



ASIA NANO FORUM

ANNUAL REPORT 2018

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About Asia Nano Forum

Asia Nano Forum (ANF) is a network organization, founded in May 2004 and became a registered society in Singapore in Oct 2007.

Mission & Objective

The mission of ANF is to promote responsible development of nanotechnology that educationally, socially, environmentally and economically benefits members by fostering the international network collaboration. Its objectives are

- 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 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 Summit is held annually hosted by one of its member organizations where high-level invited delegates from government, academia and industry gather to report on the latest developments of nanotechnology in ANF member economies. The ANF summit is a flagship event of great significance to the hosting member economy which receives strategic support from ANF for its nanotechnology development.

Working Groups

Standardization

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

Through this working group, ANF is an official and very active member of ISO/TC229 and IEC/TC113 Standards for Nanotechnologies.

Coordinator: Dr. Bin-Cheng YAO (ITRI, Taiwan) - MikeYao@itri.org.tw

Dr Ali Beitollahi (INIC, Iran) - beitolla@iust.ac.ir ; Group Email - SG@asia-anf.org

Education

To inspire and train the future generation of leaders to drive nanotechnology R&D towards responsible development and sustainability of humanity

There are two flagship events in this working group namely Asia Nanotech Camp (ANC) and International Nanotechnology Olympiad (INO) which provide platform for young scientists to learn the latest nanotechnology development, forge early collaborations and addressing nano enabled innovation for solving problems related to sustainability.

Coordinator: Dr Ali Beitollahi (INIC, Iran) - beitolla@iust.ac.ir

Prof. Jason Chang (Academia Sinica, Taiwan) - jasonc@phys.sinica.edu.tw

Nano Safety

To coordinate nanosafety activities in the region through the Asia Nano Safety network, including harmonization of nano safety training, safety-by-design approach to nanotechnology development and translational nano research to the marketplace. Also, to provide a coordinated response for community concerns and engagement on nanotechnology safety and risk management issues.

This working group has been playing an active role in the annual International Symposium on Nanotechnology Occupational and Environmental Health (NanOEH) through offering Asia Nanosafety Award to distinguished young researchers.

Coordinator: Dr. Paul WRIGHT (Australia) - paul.wright@rmit.edu.au

Dr. Wannee Chinsirikul (NANOTEC, Thailand) - wannee@nanotec.or.th

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.

Coordinator:

Dr. Rezal Khairi Ahmad (NanoMalaysia, Malaysia) - rezal@nanomalaysia.com.my

Mr. Alexander Pogany (BMVI, Austria) - alexander.pogany@bmvit.gv.at

Dr. Jun'ichi Sone (JST, Japan) - junichi.sone@jst.go.jp

Member Organizations

Australian Nanotechnology Network, Australia

Austrian Ministry for Transport, Innovation and Technology (BMVIT), Austria

Iran Nanotechnology Initiative Council (INIC), Iran

Japan Science and Technology Agency (JST), Japan

National Institute for Materials Science (NIMS), Japan

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

Korea Institute of Science and Technology (KIST), South Korea

Korea Nano Technology Research Society (KoNTRS), South Korea

NanoMalaysia Berhad, Malaysia

National Nanotechnology Centre (NNC), Ministry of Energy, Science, and Technology, Environment and Climate Change (MESTECC), Malaysia

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

Innovation and Application of Nanoscience Thematic Program, Taiwan

National Nanotechnology Center (NANOTEC), Thailand

Asia Nano Forum Office Bearers (2018– 2019)



President
Toshihiko KANAYAMA
(AIST, Japan)



Vice President
T.K. LEE
(Academia Sinica, Taiwan)



Vice President
Peter MAJEWSKI
(Australian Nanotechnology
Network, Australia)



Treasurer
Rezal Khairi AHMAD
(Nano Malaysia)



Secretary
Yukio KIMURA
(AIST, Japan)

Asia Nano Forum Executive Committee (2018)



CHENNUPATI Jagadish
(ANN, Australia)



Alexander POGANY
(BMVIT, Austria)



Ali BEITOLLAHI
(INIC, Iran)



