoT, automobile and other industries to retain cutting-edge semiconductor technologies domestically. Currently, however, the Japanese domestic industry is in a rather difficult situation in its semiconductor business and largely behind its counterparts in Taiwan, Korea and other leading countries in terms of the research and development of advanced semiconductor devices in which two-dimensional materials are strongly expected to be introduced. Since the generation in which channel materials and manufacturing processes change dramatically can also be seen as a great opportunity for the resurgence of the Japanese advanced semiconductor technology and industry, it is important for Japan to develop a successful research and development strategy on science and technology that is related to the use of transistor channels based on two-dimensional materials.

The academic research on two-dimensional materials conducted in Japan includes “Science of Atomic Layers” (2013-2017), a new academic field in Grants-in-Aid for Scientific Research (KAKENHI), and “Development of Atomic or Molecular Two-Dimensional Functional Films

and Creation of Fundamental Technologies for Their Applications” (2014-2021), and a JST CREST research. These research programs covered investigation from the characteristics and functionality of two-dimensional substances to device structure production, accumulated knowledge in thin film formation and characteristic control of two-dimensional materials, and identified issues on device development. Recently, Grant-in-Aid for Transformative Research Areas (A) “Science of 2.5 Dimensional Materials: Paradigm Shift of Materials Science Toward Future Social Innovation” (2021-2025) has been launched to research new physical properties, functions and other aspects of laminated two-dimensional substances. In coming years, it will be necessary to strategically promote, from a long-term perspective, the research and development of fundamental technologies such as thin film formation technology of two-dimensional materials, evaluation technology for interfacial characteristics, interfacial control technology and higher carrier mobility technology in order to apply them to new functional devices and integrated circuits.

The research and development issues that should be examined in the future include the identification and modeling of interfacial physical properties and functions of two-dimensional materials, high-quality thin film formation of two-dimensional materials at wafer-scale as well as device production and integration, which require various fundamental technologies as shown in the following.

(1) Identification and modeling of interfacial physical properties and functions of two-dimensional materials

Although the physical properties of two-dimensional substances such as graphene and TMDC, multiple one-dimensional substances arranged in two-dimensions such as CNT, and ultrathin silicon of less than 5 nm have been mainly studied as two-dimensional materials for semiconductors, their physical properties and functions including the heterointerfaces with insulators, metals and other substances are not fully understood yet. For this reason, it is necessary to develop analysis and evaluation methods that can characterize the physical, chemical, stress, electrical and other characteristics of hetero-interfaces with two-dimensional materials and also develop models and theories that help understand the obtained measurement results. It is important to form highly functional and high-quality hetero-interfaces, based on these findings. It is also desirable to search new two-dimensional materials with new compositions and crystal structures that exhibit better characteristics.

(2) High-quality film formation at wafer-scale

In order to use two-dimensional materials in the channels of fine transistors for an integrated circuit, it becomes critical to develop the technology for forming a high-quality thin film made of two-dimensional materials with a large area on a silicon wafer. The thickness of the two-dimensional materials has to be controlled with an atomic layer precision over 200mm or 300 mm silicon wafers by using chemical vapor deposition (CVD) methods or sputtering methods. It is also important to develop a method for transferring a high-quality crystal layer of two-dimensional materials produced on a different substrate onto a silicon wafer, while controlling the surface orientation.

(3) Device structure production and integration.

The transistors with the two-dimensional materials as semiconductor channels are expected to make possible devices that are difficult to produce with a conventional silicon technology, such as a transistor with an ultra-thin high-mobility channel, terahertz (THz) active devices, and sensors with molecular-level sensitivity. To this end, not only film formation and n/p doping technology of two-dimensional materials but also various process technologies, particularly gate stack structure and low-resistant ohmic contact formation technologies are highly required to be developed. It is also necessary to prototype new device structures using transistors with two-dimensional materials as semiconductor channels and verify their performance and functionality. Moreover, it is important to develop a device simulation technology that models characteristics specific to two-dimensional materials and characteristics of their hetero-interfaces in order to advance the design and integration of high-performance devices.

The efficient promotion of the above research and development efforts will need the establishment of new research and development programs. In addition to leveraging the knowledge obtained in past efforts and projects on two-dimensional materials to the maximum level, coordination and collaboration among different research fields such as material science, theoretical science, process science, data science, device physics and simulation should be promoted. The development of shared facilities where substrates can be produced with two-dimensional materials and devices can be prototyped and evaluated will be required. It is also desirable to develop a new community for device research using two-dimensional materials and promote collaboration between the academia and industry in device development projects. Furthermore, it is important to leverage Japan's technological strengths in materials, crystal growth and device fabrication to acquire the knowledge and technology of advanced semiconductor integration processes through enhanced collaboration with research institutions in overseas that have strengths in process technology and integration technology. Particularly interaction with young human resources in overseas organizations is desired to develop and train young semiconductor experts in Japan, with knowledge and skills ranging from materials to devices and processes.

3. Panoramic View Report on Nanotechnology/Materials Research Field (2023) 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 issues Panoramic View Reports on Nanotechnology/Materials Research Field every two year, which are utilized by the Japanese government for consideration as potential national projects. In May, 2023, the report was issued whose executive summary is provided below. (Available in Japanese Language at <https://www.jst.go.jp/crds/report/CRDS-FY2022-FR-05.html>)

Advanced materials and device technologies support our lives in various fields. They play a central role in information and communication areas through providing advanced devices such as smartphones, automobiles, robots, PCs and others. They also contribute to carbon neutrality through providing various devices and materials such as solar cells, rechargeable batteries, power semiconductors, magnets/ magnetic materials, water and CO₂ electrolysis cells, and separation

membranes for gas and solvent. In the fields of healthcare and medicine, they are used in realizing artificial microsystems such as mRNA vaccines for the COVID-19 virus, highly sensitive sensor devices for early diagnosis and biological information monitoring, and medical devices for the prevention, diagnosis, and treatment of cancer and brain diseases. Nanotechnology, which enables observation, control, and processing of the material structure on micro- and nano-meter scale, is indispensable for realizing these materials and devices.

Recent increasing tensions in the world caused by trade conflicts between the United States and China and regional conflicts in Ukraine and Israel bring about the instability in the global supply chain. These changes in the world are destroying the premise of the global supply chain that “production in the most suitable place is optimal for increasing overall efficiency”. Many countries begin to take industrial policies considering economic security, such as identifying industrially important and rare materials and industrial products with limited supply sources, diversifying their supply sources, and returning to domestic production of important products. The movement toward a global open economy, which has continued since the end of the Cold War, stagnates, and the rise of nationalism and protectionism with economic decoupling are becoming pronounced. Such global trends are affecting not only the economic policies but also advanced scientific research in academia.

Another major international demand to this field is contribution to SDGs. In particular, in order to achieve carbon neutrality by 2050, renewable energy utilization and power saving technologies to reduce CO₂ emissions, CO₂ capture and utilization technology, and recycling/reuse/reduce technologies for materials and products need to be newly developed. In addition to the development of these new technologies, it is also necessary to reexamine current production technologies that were previously thought to be already established and optimized. In order to promote the research and development in these difficult technological areas, it is necessary to pursue the technological possibilities from the basic level of materials and production processes. Various research and development are being conducted intensively under national strategies such as “Green Growth Strategy toward Achieving Carbon Neutrality in 2050”, “Materials Innovation Strategy through establishing materials DX platform”, and “Quantum Technology and Innovation Strategy toward realizing Future Quantum Society”. These are being implemented in order to respond to various social and technological requirements, such as various issues facing Japan, contributions to the common goals of the international community, and establishment of economic security.

What has been attracting particular attention recently among the national strategies above is an effort to restart Japan's advanced semiconductor process development. Based on the “Strategy for Semiconductors and the Digital Industry”, intensive investment for research and development of semiconductors is being made in all directions of front-end and back-end processes of semiconductor chip manufacturing, equipment manufacturing, and material development. The government is also working to revitalize the domestic semiconductor industry by attracting foreign companies to establish factories and research centers in Japan and by providing support for development costs to companies with factories in Japan. Remarkable R&D trends in the world can be also seen in energy and environment fields such as electric energy storage devices and water electrolysis, in healthcare and medical fields such as mRNA nanomedicine, in electronics fields such as advanced semiconductor and neuromorphic computing

chips, and in emerging technology fields such as quantum computing and topological materials. Recent methodological innovation in materials science through data-driven materials design is also remarkable. Many countries are conspicuously focusing on these fields and developing technologies with the aim of establishing their own presence and competitiveness in science and technology and innovation in the future.

Under these situations, the status and challenges of research and development in Japan are as follows. Japan maintains traditional competitiveness in materials design and manufacturing of energy materials, electronic materials and composite materials, and also in fundamental nanotechnologies of measurement/ analysis / evaluation / processing. However, these advances of basic research in fundamental science and technology have not been fully utilized in internationally competitive businesses. There are considered to be issues in the transfer of technologies through industry-academia collaboration and/or the construction of medium- to long-term innovation ecosystems. In addition to efforts to solve these issues, various measures are also required, such as enhancement of human resource development programs to address the shortage of professional human resources and to resolve concerns about the career paths of the next-generation human resources. Based on these efforts, it is necessary to further focus on quantum technology, data-driven material development, carbon neutral technology, and medical-engineering collaboration for innovation in biotechnology. We surveyed and analyzed the social, economic and R&D trends both in Japan and overseas, as well as the issues facing Japan mentioned above. In conducting the survey, we analyzed the field of materials and nanotechnology by categorizing it into 7 subfields and selecting 29 research and development areas which are described in the reference 1 entitled panoramic view report on Nanotechnology/Materials Research Field by CRDS and identified 12 research and development subjects described in the following from the three standpoints which are, “New demands for science and technology brought about by changes in society,” “Necessity of strategic investment accompanying the emergence of new trends in science and technology,” and “Japan’s industrial competitiveness and national security”;

- 1) Advanced semiconductor materials and device technology,
- 2) Manipulation, control, and utilization of unique properties of quantum technology,
- 3) Advanced electricity-material energy conversion technology,
- 4) Multi scale thermal control technology,
- 5) Material technology that achieves both resource recycling and carbon recycling,
- 6) Expanded understanding and control of biocompatibility,
- 7) Hybrid materials utilizing biological functions,
- 8) Nanoscale high-performance materials,
- 9) Highly reliable materials in extreme environments,
- 10) Material DX fundamental technology,
- 11) Operando-multimodal measurement,
- 12) Responsible research innovation of new materials

The details of them are described in the reference (1).

Reference 1: CRDS-FY2022-FR-05, “Panoramic View Report on Nanotechnology/Materials Research Field (2023)”, issued in May, 2023.

Nano Young Challenge 2023

The 'Nano Young Challenge,' a competition focused on fostering the development of nanotechnology and nurturing the next generation researchers, has reached its 7th iteration this year since that was held first in 2017.

This aims to discover and reward those who present creative ideas with the potential for societal impact in various fields of nanotechnology, such as Nano-energy, environment, bio, manufacturing, devices, and information electronics for undergraduate and graduate students in Korea.

It is hosted and organized by the Ministry of Science and ICT and Korea Nanotechnology Research Society (KoNTRS) to facilitate the expansion of nanotechnology awareness by offering the high-quality participatory platform for researchers in relevant fields. It encourages the exchange of excellent technologies, fosters young professionals, and promotes the advancement of nanotechnology.



From February to April, a total of 120 teams (9 individual teams, 111 groups) applied nationwide, reaffirming the competition's recognition. The expert committee reviewed the proposals, focusing on the feasibility of the ideas, technical difficulty, societal value creation, differentiation strategy and etc.

The first and second rounds of evaluation took place until June, resulting in the selection of 10 outstanding nanotechnology-based ideas, including wearable micro-vibration sensors, nano-filters of titanium dioxide zeolite, eco-friendly nanocellulose-based 3D printer materials, embedded hydrogel, and hybrid energy harvesting smart white canes, and etc.

The chosen teams receive activity support funds, and they are given an opportunity to display their ideas at the Poster Session of the NANO KOREA 2023 Symposium in July. In September, the third round of evaluation will focus on the validation of prototype created based on the proposed ideas to determine the final winners.



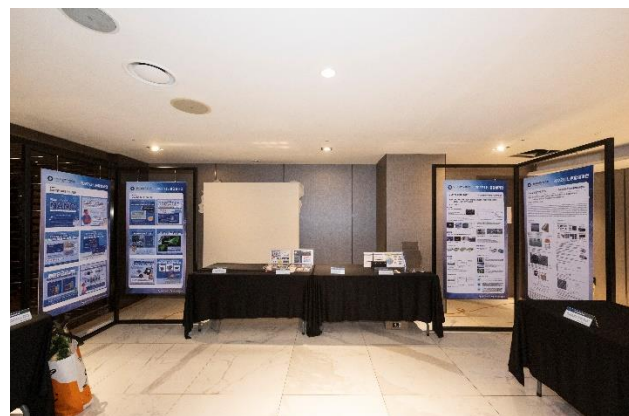
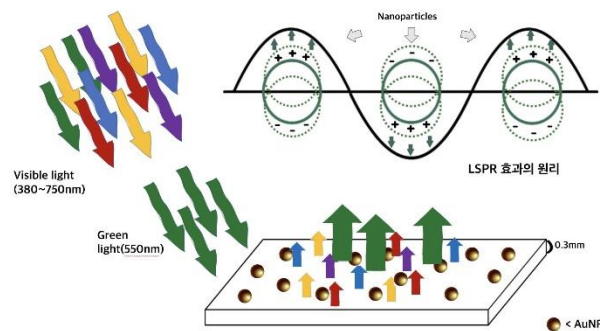
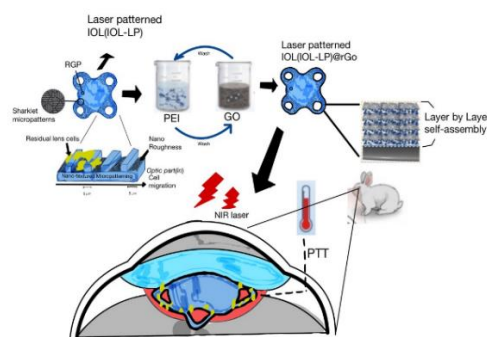
KoNTRS plans to hold the Nano Young Challenge awards ceremony at the “2023 Korea Science and Technology Competition” to be held in November. The prestigious Minister of Science and ICT Award will be presented to the top winner at this ceremony.