Jun'ichi Sone
(JST, Japan)



Yasuo KOIDE
(NIMS, Japan)



Byung-ki CHEONG
(KIST, Korea)



Abdul Kadir Masrom
(NNC, Malaysia)



Blessie A. Basilia
(ITDI, Philippines)



Maw-Kuen WU
(Acaemia Sinica,
Taiwan)



Wannee Chinsirikul
(NANOTEC,
Thailand)

Asia Nano Forum Former Presidents



Founding Chairman
Kazunobu TANAKA
(JST & AIST, Japan)



Founding President
(2008-2009)
Maw-Kuen WU
(Academia Sinica, Taiwan)



President (2010-2011)
Hak Min KIM
(KAIST, Korea)



President (2012-2013)
Teruo KISHI
(ISMA, Japan)



President (2014-2015)
Sirirurg SONGSIVILAI
(NANOTEC, Thailand)



President (2016-2017)
Ramam AKKIPEDDI
(A*STAR, Singapore)

Other Founding Members



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



Founding Vice President (2007-2010)
Khiangwee LIM
NRF, Singapore



Venkatesh Rao AIYAGARI
India



Jane NIALL
Australia



Hong Khoi PHAN
Vietnam



Wiwut TANTHAPANICHAKOON
Thailand



Halimatun HAMDAN
Malaysia

✧ Greetings from ANF President



Dear ANF members,

It is my great pleasure to present here a new issue of ANF Annual Report 2018. First of all, I deeply appreciate the effort of all the contributors to the report. This report is composed of survey of each Working Group, activities and policies of nanotechnology in member economies as well as the list of major related events. I hope this will give you a recent overview of ANF.

At the last summit meeting held in Taipei, Taiwan on May 18, 2018, we reviewed the status and activities of ANF and confirmed that the ANF acquired the solid presence in the nanotechnology community in Asia and related regions. For example, such activities as standardization, nanosafety, and commercialization are well supported and participated by many ANF members. We also discussed how we further strengthen the significance of ANF. One of the conclusions was to partly reorganize the Working Groups and their coordinators. We also decided that the continuation of each Working Group will be reviewed every two years always to keep the vitality. I hope these changes are reflected in this annual report.

The next summit meeting will be held in Philippines, in May 2019 by courtesy of Industrial Technology Development Institute (ITDI), Philippines. By that time, the ANF will sponsor several events, e.g., Asia-EU Dialogue on Nanosafety in October in Vienna and Nanosafety Technical Forum at Nano Thailand in December and will join in again Nanotech Japan 2019 in Tokyo. Needless to say, active participation by every member is essential to keep the ANF successful. I appreciate your proposals and inputs at any time and any occasion.

With best regards.

A handwritten signature in dark ink that reads "Toshihiko Kanayama". The signature is written in a cursive, flowing style.

Toshihiko Kanayama

President, ANF

✧ Working Group Report

Commercialization Working Group

1. Commercialization Dr. Rezal Khairi Ahmad, NanoMalaysia, Malaysia

The formation of Commercialisation Working Group (CWG) was agreed by Exco Members at ANFoS 2016, Singapore. The aim of the Commercialisation Working Group is to promote cross-border commercialisation activities facilitated by ANF platform at strategy and implementation levels. The Commercialisation Working Group also acts as a convergence and exchange platform facilitating cross-border technology transfer between businesses, research institutes and academia.

In 2017 NanoMalaysia hosted the ANF Commercialisation Working Group in Malaysia. The key members of the WG are Rezal Khairi Ahmad, Jun'ichi Sone and Alexander Pogany. There were 30 participants from 7 Malaysian companies as well as a delegation from the China Innovation Alliance of the Graphene Industry (CGIA).



During the Working Group, there was a sharing of commercialisation 'Success Stories & Challenges' by Malaysia Industrial Representatives. Divided into four sectors, the speakers and subjects were:

1. Electronic Devices & Systems

Dato' Dennis Chuah from Eclimo Sdn. Bhd. presented on the Applications of Graphene Ultracapacitor and Internet of Nano-Things Solution for Electric Bike.