The chosen teams received activity support funds, and they were given an opportunity to display their ideas at the Poster Session of the NANO KOREA 2023 Symposium. In September, the third round of evaluation focused on the validation of prototype created based on the proposed ideas to determine the final winners.

The undergraduate team from Chung-Ang University, proposing the "Sharklet Patterning-rGO Coating Artificial Intraocular Lens (IOL)" to prevent Posterior Capsular Opacification (PCO) after cataract surgery, has been awarded the grand prize. They introduced a Sharklet (shark fin) pattern on the HEMA lens to inhibit the proliferation of Lens Epithelial Cells (LEC) and coated the edge of the IOL with rGO/PEI film to maximize near-infrared photothermal therapy. This idea is expected to alleviate burdens for cataract treatment side effects and recognized for its potential in creating social value, leading to its selection for the prize. In addition, the team that proposed a Wavelength-enhanced Nano Film for individuals with red-green color blindness and a Titanium Dioxide Zeolite Nano Filter designed based on fish gill structures won the award.

Finally, Nano Young Challenge Awards Ceremony at the “2023 Korea Science and Technology Competition” was held in November. The prestigious Minister of Science and ICT Award was presented to the top winner, and the team exhibited their prototype during the event.



NANO KOREA 2023

The 21st International Nanotech Symposium and Exhibition(NANO KOREA 2023), co-hosted by the Ministry of Science and ICT and the Ministry of Trade, Industry and Energy was held at KINTEX, Korea on July 5 to 7, 2023 with the theme of 'Nanodevice: Evolving into Intelligent Semiconductors'.

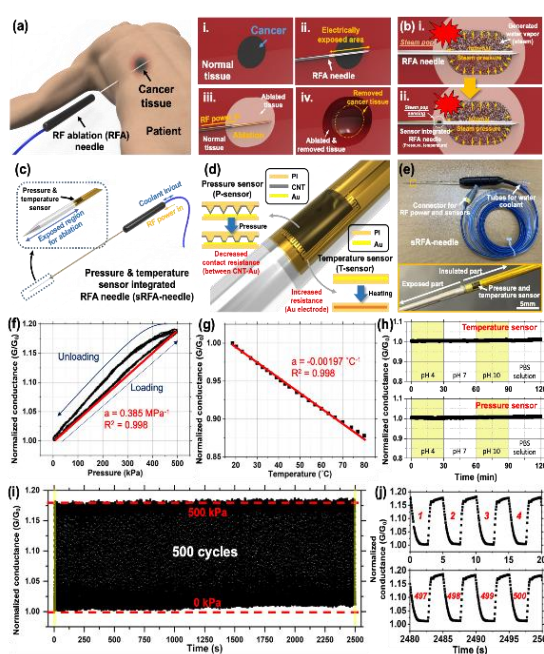
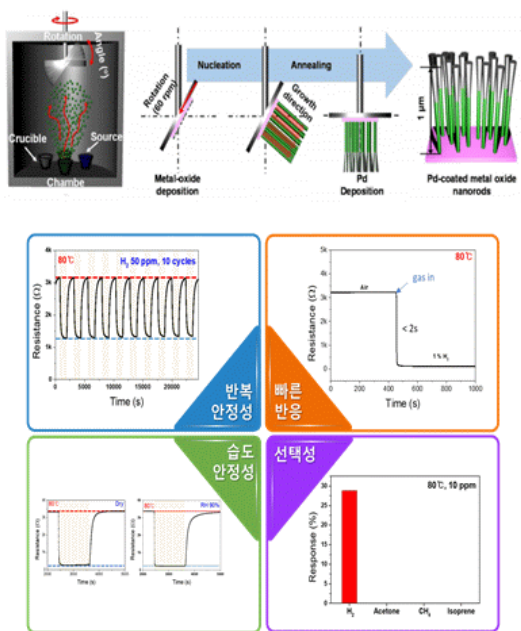
This year, it hosted 1,108 scientists from 23 countries and with a total of 1,884 attendees in symposium and 393 companies have participated as exhibitor and 10,679 participants have visited exhibition for 3 days.

Professor Shuji Nakamura of the University of California, the winner of Nobel Prize in Physics for his development of Blue Light-emitting Diodes and Executive Vice President Jang Hyuk who is a key figure in Samsung SDI's next-generation battery development, delivered speeches in Keynote Session and some companies like Hyundai Motor and Hanwha Systems participated in the industry session focusing on 'advanced mobility', exploring future trends and issues.



At the symposium, there were invited talks, oral, and poster presentations in 13 technical session including semiconductors, AI, sensors, and carbon neutrality. They even gave awards to outstanding research achievements that could be commercialized. Professor Woo-Young Lee of

Yonsei University won the Prime Minister's Award for his technology of producing hydrogen sensors using semiconductor nanomaterials which is highly sensitive and reliable hydrogen sensor used to hydrogen electric vehicles, secondary battery explosions, and breath diagnosis using various nanostructures was recognized its contributions to the development of technologies in other fields. And outstanding research results, such as high-speed wide-angle optical wave surface control technology using electro-modulation metasurface-based phase modulation arrangement, production technology of plastic raw materials through electrochemical CO₂ conversion, and flexible pressure/temperature sensor technology were selected the Minister of Science and ICT Award. Furthermore, NANO KOREA shared and promoted the awarded technologies through YouTube live streaming with the channel in the science field.

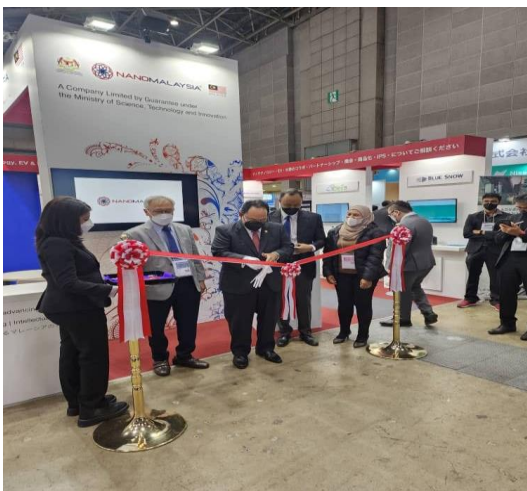


Additionally, ANFSo2023(The 20th Asia Nano Forum Summit) was held from July 5 to 6, in conjunction with NANO KOREA, and about 40 participants came together online and in person. The Commercialization Working Group organized a workshop on "Commercialization of Nanotechnology for People, Planet, and Profit," and activities such as the Annual General Meeting, Tour Program, Welcome reception, and Banquet were held to promote networking and cooperation among ANF members.



National Nanotechnology Centre (NNC) and NanoMalaysia Berhad (NMB) during January to December 2023

1. NANOTECH JAPAN EXHIBITION, 1 -3 February 2023



The Japan Nano Tech Exhibition 2023 started with the opening ceremony of the NanoMalaysia Berhad (NMB) Pavilion by H.E. Dato' Shahril Effendi Abd Ghany, Malaysian Ambassador to Japan. The NNC was represented by Director Dr. Ruslinda A Rahim and Principal Assistant Director Mr. Ismarul Nizam Ismail.

A discussion related to the potential of hydrogen fuel cell technology was also held with Mr. Eeji Ohira, Strategy Architect of NEDO Japan. The NNC and NMB teams were led by Dr. Ruslinda A Rahim, Dr. Daniel Bien Chia Seng, Mr. Hairul and Mr. Vimal.

2. Symposium On User-Facility Network in Asia (UFNA), NANOTECH JAPAN Exhibition, 2 February 2023



NNC Director Dr. Ruslinda A Rahim and Chief Assistant Director Mr. Ismarul Nizam Ismail attended the UFNA sharing session which involved participants from NIMS Japan, University Malaya Malaysia, DOST-ITDI Philippines, NANOTEC Thailand and ILN Iran updating on the nanotechnology laboratory activities in their respective countries. At the end, Dr. Ruslinda gave her concluding remarks and presented a souvenir to Prof. Yasuo Koide, Director of Advanced Research Infrastructure for Materials and Nanotechnology (ARIM) Program Japan.

3. Briefing on Professional Recognition by Malaysia Board of Technologists (MBOT), 17 February 2023



TAKLIMAT

LALUAN PENGIKTIRAFAN PROFESIONAL OLEH LEMBAGA TEKNOLOGIS MALAYSIA (MBOT)

17 Februari 2023 (Jumaat)
9.30 - 10.30 pagi
Zoom Platform
Penyertaan adalah **PERCUMA**
Terhad kepada **100 peserta** awal sahaja



MEMERAKYATKAN SAINS
MENGINSANKAN TEKNOLOGI

MALAYSIA MADANI

NNC, in collaboration with SIRIM STS and MBOT, organized a briefing on professional recognition for technologists and technicians in 24 technology and technical fields, including nanotechnology. This briefing discusses the procedures for registering professional technologists and certified technicians with Ts./ P.Tech. and Tc./ C.Tech. designations, respectively. These recognitions come with lifelong learning through the implementation of Continuing Professional Development (CPD) for the renewal of registration certificates.

4. 4th Malaysia-Japan International Conference on Nanoscience, Nanotechnology & Nanoengineering 2023 (MJIC 2023), 25th-26th February 2023



4th Malaysia-Japan International Conference on Nanoscience, Nanotechnology & Nanoengineering 2023 (MJIC 2023) were jointly organized by the National Nanotechnology Center (NNC), MOSTI and the Institute of Science (IOS), Universiti Teknologi Mara (UiTM) Shah Alam at Vilea Teluk Kemang Resort, Port Dickson, Negeri Sembilan. This conference is one of the platforms for nanotechnology activists to share the latest information, discoveries and innovations in Nanoscience, Nanotechnology and Nanoengineering. Dr. Yusrizam Sharifuddin represented NNC MOSTI in delivering the Secretary General of MOSTI officiating speech. Delegates from Nagoya Institute of Technology and Kagawa College represented Japan.

5. ISO/TC 229 Nanotechnologies – WG 3 General and Project Group Meetings, 8 -12 May 2023

The ISO/TC229 Working Group meeting on 8-12 May 2023 in Sendai, Japan. This meeting was also held as hybrid and Malaysia participated online.

Malaysia (DSM) and Colombia (ICONTEC) continue to lead the revision of ISO/TS 12091:2014 Occupational risk management applied to engineered nanomaterials – Part 2: Use of the control banding approach. The project group meeting was held on 10 May 2023.

Malaysia presented the draft document titled ‘Radiotelemetry-spectral-echocardiography Based Real-Time Surveillance Protocol for *In Vivo* Toxicity Detection and Monitoring of Engineered Nanomaterials (ENM)’. The project group meeting was held on 10 May 2022. Malaysia has requested a second ballot for registration as a new project.

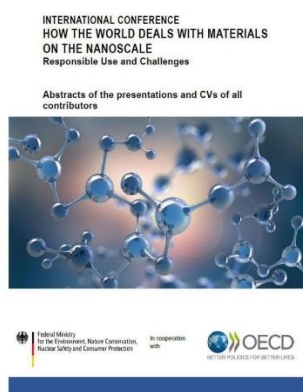


6. EU-Asia Dialogue on Nanosafety, Physikalisch-Technische Bundesanstalt (PTB), 10587 Berlin, Germany, 21 June 2023



The 6th EU-Asia Dialogue on Nanosafety was held in Berlin, Germany and organized by the Federal Ministry for Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV). Ts. Mohd Helme bin Mohd Helan representing National Nanotechnology Center MOSTI delivered a key note, a recap of the 5th Dialogue held in Kuala Lumpur last year. Participants exchanged ideas on international collaboration, mainly on the role of characterization towards implementation of the International Network Initiative on Safe and Sustainable Nanotechnology (INISS-nano).

7. International Conference: “How the World Deals with Materials on the Nanoscale – Responsible Use and Challenges”, Berlin, Germany, 22 -23 June 2023



The International Conference ‘How the World Deals with Materials on the Nanoscale – Responsible Use and Challenges’ held 22-23 June 2023 in Berlin Germany organized by the OECD and the Federal Ministry for Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV).

MOSTI presented two technical papers in this conference by Puan Sri Dr. Halila Faiza binti Zainal Abidin's on 'Regulating Risk of Nanomaterials Through Soft Law Approach' and Ts. Mohd Helme bin Mohd Helan's on 'Nanosafety Studies on Locally Available Nano-products'. This conference marks the end of BMUV's 16 years of intense discussions among stakeholders from industry, science, authorities, and civil society organizations in applying nanotechnologies to products and processes. Nevertheless, the opportunities and risks of nanoscale materials remain a topic under BMUV and related initiatives from all over the world including legislative approaches, standardisation and stakeholder engagements were discussed in this conference.

8. OECD Conference Centre, Paris, France, 26th-28th June 2023



The 23rd OECD Working Party on Manufactured Nanomaterial (WPMN) was held at the OECD Conference Centre, Paris. This Working Party established in 2006 meets annually to discuss current issues related to manufactured nanomaterials in promote safe and sustainable use.

The development of guidelines are managed as specific projects under one of these five (5) Steering Groups: Testing and Assesments (SGTA); Exposure Measurement and Exposure

Mitigation (SG8); Risk Assessment and Regulatory Programme (SGAP)*; Safe(r) and Sustainable Innovation Approach (SSIA); and Advanced Materials (AdMa).

9. National Nanotechnology Laboratory Network (NNLN) Seminar Series 1, 5th July 2023



This NNLN seminar was held in collaboration with the National Nanotechnology Centre, MOSTI and Hi-Tech Instruments Sdn Bhd. It follows the inauguration of six (6) new Electron Microscopy facilities at the Application Refinement laboratory, Hi-Tech Instruments Sdn Bhd, Bandar Bukit Puchong. YBM MOSTI officiated the inauguration ceremony. This laboratory at Hi-Tech Instruments is included in the National Nanotechnology Laboratory Network which is one of the initiatives under the National Nanotechnology Policy and Strategy 2021-2030.

The event was attended by Prof. Zhang Ze, the President of China Electron Microscopy Society and from Zhejiang University, PR China who delivered the keynote talk about “The perspective of future development of electron microscopy”. The seminar was also attended by representatives from Thailand and Indonesia Electron Microscopy Society.

10. The World Renewable Energy Congress (WREC) XXII 2023, 17 July 2023



YB Minister of Science, Technology and Innovation, YB Chang Lih Kang today inaugurated the World Renewable Energy Congress (WREC) XXII 2023 organized by the Solar Energy Research Institute (SERI), UKM and the World Renewable Energy Network (WREN) in collaboration with the National Nanotechnology Center, MOSTI. This international congress with the theme "Transition Towards a Carbon-Free Future" which lasts for five days starting on July 16, 2023, gathers scientists, policy makers, industry players especially Renewable Energy (TBB), students and community representatives from inside and outside countries.

YB Minister in his speech has mentioned the importance of Science, Technology and Innovation (STI) in dealing with various issues and challenges faced by society, including the need for energy transition to achieve decarbonisation for more sustainable and environmentally friendly socio-economic development. YB Chang Lih Kang also witnessed the signing of the Mobile Hydrogen Refueling Station project collaboration document between NanoMalaysia Berhad (NMB), PETRONAS, UMW and Malaysia Green Technology and Climate Change Corporation (MGTC). This hydrogen refueling station is the first of its kind for hydrogen mobility in Peninsular Malaysia and this collaborative project is supported by MOSTI as a complement to the Hydrogen Economy and Technology Roadmap (HETR).

PETRONAS will supply and provide mobile hydrogen filling facilities, green hydrogen production, as well as operation and maintenance of the station. NMB will use local nano-based technology produced under the Hydrogen EcoNanoMy program such as the Hydrogen Kiosk Storage System and hydrogen reactor while the UMW Group will donate a Toyota Mirai for this collaborative project. MGTC, as the organization responsible for leading climate change mitigation efforts, will focus on the identification of green incentive proposals to support the advancement of hydrogen fuel cell technology and its supply chain ecosystem in Malaysia, in line with the HETR target.

11. National Nanotechnology Laboratory Network (RMNK) Seminar Series 2, 21 August 2023



YBhg. Datuk Ts. Dr. Mohd Nor Azman Hassan, Deputy Secretary General (Technology Development), Ministry of Science, Technology and Innovation was present to inaugurate the NNLN Seminar Series 2 titled "Advanced X-ray Characterization Techniques for Nanomaterials" held at the Tun Dr. Hall, Ismail, Malaysian Nuclear Agency. This NNLN seminar is organized together with the National Nanotechnology Centre, Malaysian Nuclear Agency and Malaysia Nanotechnology Association. The Malaysian Nuclear Agency is a government agency in the National Nanotechnology Laboratory Network (RMNK) consortium.

This seminar was held to support NNLN initiatives under the National Nanotechnology Policy and Strategy 2021-2030.

12. Roadshow Session of the National Nano Technology and Product Roadmap 2021-2025, 17 August 2023



The National Nano Technology and Product Roadmap 2021 – 2025 Roadmap Session (Central Zone) organized by the National Nanotechnology Center involves ministries, research agencies, academia, the private sector and industry players especially in the innovation ecosystem and nanotechnology associations.

The discussion of solution formulation, status updates and reporting of the National Nano Technology and Product Roadmap 2021-2025 is aimed at planning nano industry programs and activities in Malaysia. Findings from this roadshow session are to identify the problems and constraints faced by the nanotechnology industry in Malaysia.

13. 3rd International Conference on Semiconductor Materials and Technology (IcoSeMT) 2023 and International Invention, Innovation & Design Expo (InoDEx) 2023, Hotel Shangri-La Rasa Sayang, Penang, 18th – 19 September 2023

Assoc. Prof. Ts. Dr. Ruslinda A. Rahim, Director of the National Nanotechnology Center on behalf of the Honorable Minister of Science, Technology and Innovation (MOSTI) has officiated the IcoSeMT and InoDEx 2023 conferences. This conference is jointly organized by the National

Nanotechnology Center, MOSTI and the Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia (USM), Universiti Teknologi MARA Penang Branch (UiTM CPP), MIMOS Berhad, and Collaborative Research in Engineering, Science & Technology (CREST). This conference aims to present the latest findings, ideas and applications of local researchers and industry in the field of optoelectronic technology development in particular.



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of local researchers and industry in the field of optoelectronic technology development in particular.

14. Launching of Hydrogen Economy and Technology Roadmap (HETR) hosted by National Nanotechnology Centre, 5th October 2023

YAB Deputy Prime Minister, Dato' Sri Haji Fadillah Haji Yusof, today officially launched the Hydrogen Economy and Technology Roadmap (HETR) at the International Conference and Exhibition of Green Technology and Eco Products Malaysia 2023 (IGEM 2023). which took place at the Kuala Lumpur Convention Center.

HETR was developed by the Ministry of Science, Technology and Innovation (MOSTI) to support the Aspiration of a Low Carbon Country 2040, under the National Energy Policy 2022-2040. The main focus of HETR is to advance the country's hydrogen economy through an innovative and comprehensive ecosystem, driven by high technology to enable the transition to the use of hydrogen to achieve decarbonisation targets in a more sustainable socio-economic development agenda.

HETR will put Malaysia in a favorable position globally due to potential resources and local advantages that can be developed for example Renewable Energy (Renewable Energy) such as solar and hydro for green hydrogen generation. The Strategy and Action Plan outlined in the HETR will drive the use of hydrogen which is projected to contribute to the reduction of greenhouse gas (GHG) emissions between 6% and 15% as well as generate up to 200,000 job opportunities by the year 2050. While in the short term, it is projected to be between 0.4% -1.3% GHG reduction can be achieved by 2030 depending on the implementation model proposed in HETR. In addition, the generation of income of up to RM12.1 billion with a contribution to the country's Gross Domestic Product (GDP) of between RM49 billion and RM61 billion is expected in 2030 in addition to the generation of job opportunities between 8,000 to almost 45,000 in the clean energy sector by 2030.

Capacity development and high technology drive planned through HETR with a “Build Some, Buy Some” approach aims to produce hydrogen at a competitive cost, supported by local ecosystems and expertise. This is important to facilitate the transition to hydrogen for domestic use in the framework of the country's energy transition to achieve decarbonization targets and also for the export of hydrogen to the international market.

HETR is one of the Unity Government's agenda to drive the development of green technology and low carbon economy in Malaysia. HETR will present detailed strategies and initiatives, as well as outline the potential and opportunities that can be generated by driving the hydrogen technology and economy.

Also present at the HETR launch ceremony at IGEM 2023 are YB Tuan Chang Lih Kang, Minister of Science, Technology and Innovation, YB Tuan Nik Nazmi Nik Ahmad, Minister of Natural Resources, Environment and Climate Change, YB Datuk Arthur Joseph Kurup, Deputy Minister of Science, Technology and Innovation and YBhg. Dato' Ts. Dr. Haji Aminuddin bin Hassin, Secretary General of MOSTI.



15. Nano Kebangsaan (NanoKEB) 2023, Bangi Resort Hotel, Selangor, 10th October 2023

Datuk Arthur Joseph Kurup, Deputy Minister of Science, Technology and Innovation has inaugurated the National Nano Program (nanoKEB) 2023 at Bangi Resort Hotel, Selangor. The NanoKEB program is an annual program organized by the National Nanotechnology Center (NNC), Ministry of Science, Technology and Innovation (MOSTI), since it was first organized in 2015.





The NanoKEB 2023 program is organized in collaboration with strategic partners and other implementing partners namely NanoMalaysia Berhad (NMB), MIMOS Berhad, Malaysian Technological Board (MBOT), SIRIM Berhad, Malaysian Green Technology and Climate Change Corporation (MGTC), Universiti Malaysia Perlis Nanoelectronics Engineering Institute, Malaysia Nanotechnology Industrial Group and Malaysian Nanotechnology Association. Also held during this opening ceremony was the launch of the Nanosafety Reference System, the launch of the Nanotechnology Laboratory Network Portal (NNLN) 2.0 and also the prize presentation of the National Level 2023 Nanotechnology Innovation Research Project Competition (PIN).

16. NanoDidik Program: Empowering Teachers, 16th to 17th November 2023

Officiated by the Director of ION2, YBhg. Prof. Dr. Mohd Nizar Hamidon. This program is a knowledge transfer program for high school chemistry teachers organized by ION2 in collaboration with the National Nanotechnology Center Malaysia (NNC). The main objective of this program is to improve the understanding of teachers specifically in the topic of nanoscience and nanotechnology. This pilot program was attended by a total of 21 selected teachers from around Selangor.



17. NANOTHAILAND 2023, Chon Buri, Thailand, 29th November – 1st Disember 2024

The participation of the National Nanotechnology Center (NNC) in NANOTHAILAND 2023 is an invitation from the Vidyasirimedhi Institute of Science and Technology (VISTEC), the Nanotechnology Association of Thailand and the National Nanotechnology Center (NANOTEC), Thailand. The NNC represented by Mr. Dominic Anak Geruka presented a technical paper which is the result of the Study on Developing Benchmarks for the Safety Risks of Nano-Based Products entitled "Insights from Physical-Chemical Testing in Nano-Based Products".

The participation of the National Nanotechnology Center (NNC) in NANOTHAILAND 2023 is an invitation from the Vidyasirimedhi Institute of Science and Technology (VISTEC), the Nanotechnology Association of Thailand and the National Nanotechnology Center (NANOTEC), Thailand. The NNC represented by Mr. Dominic Anak Geruka presented a technical paper which is the result of the Study on Developing Benchmarks for the Safety Risks of Nano-Based Products entitled "Insights from Physical-Chemical Testing in Nano-Based Products".

The conference organized every two years by Thailand aims to discuss the opportunities and applications of engineering, materials science and nanotechnology in improving the quality of life today. This conference also touches on various aspects related to nano from synthesis, theory,

industry, safety, security and regulatory. The conference theme this year is "Nanotechnology for a Sustainable World".



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18. Integrity, Governance, and Anti-Corruption Award (AIGA2022) - 17 January 2023

NanoMalaysia Berhad (NMB) received the Anugerah Gangsa at the Integrity, Governance, and Anti-Corruption Award (AIGA2022) under the work culture and practice of integrity in the workplace category.

The Integrity, Governance, and Anti-Corruption Award (AIGA2022) is an award handed out by Institut Integriti Malaysia (IIM) that recognises and appreciates the public and private sectors who show commitment to the culture and practice of integrity and best governance, as well as anti-corruption initiatives in their organisations.

AIGA2022 is also one of the benchmarking mechanisms for public and private organisations in cultivating integrity, best governance, and anti-corruption, especially in their organisations. In addition, it is also a space to discover the capabilities, commitment, and seriousness of the private and public sectors in implementing the internal control system of integrity management and corruption prevention. A total of 110 government agencies and private companies participated in AIGA 2022.

The award was accepted by Dr. Rezal Khairi Ahmad, CEO of NanoMalaysia, during a ceremony at Institut Integrity Malaysia, Kuala Lumpur. The award follows the launch of NanoMalaysia's Organisational Anti-Corruption Plan (OACP) in February 2022. The OACP is designed as a guideline to management and employees towards ensuring an efficient, transparent, integrity, clean and implementable delivery system and service.



19. NANOTECH JAPAN 2023 - 2 February 2023

NanoMalaysia Berhad continues to revitalise industries and drive innovation through the successful development and commercialisation of nanotechnology in Malaysia by presenting Malaysian nanotech companies at Nanotech 2023.

The pavilion was officiated by the ambassador of Malaysia (Tokyo, Japan), H.E. Dato' Shahril Effendi Abd Ghany, at Tokyo Big Sight.

The pavilion featured companies offering nanotechnology products commercially developed by NanoMalaysia or certified by NanoVerify, a subsidiary of NanoMalaysia. Participating companies included Blue Snow Engineering Sdn Bhd, iDeria Sdn Bhd, Alnair Photonics and Alnair Labs. The Malaysian Investment Development Authority was also present. H.E. Dato' Shahril was joined by Prof. Emeritus Dato' Ir. Dr. Mohamad Zawawi Bin Ismail, Chairman of NanoMalaysia, Dr. Rezal Khairi Ahmad, CEO of NanoMalaysia, Dr. Ruslinda A. Rahim, Director, National Nanotechnology Centre, and Mr. Shamsul Amir Azman, Deputy Director at MIDA Tokyo.