2. Energy & Environment

Dato' Dr. Cheng Kok Leong from Nanopac (M) Sdn. Bhd. presented on Nano Light Energy Panels (NLEP), Sustainable Toilet System with Nanofiltration and System to Convert Air (Humidity) to Water.

3. Food & Agriculture

Mr. Izmir Hamid from NanoSiltech Sdn. Bhd. presented on Nanosilica Produced from Rice Husk.

4. Healthcare, Wellness & Medicine

Dr. Thomas Ong from Nanotextile Sdn. Bhd. presented on Technology Textile Solutions

The China Innovation Alliance of the Graphene Industry (CGIA) also presented during the Working Group. According to CGIA, there is an RMB 1 Billion investment to produce and commercialise Graphene-based products. NanoMalaysia's National Graphene Action Plan 2020 (NGAP2020) facilitates investment into collaboration projects between companies and research institutes in Malaysia. NGAP2020 and CGIA are also exploring possible collaborations with other ANF countries.



In the Breakout Session, there were discussions on approaches in terms of Proof of Concept, Product Development, Pilot Production, Scaling-up, Testing, Certification, Investments, Business Strategy as well Government Intervention in terms of Policy, Programme or Action Plan.

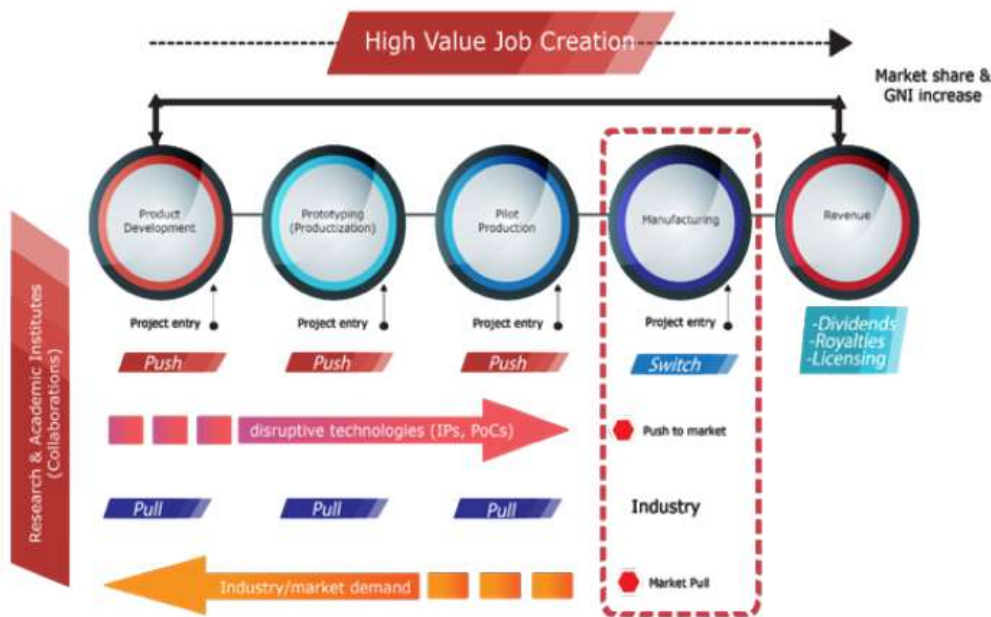
The participants also shared some challenges during the Workshop Session. The challenges highlighted include:

1. The need for focus funding in research and development, pre-commercialisation and commercialisation.
2. Indirect competition from existing products or solutions.
3. New product introduction is normally more expensive before scale-up
4. Government policies need to encourage adoption of new technology products and solutions.
5. Lack of IP advisory, strategy and protection especially for start-ups.
6. Lack of facilities and expertise specially to support commercialisation of disruptive nanotechnologies.
7. Lack of investment from private or angel investors in Malaysia.
8. Lack of partnership, collaboration or joint-venture within industry.

There was also a sharing of NanoMalaysia's **Nanotechnology Readiness Level (NRL)** which shows the level of market acceptance for nanotechnology products or solutions.

NanoMalaysia also shared two intervention programmes name **iNanovation** and the **National Graphene Action Plan (NGAP)**.