20. MOU NANO4SOCIETY - 3 February 2023

NanoMalaysia moved forward with its partnership with Nano4Society with an MOU signed in Tokyo following the exchanges of an LOI in Amsterdam in 2022. Nano4Society, a successor to NanoNextNL, is a nanotechnology ecosystem in The Netherlands.

In 2019, NanoMalaysia signed an MOU with NanoNEXTNL to cooperate in several areas of nanotechnology innovation, including facilitating the networking of Malaysian and Dutch nanotechnology research institutions and companies, exploring collaborative joint development or investment, as well as sharing best practices and knowledge in platform technology and intellectual property on nanotechnology.

The updated MOU focuses on SMEs & Startup's B2B Interface, Joint IP Development, and NanoSafety and Product Certification (NANOVerify), especially in the areas of Energy and Renewables, Electric Vehicle (EV), Hydrogen Economy and Food Security (Urban/Smart/Precision Farming).

NanoMalaysia was represented by its Chairman, Prof. Emeritus Dato' Ir. Dr. Mohamad Zawawi bin Ismail, and Dr. Rezal Khairi Ahmad, CEO of NanoMalaysia, while Raoul A. Oostenbrink and Prof Dr. Ir Wilfred G Van Der Wiel represented Nano4Society.



21. MOU NMB x XIAMEN University on BICEP - 16 February 2023

NanoMalaysia Berhad and Nanoquartz signs Memorandum of Understanding (MoU) With XMU Jiageng Education Development for cooperation in Biomass Innovation Circular Economy Programme (Bicep) at Xiamen University Malaysia on 16 February 2023.

Witnessing by YB Tuan Chang Lih Kang, the Minister of Science, Technology and Innovation of Malaysia (MOSTI), Datuk Ts. Ir. Dr. Hj Aminuddin Bin Hassim, Secretary General of MOSTI, Prof. Emeritus Dato' Ir. Dr. Mohamad Zawawi bin Ismail, Chairman of NanoMalaysia Berhad (NMB) while the MoU was signed by Dr. Rezal Khairi Ahmad, Chief Executive Officer of NanoMalaysia Berhad, Dr. Daniel Bien, Director of NanoQuartz Sdn. Bhd. and Professor Dr. Wang Ruifang, the President of Xiamen University Malaysia. Dignitaries present for the occasion included Datuk Ts, Dr. Mohd Nor Azman bin Hassan, Deputy Secretary General of MOSTI (Technology Development), Dr. Ruslinda A. Rahim, Director, National Nanotechnology Centre, Associate Professor Dr. Zhang Ying, the Vice-President of Xiamen University Malaysia, Associate Professor Dr. Ong Wee Jun, the Director of the Center of Excellence for NaNo Energy & Catalysis Technology (CONNECT), and Professor Dr. Chen Binghui, the Dean of School of Energy and Chemical Engineering of Xiamen University Malaysia.

The objective of the MoU is to strengthen the progressive trilateral relationships and cooperation in the Biomass Innovation Circular Economy Programme (BICEP) between the Ministry of Science, Technology and Innovation (MOSTI), NanoMalaysia Berhad - as the leading agency for the commercialisation of nanotechnology and advanced solutions - and Xiamen University Malaysia - as a university dedicated to providing world-class research and teaching towards a new era of high value of biomass industry in the country.



22. MOU NMB x BIFORST BHD - 19 March 2023

The Ministry of Science, Technology and Innovation (MOSTI) through its agency for electric vehicle (EV) technology development, NanoMalaysia Bhd (NMB), has signed a collaboration agreement with Biforst Bhd to adapt the Hydrogen Hybrid Energy Storage System (H2SS) for carbon-free transportation.

The collaboration will enable the development, testing, deployment, and commercialisation of a hybrid hydrogen-based power system based on H2SS as an additional power source on top of EV components, which will replace the internal combustion engine (ICE).

The collaboration agreement was signed by NMB chief executive officer Dr. Rezal Khairi Ahmad and Biforst group managing director Datuk Hamie Appala Nakkiah, witnessed by the Science, Technology and Innovation Minister Chang Lih Kang, NMB chairman, Prof. Emeritus Dato' Ir Dr. Mohamad Zawawi bin Ismail and Biforst chairman, YTM Dato' Muhammad Hj Abdullah during the Malaysia Technology Expo 2023 (MTE 2023) at the World Trade Centre.



23. MOU NMB x SBC x NCSTT x TESTA x EVAP x NBRI x ABEVTC IN BALI INDONESIA - 10 May 2023

NanoMalaysia Berhad has signed MoU between Singapore Battery Consortium (SBC), National Center for Sustainable Transportation Technology (NCSTT) from Indonesia, Thailand Energy Storage Technology Association (TESTA), Electric Vehicle Association of the Philippines (EVAP) and National Battery Research Institute (NBRI) during the first ASEAN Battery & Electric Vehicle Technology Conference (ABEVTC) in Bali, Indonesia.

With focus on manufacturing and production sectors, the event strives to bring opportunities & exchange of knowledge amongst the mid-level professionals in the field of EV and Battery technology and nourish relationships among industry players to build an ASEAN community for future collaboration. NanoMalaysia Berhad was represented by Dr. Rezal Khairi Ahmad, CEO of NanoMalaysia Berhad.



24. International Invention, Innovation, and Technology Exhibition (ITEX 2023) - 12 May 2023

NanoMalaysia Berhad recently participated in the 34th International Invention, Innovation, and Technology Exhibition (ITEX) 2023, held at the Kuala Lumpur Convention Centre. They showcased two groundbreaking inventions that garnered significant recognition. The first invention, called Graphene Pre-Cured Tread Liner, received a gold medal in the Automotive, Aerospace, Aviation, and Transportation Category. This innovative rubber compound incorporates a small amount of graphene M-15 and was developed in collaboration with GIIB Rubber Compound Sdn Bhd.

The second invention, AQUENE, a graphene-based nanofluid, which solely nominated under Environment & Energy category for the Malaysia Innovative Product Award. AQUENE is designed to enhance heat transfer at various heat exchange interfaces and rapidly dissipate heat from conditioned spaces.

Apart from these inventions, NanoMalaysia Berhad also engaged in important collaborations. They exchanged documents with Universiti Malaysia Perlis (UniMAP) and its spinoff, Ideria Sdn Bhd. A Contract Research Agreement (CRA) was signed between NanoMalaysia Berhad and UniMAP for the project titled "Scale Up of Reduced Graphene Oxide (RGO) from Oil Palm Trunk (OPT)." This project focuses on a sustainable method of converting oil palm trunks into reduced graphene oxide, which has applications in sensors, composite materials, nanofluids, energy storage, and more. The project received a gold medal in the Agriculture Category.



25. Launch of NANOTRUST and Grapheneverify Programme - 15 May 2023

NanoMalaysia Berhad (NMB) launched two groundbreaking product certification schemes, NANOTrust and GRAPHENEVerify on 15 May 2023. These schemes, part of the NANOVERify Programme, enhance consumer trust in nanotechnology products, promoting the growth of nanotechnology in Malaysia.

The event was officiated by Datuk Arthur Joseph Kurup, Deputy Minister of Science, Technology, and Innovation (MOSTI) in which The NANOTrust and GRAPHENEVerify Product Certification Schemes provide SMEs with nano- based products an opportunity to secure a credible seal of trust. This enables wider market penetration both locally and abroad and contributes to the dynamic nanotechnology ecosystem envisioned in the National Nanotechnology Policy and Strategy 2021-2030 (DSNN).

26. ASEAN Green Hydrogen Conference 2023 - 23-24 May 2023

This year, RoomOfLeaders is proudly taking initiative to organise the ASEAN GREEN HYDROGEN CONFERENCE 2023 in Kuala Lumpur, Malaysia with the main theme 'Stimulating Regional's Green Hydrogen Economy'.

This private and exclusive conference will act as a regional roadmap and aim as the catalyst for the regional's green hydrogen developments, assisting governments, leading energy companies, academics and service providers within the Hydrogen domain across Southeast Asian countries.

Among the conference highlights for this edition include Green Hydrogen Policy and Regulations, Green Hydrogen Ecosystem & Value Chain, Technologies, Research and Developments and Green Hydrogen Financing.



NanoMalaysia Berhad represented by Dr. Rezal Khairi Ahmad, CEO of NMB as one of the panelists just concluded two session titled "Policies, Strategies & Innovation Ecosystems For Future Energy" and "Accelerating Green Hydrogen Production At Low Cost".



27. 2023 Langkawi international Maritime and Aerospace Exhibition (LIMA2023) - 24 May 2023

NanoMalaysia Berhad proudly participated in the 2023 Langkawi International Maritime and Aerospace Exhibition (LIMA2023) at Mahsuri International Exhibition Centre in Langkawi,

Kedah. Our booth was in the Ministry of Transportation Pavilion from May 23rd to May 27th, 2023.

NanoMalaysia Berhad's representative presented NMB's innovative Hydrogen-paired Electric Race Car and Nanomaterial-based Multispectral Camouflage to YAB Dato' Seri Anwar bin Ibrahim, the Prime Minister of Malaysia. This event occurred at the NMB Booth, under the Ministry of Transport Pavillion, located at the Mahsuri International Exhibition Centre in Langkawi, Kedah. Accompanying the Prime Minister were YB Anthony Loke, the Minister of Transport, as well as YB Tuan Chang Lih Kang and YB Datuk Arthur Joseph Kurup, the Minister and Deputy Minister from the Ministry of Science, Technology, and Innovation.



28. MOU NIG Indonesia - 6 June 2023

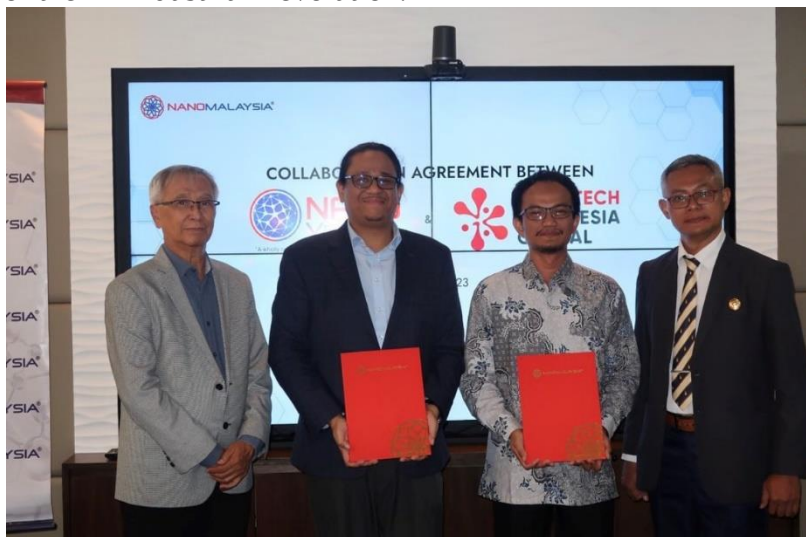
NanoMalaysia Berhad (NMB) is pleased to announce that their subsidiary, NanoVerify Sdn Bhd (NVSB), has signed a strategic agreement with PT Nanotech Indonesia Global (NIG) to collaborate and shape the nanotechnology business in the region. The aim of this collaboration is to establish a regional "Gold Standard" in nanotechnology certification. The signing ceremony, which took place in Kuala Lumpur, is a significant milestone in the commercialization of nanotechnology in Malaysia and Indonesia.

NVSB will lead the regional commercialization of nanotechnology through its NANOVerify Certification Programme. This program will set a regional standard for nano product certifications in the ASEAN region. The signing ceremony is a major step towards NVSB's goal of becoming a leading authority for nanotechnology certification and consultation in Asia by 2025.

The partnership between NVSB and NIG has the potential to shape the nanotechnology business in the region. By sharing infrastructure and expertise in nanotechnology product certification, the collaboration aims to explore and leverage the regional potential of nanotechnology products. This initiative is aligned with the Malaysia MADANI framework, which promotes trust, prosperity, and technological advancement to drive socioeconomic growth in communities in Malaysia and Indonesia.

29. Launch of Ezycart - 19 JUNE 2023

The Minister of Science, Technology, and Innovation (MOSTI), YB Chang Lih Kang, launched the ezyCart, a smart shopping cart which is projected to be a game-changer in the retail industry at the Redtick Supermarket in Putrajaya. The high-tech trolley is an example of local innovative output in the era of the 4th Industrial Revolution.



EzyCart is a technology developed by NanoMalaysia Berhad, an agency under the Ministry of Science, Technology, and Innovation (MOSTI), in collaboration with Retailitics Sdn Bhd, a company providing artificial intelligence-based retail automation solutions. EzyCart offers a personalised shopping experience and was developed based on feedback from shoppers and retailers. Following the successful launch of the prototype in 2022, the smart shopping cart EzyCart has now been equipped with software optimised for seamless data collection and analysis, and is entering the trial phase in several supermarkets, including Redtick Supermarket in Shaftsbury Putrajaya. The development of AI technology in EzyCart utilises advanced nano technology features, such as those found in the semiconductor sector, enabling faster processing. NanoMalaysia guarantees optimal cleanliness of the ezyCart trolleys by integrating nano-based antibacterial technology on the surrounding surfaces, ensuring they remain impeccably clean at all times.

30. ESG Positive Impact Awards 2022 - 23 June 2023

NanoMalaysia Berhad was honored with a "Gold" award at the ESG Positive Impact Awards 2022 organized by Star Media Group. They received this recognition in the Innovative Partnership category under the SMEs to Mid Tier Company section. The award acknowledges NanoMalaysia Berhad's commitment to sustainability and their ability to foster effective partnerships. It highlights their dedication to driving positive change through collaborations and showcases their leadership in promoting innovative and responsible business practices. This achievement will inspire NanoMalaysia Berhad to continue excelling in their pursuit of sustainability and making a positive social impact.

NanoMalaysia Berhad has announced its commitment to adopting the United Nation's Sustainable Development Goals (SDGs) as guiding principles in its corporate strategy, culture, and day-to-day operations.

NanoMalaysia Chief Executive Officer Dr. Rezal Khairi Ahmad said: "As a business entity that energizes industries and the national economy, we aim to contribute to all 17 goals by realigning our existing sustainability strategies to meet SDGs and green corporate goals. We will take a focused, strategic and robust approach to address local and global issues, which will help attract future investments and funding. We are already operating on a quadruple helix-based Venture Builder model to support the government, research institutes, industry, and communities to deliver our mandate towards commercializing and developing sector and people-centric nanotechnology solutions, local EV and hydrogen technology for the nation's sustainable economic growth".



31. Mobile Hydrogen Refueling Station Project Signing Ceremony - 20 July 2023

Minister of Science, Technology, and Innovation, YB Chang Lih Kang, had officiated the World Renewable Energy Congress (WREC) XXII 2023, focusing on the theme "Transition Towards a Carbon-Free Future." The international congress had gathered scientists, policymakers, industry players, students, and community representatives to address sustainable energy challenges. During the event, a collaboration document for the Mobile Hydrogen Refueling Station project had been signed, involving NanoMalaysia Berhad (NMB), PETRONAS, UMW, and Malaysia Green Technology and Climate Change Corporation (MGTC). This initiative had marked a significant step towards hydrogen mobility in Malaysia and had supported the country's Hydrogen Economy and Technology Roadmap (HETR). PETRONAS had provided hydrogen facilities, NMB had used nano-based technologies, and MGTC had focused on green incentives for hydrogen fuel cell technology advancement.



32. International Battery Summit 2023 - 1 August 2023

At the International Battery Summit 2023, Dr. Rezal Khairi Ahmad, CEO of NanoMalaysia Berhad, had proudly represented Malaysia as a panelist. Alongside Bernardus Irmanto from PT. Vale Indonesia and Dany Amrul Ichdan from MIND ID, they had explored the path towards global battery manufacturing excellence, leveraging Indonesia's abundant nickel resources. Our collaborative efforts with industry leaders had further accelerated the clean energy transition and had driven innovation in battery technology.



33. Malaysia Commercialisation Year 2023 - 3 August 2023

NanoMalaysia Berhad had made its mark as an exhibitor and distinguished panellist at the Malaysia Commercialisation Year Summit 2023. Dr. Rezal Khairi Ahmad, the Chief Executive Officer of NanoMalaysia Berhad, had shared insights and expertise alongside esteemed panelists Dr. Chen Yiren from Genedant and Aaron Sarma from ScaleUp Malaysia during Panel Session

4. Tackling the theme 'CROSS-BORDER COLLABORATION: MALAYSIA'S ROLE IN GLOBAL INNOVATION,' the discussion had shed light on Malaysia's crucial role in driving global innovation and fostering international partnerships. The event had served as a dynamic platform, uniting key players and thought leaders to shape a brighter future for Malaysia's presence on the global stage.



34. Green Waqaf Initiative - 6 September 2023

The "From Saplings to Forests" event at the Graduate School of Business, Universiti Kebangsaan Malaysia, was a huge success, with YB Syahredzan Johan, Bangi MP, inaugurating it. The event focused on the forum "Harnessing the Power of Waqf for Environmental Conservation," and we're proud to announce that NanoMalaysia Berhad was a key sponsor, making this project a reality.

Our partnership with Green Waqaf UKM goes beyond financial support; it's about our shared vision to create a sustainable rainforest ecosystem. This includes growing trees and fostering hope, resilience, and collective responsibility for our planet.

Green Waqaf's vision aligns perfectly with our values. Our sponsorship, which involves planting 200 trees, reflects our commitment to combating climate change, restoring ecosystems, engaging communities, and setting a conservation precedent. These aspects resonate deeply with our dedication to environmental stewardship and social responsibility.

At NanoMalaysia, we're deeply committed to Environmental, Social, and Governance (ESG) principles. Our collaboration with Green Waqaf UKM isn't just about trees; it emphasizes the

importance of aligning corporate values with global goals like the United Nations Sustainable Development Goals (UN SDGs).



35. Hydrogen Economy & Technology Roadmap Launching - 5 October 2023

On 5 October 2023, the Deputy Prime Minister, Datuk Seri Fadillah Yusof, had launched Malaysia's much-anticipated Hydrogen Economy & Technology Roadmap¹ ('Hydrogen Roadmap') at the International Greentech and Eco Products Exhibition and Conference Malaysia 2023.

The Hydrogen Roadmap was intended to be a supporting document to the National Energy Policy 2022-2024, which had envisaged the development of a hydrogen economy in Malaysia. This had also followed the launch of Malaysia's National Energy Transition Roadmap on 29 August 2023, in which hydrogen had been identified as one of the six energy transition levers that would drive the country's efforts to be a net-zero nation by 2050.



36. NanoKebangsaan 2023 - 9 October 2023

NanoMalaysia Berhad and the Malaysia Nanotechnology Industrial Group (MNIG) took part as exhibitors at NANOKEB 2023. NANOKEB 2023 was a noteworthy event organized by the National Nanotechnology Centre (NNC) and was inaugurated by YB Datuk Arthur Joseph Kurup, Deputy Minister of MOSTI, at Bangi Resort Hotel.

Their participation in NANOKEB 2023 was marked by a display of nanotechnology innovations and breakthroughs, reinforcing their commitment to advancing Malaysia's position in the global nanotechnology landscape. NanoMalaysia Berhad and MNIG actively engaged with visitors and fellow participants, fostering valuable connections and collaborations.

The event served as an excellent platform for NanoMalaysia Berhad and MNIG to showcase their contributions to the field of nanotechnology and highlight their dedication to fostering growth and innovation in this dynamic industry.



37. Dassault Systèmes Transportation & Mobility Industry Event - 31 October 2023

Dr. Rezal Khairi Ahmad, Chief Executive Officer of NanoMalaysia Berhad, participated in the Dassault Systèmes Transportation & Mobility Industry Event held at Le Meridien Kuala Lumpur in KL Sentral. This event focuses on the transportation and mobility sector, gathering industry professionals to discuss key topics and innovations in the field. It includes keynote speeches, panel discussions, workshops, and networking. The event is a platform for knowledge sharing and showcases Dassault Systèmes' solutions for addressing industry challenges. It's a valuable opportunity for professionals to stay informed and collaborate in the transportation and mobility industry.



38. Launch of Hydrogen Generator (HyPEReactor) - 15 May 2023

NanoMalaysia Berhad, together with HyPERTech Industries Sdn Bhd, Universiti Kebangsaan Malaysia's Fuel Cell Institute, and ADMatix Solutions Sdn Bhd today launched their solid-state-based hydrogen reactor referred to as the HyPEReactor. The reactor was unveiled by the Minister of Science, Technology, and Innovation, YB Chang Lih Kang in Shah Alam.

The HyPEReactor utilizes sodium borohydride (NaBH_4) and it is a “modular and customizable” hydrogen generation system – hydrogen is generated via hydrolysis of sodium borohydride. That hydrogen is then channeled to a fuel cell. The gist of the reactor is that it creates hydrogen on demand and that it tackles the storage problem of high-pressure liquid hydrogen.



39. Malaysia EV Tech 2023 - 9 November 2023

Malaysia EV Tech 2023 showcases the country's strong commitment to advancing its electric vehicle (EV) sector. This conference aims to highlight the efforts of the MOSTI and the Malaysian government/agencies in enhancing EV technology, infrastructure, and the overall ecosystem. The goal is to position Malaysia as a key leader in EV innovation and development.



40. NanoMalaysia participated in the Launch of the TVET Centre at Universiti Malaysia Perlis (UNIMAP) - 12 December 2023

NanoMalaysia participated in the Launch of the TVET Centre at Universiti Malaysia Perlis (UNIMAP). We were honored to have the Datuk Seri Mohamed Khaled Nordin, Minister of Higher Education visit our booth, where we showcased the Biomass Innovation Circular Economy Programme (BICEP)'s graphene production powder and our airsense 360 air monitoring system.



Activities from Member Countries

TAIWAN

Government Funding for Nanotechnology R&D

1. The Innovation and Application of Nanoscience Thematic Program (Initiated in 2014)

This Program supports research to proceed from a basic Technology Readiness Level (TRL) of “Concept Development” to a more advanced “Prototype Validation”.

Types of Project:

(1) Advanced Nanotechnology Research Project:

Each grant provides about US \$0.1 million per year for two years to support cutting-edge scientific discoveries.

(2) Innovation and Application Project:

Each grant provides about US \$0.23 million per year for three years, from concept development to prototype validation (TRL 1-4).

Research Areas	No. of running projects					Percentage of projects
	(1) <i>Advanced Nanotechnology Research /</i>					
	(2) <i>Innovation and Application Project</i>					
	2019	2020	2021	2022	2023	
Biotechnology & Medicine	13/0	11/0	15 (10/5)	14 (8/6)	10 (7/3)	46%
Energy & Environment	4/0	5/0	6 (5/1)	6 (4/2)	5 (2/3)	19%
Electronics & Optoelectronics	2/0	6/0	7 (4/3)	9 (4/5)	5 (1/4)	21%
Characterization & Synthesis	2/0	3/0	4 (3/1)	4(4/0)	5 (5/0)	13%
Total	21 (21/0)	25 (25/0)	32 (22/10)	33 (20/13)	25 (15/10)	

2. Taiwan in M-ERA.NET Joint Call

More than 30 funding agencies participate with an indicative budget of more than 40 million €. Taiwan's National Science and Technology Council (NSTC) joined as a member with 0.75 million (2023) euros to support joint research projects every year.

The Call 2023 includes the following thematic areas:

- Sustainable advanced materials for energy
- Innovative surfaces, coatings and interfaces
- High performance composites
- Functional materials
- Advanced materials and technologies for health applications
- Next generation materials for advanced electronics

Funded Proposals of Call 2022 (projects started from 2023):

1. Inert Coatings for Prevention of Ageing of NMC Cathode for Lithium-Ion Batteries (Partner, National Taiwan University)
2. Lithium Metal Coating Technologies for Future Generation Batteries (Partner, National Taiwan University of Science and Technology)
3. Engineering of two-dimensional heterostructural photocatalysts for hydrogen generation (Partner, National Taiwan University)
4. Atomic-layer 3D printing as a new paradigm for smart sensorics (Partner, National Yang Ming Chiao Tung University)

3. Taiwan-NSTC/ USAF Topological and Nanostructured Materials 2nd Annual Program Review

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

Annual program reviews are held in Taiwan or US by turns. During the 2023 review in Dayton, Ohio, US, participants also visit National Museum of the USAF and AFRL Materials & Manufacturing Directorate (RX) Laboratories in Wright Patterson Air Force Base.

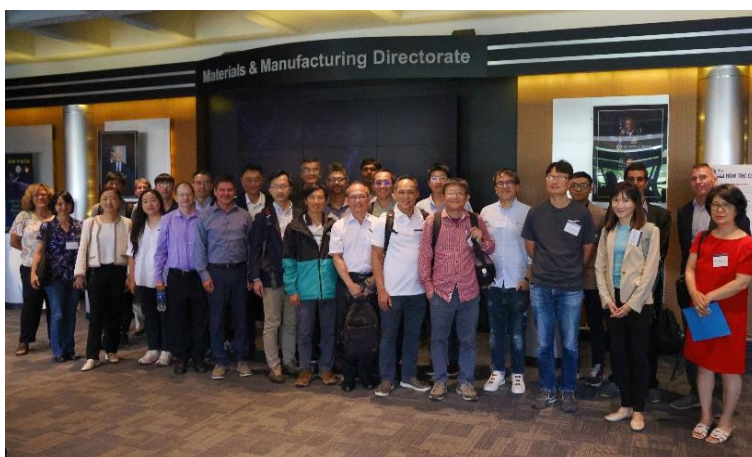
This program announced every 3 years has the Technology Readiness Level (TRL) between 1 and 1.5 and mainly focuses on materials research:

- Topological and Qubit Materials
- Novel Multifunctional Materials
- Biocompatible Nanomaterials

- Machine Learning Guided Materials Research



AFOSR held annual review meeting this year.



The participants also take a tour of AFRL labs inside Wright-Patterson Air Force Base.

4. Nanomaterials Registration Management

- Regulations of New and Existing Chemical Substances Registration Issued by Taiwan EPA on 23 Nov. 2021

Article 8

For a new chemical substance meeting the circumstances of being a substance used for the purposes of “Scientific Research and Development”(SRD) or “Product and Process Orientated Research and Development”(PPORD); or having other special forms, in addition to registering the new chemical substance in accordance with the required information items of the Regulations, the registrant shall fill in and submit the following documents to the central competent authority:

- I. Registration form for SRD and PPORD
 - II. Registration form for nanoscale chemical substances
- Guidance for New and Existing Chemical Substances Phase 1 Registration (Draft) Issued date: September 2022

Nanomaterial: Clause 3.2.6; Appendix 5

Registration types based on estimated annual manufactured or imported quantity.