The **iNanovation** Programme is a multiple-helix facilitation scheme for nanotechnology ventures. It interfaces with pre-existing facilities and programmes throughout the innovation value chain. iNanovation is designed for the industries, small and medium enterprises (SMEs) and start-up companies to establish market share, introduce new process/material and switch from current conventional to nanotechnology-enabled through the iNanovation platform. The platform consists of pushing nanotechnology products and services into the market, improve products, increasing market share and venture into new markets, and enhance its current production process from conventional manufacturing to nanotechnology-enabled process. These facilitation scheme includes Venture funds, Soft loans, Business partners and Technology Expertise.



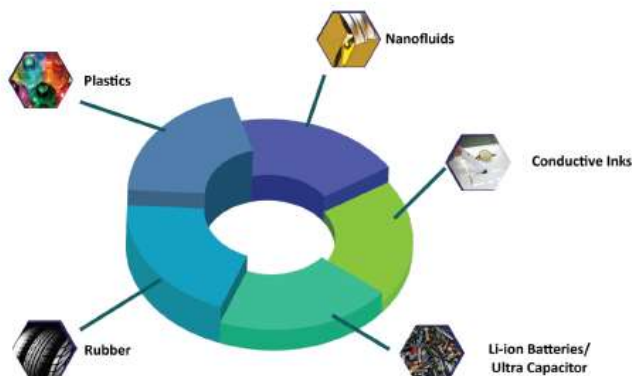
The National Graphene Action Plan (NGAP) is a commercialisation programme focusing on Graphene applications in five application areas:

- Lithium-ion battery anodes / ultracapacitors
- Conductive inks
- Rubber additives
- Plastics additives
- Nanofluids

The aim of NGAP is to enhance downstream applications relevant to Malaysia and eventually enabling a local Graphene eco-system to accelerate downstream adoption. By 2020, the National Graphene Action Plan has the potential to add more than RM 20 Billion in GNI impact and help create 9,000 Malaysian jobs.



Prioritisation of five application areas to enhance downstream applications relevant to Malaysia



Moving forward, it has been decided that in 2018 there will be three Commercialisation Workshop. Commercialisation Workshop 1 was held in February during Nanotec Japan partnering with NCBI where it was led by Junichi Sone and the CWG. The Workshop touched on Venture Success Stories & Business Matching, Development of local small and medium enterprises (SME) and Increasing the contribution to business income and job-creation through the nanotechnology commercialization.



Commercialisation Workshop 2, entitled “International Workshop on Nanotechnology: From Innovations to Applications” was held during ANFoS 2018 in May partnering with TANIDA.



2. Commercialization WG on its workshop held in Taiwan 2018 - by Dr. T. K. Lee, Academia Sinica, Taiwan

Taiwan hosted the ANFoS2018

Taiwan hosted the 15th Asia Nano Forum Summit (ANFoS2018) and a commercialization workshop in conjunction with ANFoS2018 earlier this year. This two-day event started with the “International Workshop on Nanotechnology: from Innovation to Application” on 17 May, followed by the Summit Meeting on 18 May. The workshop on the first day at Academia Sinica aimed to be a B2B platform as well as a successful model in furthering international business cooperation among ANF members. It began with an invited speech on Taiwan’s New Southbound Policy including guided introduction to information such as investment and market opportunity. Following the invited speech, presenting country representatives and founders of start-up companies from Iran, Malaysia, Philippines, Thailand, and Taiwan also elaborated on country policy of nanotechnology commercialization in the morning session and promoted business activities such as investment opportunity in the afternoon session respectively. Furthermore, there was a product demonstration from eight companies simultaneously around the venue to offer participants a deeper exchange and better understanding of market opportunity. An especial arrangement amid the Summit Meeting at Courtyard Taipei the next day was to meet with the Vice President of Taiwan, Dr. Chien-Jen Chen, at the Office of the President. Vice President Chen was much delighted to welcome all ANF delegations, on behalf of Taiwan’s government to this year’s Summit in Taiwan and offered his thanks to ANF community for holding this wonderful event in Taiwan as well. He mentioned that Taiwan’s government would continue supporting activities to foster links between Taiwan and ANF members and to promote especially the New Southbound Policy launched in 2016. Dr. Toshihiko Kanayama from Japan, President of ANF and Prof. Dr. Ali Beitollahi from Iran, head of International Nanotechnology Olympiad (INO) steering committee also expressed their gratitude for this arrangement respectively. The 1st INO was held this April in Tehran, Iran and Taiwanese team took first place with the best total score and solution to the theme of “Water and Environment” this year.