Small Quantity Registration (<100 kg/y, Level 1)

Simplified Registration (<1000 kg/y, Level 1)

Standard Registration (>1000kg/y, Level 1 to 4, submit hazard and exposure assessment)

5. Occupational safety

Many chemical fume hoods are used for controlling nanoparticle emission during nanomaterial handling processes. To protect nanopowder handling workers, Taiwan ILOSH (Institute of Labor Occupational Safety and Health) and National Yang Ming Chiao Tung University have been investigating the leakage control efficiency and its relationship with different operation conditions for 3 different fume hoods: constant air volume (CAV), air curtain (AC), and constant air volume (CAV) hoods.

The nanoparticle source (nano-titanium dioxide TiO_2 or sodium chloride NaCl) was released from inside of the fume hood to simulate the nanoparticle handling operations. For the CAV hood, the leakage percentage of nanoparticles is 13.76% when the sash is fully open. The leakage percentage decreases to 0.34% when the sash is changed to half open. In comparison, the leakage percentage of the VAV hood is lower than that of the CAV hood which is just 0.37% when the sash is fully open. The leakage percentage is further decreased to 0.10% when the sash is half open. Similarly, the air curtain (AC) hood also has less leakage percentage of about 0.18% and 0.17% when the sash is fully open and half open, respectively. The results show that the leakage of nanoparticle is higher for the CAV hood when the sash is fully open since the face velocity of 0.3 m/s which is lower than the recommend value of 0.5 m/s. In comparison, the VAV hood can maintain a constant face velocity of 0.5 m/s when the sash is open at any height. It is worth noting that the leakage percentage is below 0.2% for all three types of fume hoods when the sash is half open indicating good nanoparticle leakage efficiency. In summary, the VAV and AC fume hoods control nanoparticle emission effectively compared to the CAV hood.

6. Glycosidic switch liposomes

Liposomes are an established nanotechnology for cancer therapy. Although liposomal nanocarriers are increasingly impacting the clinical treatment of cancers, progress is limited by the lack of a general platform to load and retain anticancer agents in liposomes. We overcome this limitation by chemically incorporating a “glycosidic switch” into anticancer drugs. The glycosidic switch can be controllably interconverted between a lipid-soluble ester form for loading and a water-soluble glucuronide form for stable drug retention in the aqueous core to create glycosidic switch liposomes (GSL, Fig. 1). Our first GSL which encapsulated with 9ACG, that displays promising anti-tumor efficacy compared to the clinical-used drugs for pancreatic cancer, gemcitabine and Onivyde® (Liposomal CPT-11 injection) (Fig. 2). SN-38 is an attractive candidate for glycosidic switch strategy, that is an activated metabolite of CPT-11 in the treatment of various malignancies, that also be glucuronidated via an extensive conjugation with D-glucuronic acid through the UDP-glucuronosyltransferase 1A1/9. However, the synthesis of this natural SN-38G is challenging, regardless of chemical route or animal, the production yield is lower than 5%. Currently, we developed a new synthesizing strategy for SN-38G with a superior yield of over

70%. Moreover, we obtained liposomal SN-38G through the GSL strategy with high loading efficiency (80%) and nearly 100% retention stability (Table. 1). Besides camptothecin derivatives, we also developed MMAE, an auristatin analog that displays higher potency, to seek an appropriate candidate for GSL. The V.5 shows promising loading efficiency (38%) and 98% retention stability (Fig. 3).

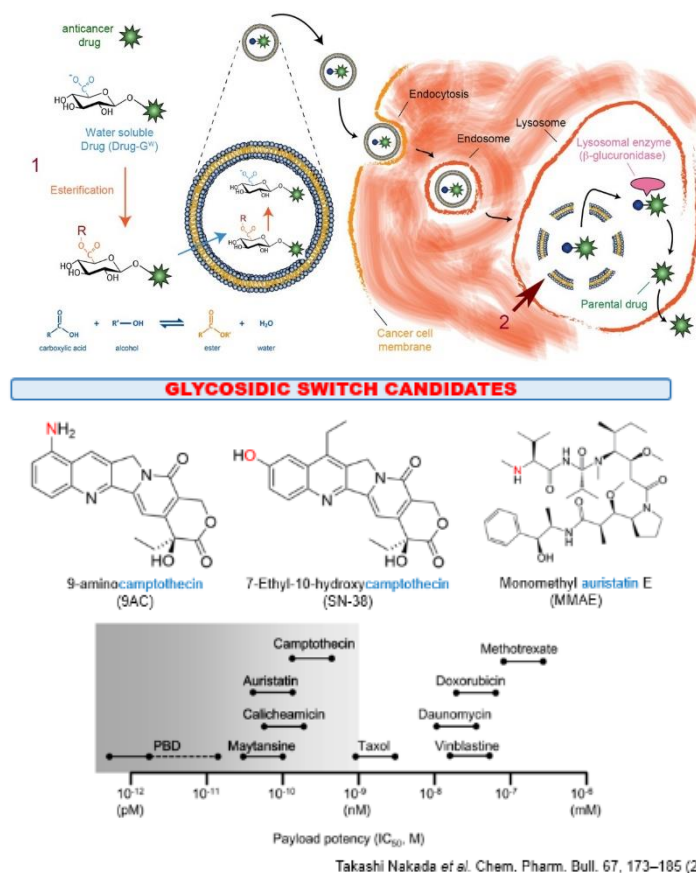


Fig. 1 Schematic diagram of glycosidic switch strategy for drug loading in liposomes and intracellular drug regeneration: A water-soluble glycosidic switch (GW) is attached to a hydrophobic drug to generate a water-soluble drug (Drug-GW). The glycosidic switch can be esterified to produce a lipid-soluble form (Drug-GL) to facilitate active loading in liposomes. At a high internal pH in the aqueous lumen of the liposomes, the glycosidic switch is spontaneously saponified to the water-soluble form, resulting in strong retention of Drug-GW. Drug-GW liposomes are stable in circulation and can be safely delivered to tumors for cellular uptake. The glycosidic switch on Drug-GW is enzymatically removed by the lysosomal enzyme beta-glucuronidase to regenerate the parental drug inside cancer cells. Some GS drug targets are shown on the right.

Results:

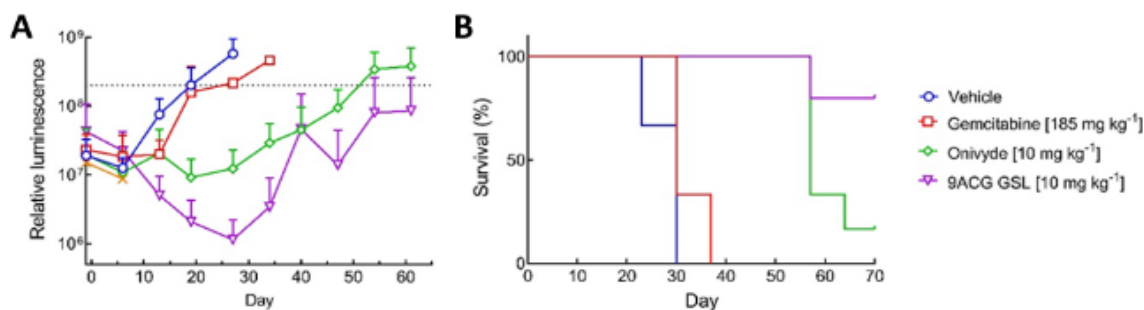


Fig. 2 9ACG GSL displays antitumor activity against human pancreatic cancer. Groups of three NOD-SCID mice were orthotopically injected with CFPAC-1/Luc human pancreatic cancer cells. After 12 days, mice received the vehicle, 185 mg/kg gemcitabine, 10 mg/kg Onivyde®, or 10 mg/kg 9ACG GSL via *i.v.* injections every week for 5 weeks. (A) Bioluminescence image, and (B) mean *in vivo* luminescence signals from cancer cells measured on an IVIS imaging system. (C) Mice survival rate.

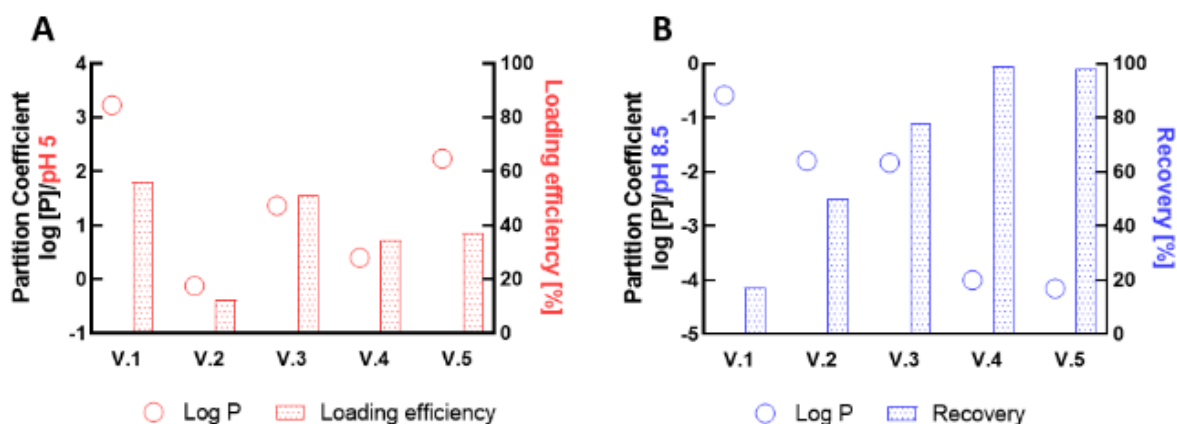


Fig. 3 Effects of modulated MMAE-G derivatives. **A.** The logP of the lipid-soluble form at pH 5, higher values demonstrate its hydrophobicity which facilitates the loading efficiency of GSL. **B.** The logP of the water-soluble at pH8.5, lower values demonstrate its hydrophilicity, which stabilized the drug's retention inside the liposome.

Table 1. Partition Coefficient and Relevant GSL Parameters of SN-38G Derivatives

SN-38G	pH 5, loading efficiency of drug ^L		pH 8.5, stability of drug ^W retained	
	Log P of drug ^L	Loading efficiency (%)	Log P of drug ^W	Recovery after dialysis(%)
R1*	0.36	80	-3.7	100**
R2	0.85	67	-3.4	100**
R3	1.3	59	-3.2	100**

*R1, shows the best loading.

**Loaded SN-38G is stable inside the liposome.

Table 2. Partition Coefficient and Relevant GSL Parameters of MMAE-G Derivatives

MMAE-G	pH 5, loading efficiency of drug ^L		pH 8.5, stability of drug ^W retained	
	Log P of drug ^L	Loading efficiency (%)	Log P of drug ^W	Recovery after dialysis(%)
V.1	3.2	56	-0.58	17
V.2	-0.12	13	-1.8	50
V.3	1.4	51	-1.8(OMe ^{1/2})	78
V.4	0.4	35	Est. -4	100
V.5*	2.4	37	-4.2	98

* V.5 possesses rational hydrophobicity for GSL loading and extreme hydrophilicity for stabilizing the drug's retention inside the liposome.

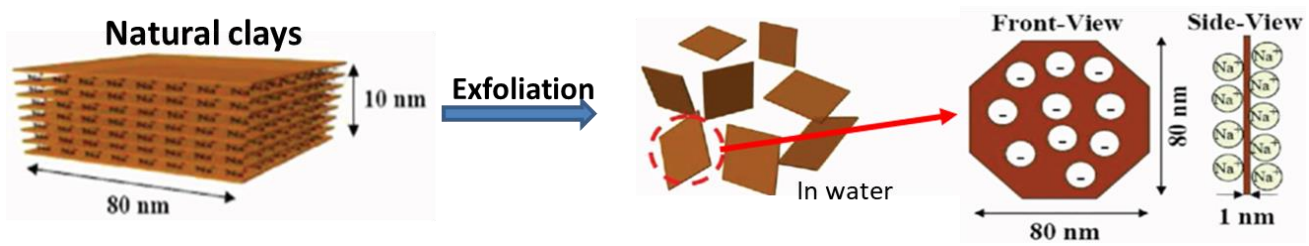
Sources: Yu-Lin Leu, Department of Pharmacy, Chia Nan University; Chun-Hung Lin, Institute of Biological Chemistry, Academia Sinica; Steve Roffler, Institute of Biomedical Sciences, Academia Sinica, from 2023 奈米科技創新應用計畫研究成果交流會暨審查會議

7. Nanotechnology Standards

ISO TS 4971: 2023 (published)

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.

Benefits/Impacts:

1. This standard provides a method for quality control of clay nanoplate. It can predict their ability to inhibit the growth of pathogenic bacteria and their effectiveness as an antimicrobial agent.
2. The application of this standard can help protect crops from diseases and reduce the use of harmful chemicals, resulting in environmentally-friendly crops and increased harvest yield

8. NanoMark in Taiwan

The nanoMark system was initiated by the Ministry of Economic Affairs in 2004. In 2017, the nanoMark system was transferred to TANIDA.

- 52 testing specifications
- 14 certification testing labs with 156 testing items
- 14 certified firms with 67 product types and 1770 product models (2023)

Total 14 firms:

- Sanitary Equipment (4 firms): Antifouling Sanitary Ceramic Ware; Antibacterial Sanitary Ceramic Ware.

nanoMark



Taiwan (2004)
Voluntary

- 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; Antibacterial Steel.
- Others (1 firms): Lubricants for Wear.

9. Research Institute



ITRI
Industrial Technology
Research Institute

Industrial Technology Research Institute.

Material and Chemical Research Laboratories.

Div. of Applied Chemistry. Dept. of Precision Purification & Application.

LCD Glass Nanoporous Material – Create New Circular Applications.

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TzBang Du / Manager TEL: +886-3-5732408 E-mail: DuTzBang@itri.org.tw

Due to its high melting point, LCD glass can't be recycled in the glass industry. A new technology from ITRI, involving nanopore modification, creates nanopores on LCD glass, making it negatively charged and capable of capturing metal ions. After system improvements and factory validation, this Glass Nanoporous Material can be integrated into electroplating. This enables recycling of process water, capturing metal ions and reusing it. The adsorption amounts up to 16%. This technology eliminates metal sludge and turns it into functional glass enriched with metals. The adsorption amounts up to 16%. This technology eliminates metal sludge and turns it into functional glass enriched with metals for humidity control, deodorization, and antimicrobial properties.



LCD Glass Nanoporous Material

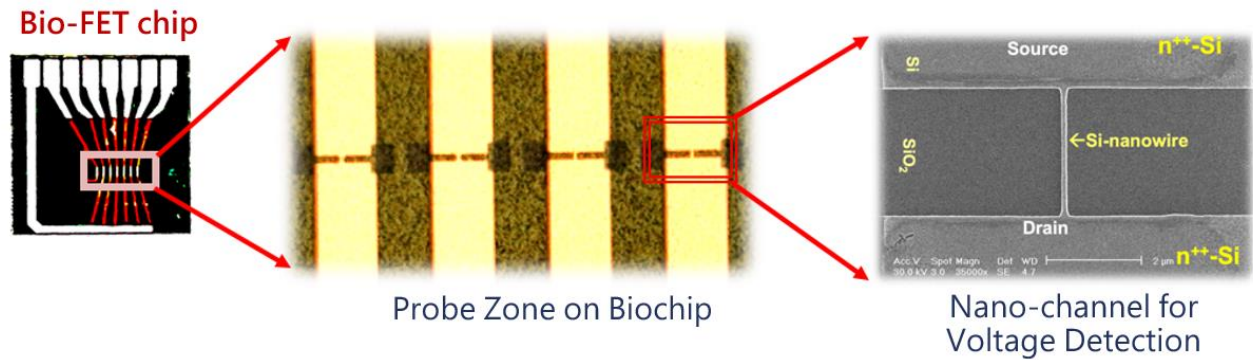
functional glass enriched with metals.

10. Startups – Nanobio

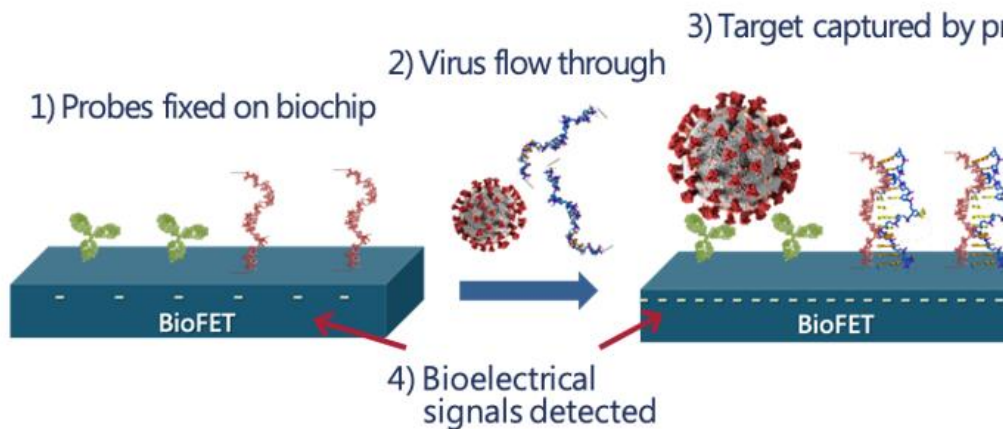
Company: Molsentech (2014)



Ultrahigh Sensitive SiNW-FET Biosensor For Early Detection of COVID-19



Process



Simplify Precise Detection !

Detection time: 5 to 30 minutes

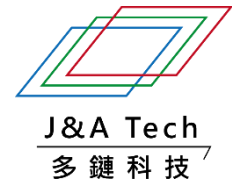
Detection limit: 10^{-15} M for nucleic acid and 10^{-12} g/ ml for protein

Courtesy of Molsentech



11. Startups - Agriculture

Company: J&A Tech (2018)



Apply to zero pesticide agriculture, zero antibiotic livestock, and anti-virus to bird flu

J&A Tech was founded in 2018. NSP has been commercialized in Taiwan for use in agriculture, achieving zero pesticide use for crop production and zero antibiotic use for livestock farming.

In crop production, a large-scale field trial of over 200 acres of rice growth has been completed successfully, resulting in a 20% increase in rice grain yield. More than 30 different crops, fruits, and vegetables, including potatoes, corn, tomatoes, tobacco, strawberries, Chinese herbs, and tea trees, have shown excellent results without the use of pesticides.



Red pepper



Coffee tree



Strawberry



Rice



Peas



Vegetable

In livestock farming,

The NSP is being developed to grow chickens and pigs without using antibiotics, even when treating bird flu virus infection. Animal feed is also undergoing numerous field tests to achieve the goal of "zero-antibiotics" for livestock farming.

Courtesy of J&A Technology Co.

12. Nano Materials

Company: ZANY MATERIALS TECHNOLOGY LTD.



ZANY MATERIALS TECHNOLOGY LTD., established in Taipei City, has a history of over 25 years. The company specializes in precision metal processing for export, development and manufacturing of components for the aerospace and automotive industries, as well as device assembly and production. Additionally, it actively engages in bulk plastic raw material trading, with its primary market focus on Asia and Europe.

The unprecedented challenges brought forth by the 2019 COVID-19 pandemic prompted ZANY to join hands with the Taiwan Industrial Technology Research Institute to explore nano-technological innovations. Leveraging the successful water-based nano-composite material - nano-silver composite titanium dioxide technology in ITRI, we applied it ingeniously to safety belt metal buckles. This pioneering technology grants commonly used safety belts in daily life with long-lasting antibacterial and antiviral properties. Validated by Taiwan's P4 Laboratory, our technology effectively suppresses the novel coronavirus and has commenced tailored promotions and sales efforts in the market.

The successful application of this technology not only underscores ZANY MATERIALS TECHNOLOGY LTD.'s steadfast commitment and capabilities in industrial technological innovation but also exemplifies Taiwan's collaborative ethos among businesses amid pandemic adversity. In the future, ZANY remains devoted to technological research and innovation, continuously expanding market reach to deliver top-notch products and services to our customers.

13. Taiwan Pavilion in nano tech 2024



- Center for Nanoscience and Nanotechnology, National Sun Yat-sen University
- *Patterned GaN micro-disks for full-color micro-LED display*
- Academia-Industry Collaboration Center, National Chung Hsing University
- *Nanofilm for Agricultural Product Preservation.*
- Department of Materials Science and Engineering, National Cheng Kung University
- *Novel Silver-based Nanomaterials for Novel Applications*
- Luxor Thermal LTD.
- *Thin Film with Super High Heat Generation Efficiency*
- Material and Chemical Research Laboratories, Industrial Technology Research Institute
- *LCD Glass Nanoporous Material – Create New Circular Applications*
- *Applications of Nylon nano-composite technology*
- ZANY Materials Technology Ltd.
- *Nano-scale antibacterial and antiviral coating technology is applied to aviation fastener parts*
- *Purification and functionalization of nanodiamonds*
- *ZANDEC Antiseptic & Disinfectant Spray*

- Department of Chemical Engineering, National Taiwan University
- *Novel Processing Technology for Recycled PET Derived from Waste Colored PET Materials*
- National Taiwan University of Science and Technology
- *All-Paper-Based Environmentally Friendly Moisture-Powered Battery*
- STRONG NANO TECH.CO.,LTD.
- *Nano gold catalyst additives (Diesel fuel additives, Gasoline additive, Engine oil additives)*
- Just Nanotech Co., Ltd.
- *Nano Bead Mills & Functional Nano Dispersions*
- Biomedical Translation Research Center (BioTReC), Academia Sinica
- *Development and Applications of High-Throughput, Label-Free Nano-Plasmonic Imaging Technology*
- Academia-Industry Collaboration Center, National Chung Hsing University
- *Advanced SERS biomedical detection based on composite nanochips*
- Protrustech Co., Ltd.
- *Liqui Nano Particle Signal Enhanced Detection Platform*
- Nanovie Co., Ltd.
- *Nanovie large-area coatings & thin films made from nanoparticles*
- *Nanovie Metal Xano M - Nano-particle & thin film mass production equipments*
- Molsentech
- *Ultrahigh-sensitive Semiconductor BioChip and Analyzer*
- Core Facility Center, National Cheng Kung University
- *Visible Planar Metalens*
- *High Throughput Detection of Serum Proteins Using Digital Barcode Microbead Platform*
- HOU CHI CHEMICAL CO., LTD.
- *Auto Formula Shaker - 720*
- *Nano ceramic bead mill*
- Institute of Biomedical Sciences, Academia Sinica
- *Glycosidic switch liposomes, an effective nanomedicine platform for cancer therapy*
- Harvard Medical School Mclean Hospital / Taipei Medical University Shuang-Ho Hospital
- *A Soft Gel of Collagen with Hyaluronic Acid, Glycosaminoglycan, Chondroitin, Pomegranate, MSM and Vitamin C for Joint Repair*
- *Early Detection of Implant Osseointegration after Maxilla Implantation Using Nano Imaging*
- Graduate Institute of Biomedical Optomechatronics, Taipei Medical University
- *High-Precision Multifunctional Optoelectronic Medical Platform*
- AimCore Technology Co.,Ltd
- *Using nanoimprint/electroforming technology to produce nano metal wire polarizers for visible and near-infrared wavelengths*

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 28 February 2023, NANOTEC and the College of Nanotechnology at King Mongkut's Institute of Technology Ladkrabang (KMITL) organized Nanosafety workshops to help build students and faculty understand issues related to nanotechnology. This year the workshop is arranged in a physical setting under the precaution. 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 safe and sustainable nanotechnology Nanosafety topics 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 participating in the question, and answer session.



Nanosafety workshop at KMITL

2. NSTDA Annual Conference (NAC 2023) Seminar Session on Nanosafety: legislation on submicron particles

On 30 March 2023, 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 seminar was focused on 4 topics as follows.

5. Measurement and analysis method of submicron particles in the air.
6. Combustible Dusts: Law and Regulation.
7. Managing Chemical Hazards in the workplace.
8. Health and safety practices occupational settings relevant to nanomaterials

NANOTEC speakers together with the speaker from Department of Industrial Works and Department of Labour protection and welfare also answer the questions from the participants.

The objective of this seminar is to share information about submicron particles in the out-door environment and workplace including the law regulation and related guideline to all stakeholders. The participants are including but not limited to the nine Nanosafety Network for Industry partners, academia, research agencies, and private sectors.



*NSTDA Annual Conference (NAC 2023)
Seminar on Nanosafety: legislation on submicron particles*

3. MOU Ceremony between NANOTEC and 10 partner organizations on Nanosafety Network for Industry phase 2.

On 25 April NANOTEC and 10 partner organizations celebrate MOU on Nanosafety Network for Industry phase 2. Due to the first phase of the Nanosafety Network, which ends in December 2022, being successful. In the initial stage, nine organizations—NANOTEC, Thailand Food and Drug Administration, Thai Industrial Standards Institute, Office of the Consumer Protection Board, Department of Industrial Work, National Institute of Metrology, Federation of Thai Industries, Council of Scientific and Technological Associations of Thailand, and Nanotechnology Association of Thailand—worked together to establish various activities related to nanosafety. Phase 2 of the collaboration was approved by all alliance groups, and two additional agencies—the departments of labour safety and welfare and pollution control—joined in this phase. The "The Nanosafety and Ethics Strategic Plan of Thailand" will unite all organizations in phase 2 to establish nanosafety knowledge for all stakeholders for the sustainability of nanotechnology development in Thailand. The honorable guests during the ceremony including the representatives from Secretary of Ministry of Higher Education, Science, Research and Innovation, Dr. Junpen Meka-apiruk and President of National Science and Technology Development Agency, Prof. Dr. Sukit Limpijumnong.



MOU ceremony on Nanosafety Network for Industry phase 2

4. PROPAK Asia Seminar on “Technology and biological processes for food and food packaging”

On 15 June 2023, NANOTEC and Council of Scientific and Technological Associations of Thailand (COSTAT) joined the 30th International Processing and Packaging Exhibition for Asia (PROPAK Asia) to organize a seminar on “Technology and biological processes for food and food packaging”.

Maj. Gen. Dr. Chainarong Cherdchu, President of COSTAT and Chairman of Nanosafety Network for Industry, NANOTEC gave the opening remarks. The seminar topics included the following:

- “Bioprocessing: From Thai Bioresources to Application”
by Dr. Kobkul Laoteng, Director of Functional Ingredients and Food Innovation Research Group, BIOTEC/NSTDA Core Business Director, Service Platform for Food and Functional Ingredients (FoodSERP).
- “Nanomaterials and Nanoplastics: Perspectives on Food Safety and Environment”
by Dr. Sasitorn Aueviriyavit, Researcher, NANOTEC
- “Zero food waste”
by Mr. Wattanapong Petcharat, Wiangsra Industrial and Community Education College, Surat Thani.