ANFoS2018_in_Taiwan_Wokshop



ANFoS2018_in_Taiwan_Meeting_Vice_President_Chen



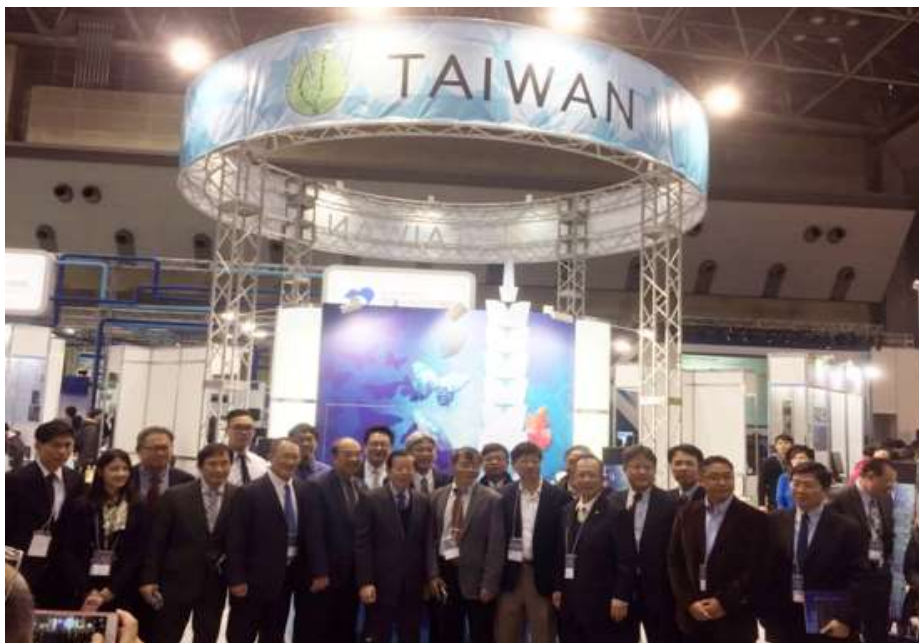
nanoMark Certification System in Taiwan

Taiwan's nanoMark, established in 2003 under the auspices of the government and also the world's first certification system of nano product, has been transferred to Taiwan Nanotechnology Industry Development Association (TANIDA), a professional and credible organization in early 2017. Construction materials are still the main categories of certified companies and products, more than 50% and 90% respectively. The nanoMark could enhance the overall enterprise competitiveness. The results of a market research indicated that not only can the nanoMark help the companies who have passed the nanoMark certification to increase their "corporate image", gain customer confidence and promote "market sales". It can even enhance the selling price of their products by 20%. To build and leverage a certification network of nanoproducts with Malaysia, another pioneer country in promoting nano-certification in the world, TANIDA and NanoMalaysia Berhad have already signed a Memorandum of Understanding (MOU) in 2016. As a concrete follow-up of the MOU, TANIDA and NANOVerify Sdn Bhd (NVSB), Malaysia's first and only nanotechnology verification body, have developed a Standard Operation Procedures (SOPs) in early 2018 for further tasks related to interlab comparison on nanoparticle size and application documents of mark system for pioneer company from either side which was also confirmed amid ANF Summit 2018 in May in Taiwan.