ProPak Seminar on “Technology and biological processes for food and food packaging”

5. Standard Developing Organization 2023

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 9 June the SDOs committee started the 1st meeting on the National Industrial standard draft of Emblica Extract and Pueraria Extract Nano-Encapsulated Particles.

6. The 6th Eu-Asia dialogue

On 21 June 2023, the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and BioNanoNet Forschungsgesellschaft mbH (BNN) organized the 6th EU-Asia Dialogue on Nanosafety entitled “The role of characterisation and how it is addressed in International Network Initiative on Safe and Sustainable Nanotechnology (INISS-nano)” Dr. Waluree Thongkam was invited as a chair of the break-out session of “Societal and Ethical Considerations – Policy Framework for Characterization” supported by ANF Nanosafety & Risk Management Working Group. In this session, Dr. Waluree shared her idea on the safety and sustainability of nanomaterials and advanced materials. The result of the discussion is that there will be collaboration work between Pillar 1 “Characterization Items in Standardization” and Pillar 4 “Societal and Ethical Considerations – Policy Framework for Characterization” of INISS-nano and the webinar between EU and ANF will be planned and hosted by NANOTEC, Thailand in the future. In addition, they discussed that the key for driving the societal and ethical consideration on policy framework for characterization are language barrier solution, two-way communication, and mutual learning.



The 6th EU-Asia Dialogue on Nanosafety entitled “The role of characterisation and how it is addressed in International Network Initiative on Safe and Sustainable Nanotechnology (INISS-nano)”

7. NANOTEC Team participated in the 20th Asia Nano Forum Summit and 2023 NANOTEC-SAINT Collaborative Meeting in Korea.

Dr. Wannee Chinsirikul, NANOTEC Executive Director, and Dr. Pavadee Aungkavattana, NANOTEC Deputy Executive Director participated in the 20th Asia Nano Forum Summit (ANFoS2023). The event was held in conjunction with the 21st International Nanotech Symposium (NANO KOREA 2023 Symposium), 5-6 July 2023, Korea.



Dr. Wannee Chinsirikul, NANOTEC Executive Director, serves as ANF President chairing the 20th Asia Nano Forum Summit (ANFoS2023) while Dr. Pavadee Aungkavattana, NANOTEC Deputy Executive Director, serves as ANF Secretary updating the committee about the ANF annual activities and financial status. The committee also reported on the ANF pilot initiatives for ANF Young Researchers Exchange Program: Bridging R&D to Commercialization Exposure to promote the cooperation of technology transfer (i.e. steps from R&D to Commercialization) Harmonization of Standards & Nanotechnology Product Certifications, Inter-lab comparisons, etc.



One of the ANFoS 2023's agenda is the election of new ANF Office Bearers 2024-2025. The results of the Election was announced. Dr. Rezal Khairi Ahmad (NanoMalaysia, Malaysia) was elected to be ANF President. Dr. Jun'ichi Sone (JST (Emeritus) / Japan) and Dr. Annabelle V. Briones (DOST-ITDI / The Philippines) were elected to be Vice Presidents. Prof. Changhwan Choi (KoNTRIS / Korea) was elected to be treasurer. Dr. Pavadee Aungkavattana (NANOTEC, /Thailand) Dr. Ruslinda A. Rahim (NNC / Malaysia) were elected as ANF Secretary 2024-2025. This is the second term of Dr. Pavadee to serves as ANF secretary.



As part of ANFoS 2023, ANF Workshop on Commercialization was organized under the theme “Sustainable Commercialization of Nanotechnology for People, Planet and Profit” in which Dr. Rezal Khairi Ahmad, ANF Vice President (NanoMalaysia, Malaysia), Mr. Pogany Alexander (BMK, Austria), and Dr. Junichi Sone (JST, Japan) are the working group coordinator. The objective of this workshop is to exchange the information on policy and the applied of

nanotechnology in industrial sectors. Dr. Pavadee Aungkavattana was invited as one of the speakers to give a presentation on “Nanovation for a Better Life through NSTDA Startup”. This session was attended by speakers and participants from Germany, Indonesia, Japan, Korea, Malaysia, Taiwan, and Thailand.



Representatives from each ANF working groups reported the progress and activities during this year. Ms. Benyapa Suwan, Director of Collaboration and Public Relations Division, serves as ANF secretariat Team reported the activities of ANF Nanosafety & Risk Management Working Group on behalf of Dr. Waluree Thongkam, Senior Technical Officer of Nano-Safety Alliance Section, NANOTEC. This working group has been formed with the purpose of effectively coordinating nanosafety activities within the region through the Asia Nano Safety network. The primary objectives of this group involved the harmonization of nano safety training, the implementation of a safe-by-design approach to nanotechnology development, and the facilitation of translational nano research. Dr. Wannee Chinsirikul and Dr. Paul Wright (Australia) are the coordinators of this working group.

8. 2023 NANOTEC-SAINT Collaborative Meeting



2023 NANOTEC-SAINT Collaborative Meeting
Friday July 7, 2023, 09.00 – 11.30 (Korea Time)

Rm. 83221, 2nd Research Complex, SKKU Suwon Campus, Republic of Korea



On 7 July 2023, the 2023 NANOTEC-SAINT Collaborative Meeting was hosted by SKKU Advanced Institute of Nano Technology (SAINT), Sungkyunkwan University (SKKU), at

Suwon campus, SKKU, Republic of Korea. Prof. Sungjoo Lee, Head of SAINT/ SKKU welcomed NANOTEC delegates and participants. The objective is to strengthen the collaboration on nanoscience and nanotechnology between Thailand and Korea which is under H.R.H. Princess Maha Chakri Sirindhorn initiative since April 2013. The meeting comprises of 2 sessions which were scientific meeting and the executive meeting. There were 7 topics from both SAINT/ SKKU professors, NANOTEC/NSTDA researchers and Ph.D. student by Royal Thai government scholarship under joint supervision of SKKU Alumni were presented on nano-biosensors, renewable energy, and recycled batteries, in which SAINT, SKKU professors possess expertise. To achieve the objectives, the mechanisms such as joint supervision, funding opportunities, sharing user facilities and people mobility will be explored more in the future.



The Executive Meeting was set up with an aim to discussion on the possibility of the SKKU Studentship and Fellowship program in phase II. Dr. Chadamas Thuvasetthakul, who is committee member of the Information Technology Foundation under the Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn, was presented on behalf of Prof. Pairash Thajchayapong, Secretary-General of the Information Technology Foundation under the Initiative of H.R.H. Princess Maha Chakri Sirindhorn to discuss with Prof. Jibeom Yoo, President of SKKU and Prof. Sungjoo Lee, Head of SAINT/ SKKU.



In this regards, NANOTEC delegates visit Assoc. Prof. Jung Heon Lee, School of Advanced Materials Science & Engineering, SKKU to promote the collaboration on biomedical and environmental sensors.



9. NANOTEC organized a seminar on “Energy Storage Development and Recycling Perspectives”



On 18 August 2023, NANOTEC organized a seminar on “Energy Storage Development and Recycling Perspectives” at Novotel Bangkok Ploenchit Sukhumvit, Thailand. This event is part of the project entitled “Utilization and upcycling of graphite waste from spent Li-ion batteries to regenerative electrodes for Zn-ion batteries” which was granted by the Office of the Permanent Secretary (OPS), Ministry of Higher Education, Science, Research and Innovation (MHESI),

Thailand. This project is a collaboration among Thailand by NANOTEC and ENTEC, China by Zhejiang Sci-Tec University and Guangzhou Great Power Energy & Technology CO., LTD., and USA by Wilson College of Textiles, North Carolina State University.



The objective of this seminar is to build a network both locally and internationally through the integration of knowledge and discussion on energy storage development and recycling perspectives among peers. Moreover, we expected to build the country's competitiveness in a sustainable way.

Leading professors and scientists from renowned institutions (the name list below) were invited as speakers, details as following:

- Prof. Xiangwu Zhang, Wilson College of Textiles, North Carolina State University, USA
- Prof. Yi Hu, Zhejiang Sci-Tech University, People's Republic of China
- Prof. Suwabun Chirachanchai, Petroleum and Petrochemical College (PPC), Chulalongkorn University, Thailand
- Dr. Pimpa Limthongkul, ENTEC, NSTDA, Thailand
- Dr. Varol Intasanta, NANOTEC, NSTDA, Thailand, and
- Dr. Nakarin Subjalearndee (PI of this project), NANOTEC, NSTDA, Thailand

The seminar served as a platform for researchers and participants to exchange their research findings, insights, and experiences, fostering a collaborative environment for the advancement of energy storage development and recycling. The event witnessed the participation of over 50 attendees, further enhancing the dissemination of knowledge and promoting sustainable practices in the field.

The outcomes of this project are twofold: First, the establishment of a cooperative network with foreign countries and private companies. This could promote the utilization of the waste materials generated by the recycling of lithium batteries, thereby promoting a circular economy

and enhancing research capabilities in waste material utilization in global aspect. Second, the project aims to advance knowledge in energy technology development by exploring the potential of waste materials after lithium-ion battery recycling.



10. The Collaboration on CO2 Reduction and Bio-oil Deoxygenation between THAILAND and FRANCE.



On 27 October 2023 at NANOTEC, Thailand Science Park, Dr. Pongtanawat Khemthong, Principal Researcher and a group of NANOTEC Researchers from Catalyst Research Team, Nanocatalysis and Molecular Simulation Research Group welcomed the delegates of French National Centre for Scientific Research (CNRS) to NANOTEC. The visitors comprise of delegates from the L'Institut de recherches sur la catalyse et l'environnement de Lyon (IRCELYON), (Dr. Christophe Geantet, Deputy Director and Dr. Mathieu S. Prévot, Researcher)

and Dr. Antonio Aguilar Tapia, Beamline Scientist from the French Absorption spectroscopy beamline in Material and Environmental science (FAME), European Synchrotron Radiation Facility (ESRF). In this regard, Asst. Prof. Rattabal Khunphonoi from Khon Kaen University also accompanied the group to NANOTEC.

The aim of the visit is to follow up on the progress of the project “Sustainable Development of 2D Catalysts from Biomass for CO₂ Reduction and Bio-Oil Deoxygenation” which was granted by the Franco-Thai Cooperation Programme in Higher Education and Research Franco-Thai Mobility Programme (PHC SIAM) 2022-2023. This project is the collaboration between project leaders from THAILAND which are KKU and NANOTEC whereas CNRS are project leaders from FRANCE.



Apart from the visit, the delegates were invited to be the speakers at the hybrid NANOTalk series on “The success story under PHC Siam”. This event was organized with an aim to promote the European Synchrotron Radiation Facility (ESRF) for those interested in using the beamline synchrotron at Grenoble, France and to present information on PHC Siam scholarships and how to success in the research collaborations.



11. NANOTEC NSTDA – Thailand Nanotechnology Association and VISTEC inaugurated “NanoThailand 2023”



This significant event showcases global advancements in nanotechnology through the 8th International Conference and Exhibition on Nanotechnology (NanoThailand 2023) held at the National Nanotechnology Center (NANOTEC), NSTDA, and organized by the Thailand Nanotechnology Association in collaboration with VISTEC. The theme for this year’s event is “Nanotechnology for Sustainable World,” with the honor of being opened by Dr. Supachai Pathumnakul, Deputy Permanent Secretary of the Ministry of Higher Education, Science, Research and Innovation (MHESI).



Dr. Pavadee Aungkavattana, Deputy Director of Nanotec, NSTDA, emphasized that NanoThailand 2023, the 8th edition of the conference and exhibition, attracted more than 350 participants, including 100 international participants from 20 countries worldwide. This aligns with the objectives of the Thailand Nanotechnology Association, fostering academic exchange and knowledge dissemination, showcasing research outcomes, and promoting collaboration in nanotechnology research and innovation both nationally and internationally.

NANOTEC, NSTDA, plays a pivotal role as a research organization dedicated to excellence in nanotechnology innovation. Its commitment extends to establishing a foundation for the development of nanotechnology, contributing to academic strength through research and development, and applying research findings to create economic and societal impacts, ultimately enhancing the quality of life for the Thai population. NanoThailand serves as a crucial platform driving the progress of Thailand's nanotechnology on the global stage.

The NanoThailand 2023 international conference covers 13 topics, including Nanoencapsulation and Functional Ingredients, Theory and Simulation for Nanosystems, Nanosafety & Standard, Nanomaterials and Nanotechnology for Electronic/Optoelectronic Devices and Sensors, Nanomedicine, Nanosensor and Nano-Biotechnology, Nanotechnology for Energy Storage and Management, Nanotechnology for Environment and Agriculture, Nanotechnology for Catalysis and Industrial Applications, Nanotechnology for Startups and Industrial Enterprises, Nanocharacterization & Instrumentation, and three special sessions: Advanced Nanostructured Materials for a Global Circular Economy, Symposium on Bio-Based Chemicals & Fuels from Lignocellulose 2023 (Hub of Knowledge), and The 2nd Thailand Symposium on Nanopore technology.

The conference also featured presentations of outstanding nanotechnology research works, including nanocapsule technology and functional components, various inspection kits, carbon capture utilization (CCU) technologies, and innovative products developed from research by CLEANTECH AND BEYOND CO., LTD, under the auspices of the Vidyasirimedhi Institute.



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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

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