Taiwan Pavilion in nano tech 2017, Japan

“nano tech 2017 – the 16th International Nanotechnology Exhibition & Conference” was held on 15-17 February 2017 in Tokyo, Japan. Taiwan Pavilion has been participating in this event for 13 consecutive years. “Project of 2017 Japan nano tech and International Collaboration on Nanotechnology Education” selected 30 technology and research achievements from 26 industry, academia, and research units to demonstrate Taiwan’s latest nanotechnology status. Representative of Taipei Economic and Cultural Representative Office in Japan, Frank Hsieh, and staff visited Taiwan Pavilion during the exhibition. This year, OME Technology of Taiwan Pavilion won the “Business Matching Award”. This award represents that OME Technology obtained a largest number of business meeting appointments with various exhibitors and visitors by using a business matching system, and strenuously committed to the open innovation.



Taiwan Pavilion in nano tech 2018, Japan

“nano tech 2018 – the 17th International Nanotechnology Exhibition & Conference” was held on 14-16 February 2018 in Tokyo, Japan. Taiwan Pavilion has been participating in this event for 14 consecutive years. A total of 27 technology and research achievements from 22 industry, academia, and research units were selected to demonstrate Taiwan’s latest nanotechnology status. This year, National Taiwan University of Science and Technology of Taiwan Pavilion won the “ACS (American Chemical Society) Award”. National Taiwan University of



Science and Technology applied nano substrate technologies, to a broad range of fields such as biotechnology, energy, and materials, including the formation of metal nanotube arrays on silicon substrates.



3. ANF Commercialization Working Group Workshop 2018, Tokyo by Jun'ichi Sone, JST

Asia Nano Forum (ANF) Commercialization Working Group Workshop was held on February 16, 2018 at Tokyo Big Sight. The program of the workshop is shown in Figure 1. In the former half of the program, commercialization policies and activities of emerging technologies were presented by the representatives of USA, Germany, Japan, Taiwan, Malaysia, Iran and Thailand. In the latter half of the program, business activities together with unique technologies were presented by the active start-up companies in Japan. The number of participants in the workshop is about 50, coming mainly from the planning divisions of companies and administration divisions of universities and national laboratories. The photos taken in the workshop are shown in Figure 2. The following is a report of the presentations.

Asia Nano Forum Commercialization WG Workshop	
Program	
Chair: Jun'ichi Sone (JST, Japan), Co-chair: Yukio Kimura (AIST, Japan)	
13:00-13:05	Introduction of ANF & its Commercialization WG Alexander Pogany (BVMIT, Austria)
13:05-14:50	Commercialization policy and activity of emerging technologies of each country
	USA (Lisa E. Friedersdorf, NNCO)
	Germany (Peter Grambow, Nanoinitiative Bayern)
	Japan (Hiroyuki Kaneko, Japan Science and Technology Agency)
	Taiwan (Ting-Kuo Lee, Academia Sinica)
	Malaysia (Daniel Bien, NanoMalaysia Berhad)
	Iran (Ali Beitollahi, Iran Nanotechnology Initiative Council)
	Thailand (Pavadee Aungkavattana, NANOTEC)
14:50-15:00	Break
15:00-16:15	Business activities and unique technologies of promising Startup companies in Japan
	Power Device : Unleashing the Potential of Gallium Oxide
	Takuto Igawa (FLOSFIA http://www.flosfia.com)
	Healthcare Sensor : Envisioning a New World via Brain Wave
	Osamu Yanagisawa (PGV http://www.pgv.com)
	Surgery Robot : Development of Pneumatically-Driven Surgical Robot by Venture Company
	Emerged from University Kenji Kawashima (Riverfield https://www.riverfieldinc.com)
	Display Material : Hyperfluorescence: Materializing the Future of OLED
	Junji Adachi (Kyulux http://www.kyulux.com)
	Advanced Material : Next generation electron beam - Semiconductor photocathode –
	Takayuki Suzuki (Photo electron Soul http://photoelectronsoul.com)
16:15-16:30	Discussion on the issues & promotion measures of emerging technology commercialization
16:30-16:35	Closing Remarks

【USA】 Various government agencies under DoD, DoE and others have a mission to support SMEs (small and medium enterprises) in various schemes depending upon their sizes and business stages. Major expectations of SMEs to the government are the support for workforce supply and funding for their technology development. Commercialization of nanotechnology normally takes 10 to 20 years from the idea to the mass-production through the trial production of a prototype. It is quite different from that of software, and patience of investing venture capitals (VCs) is required.

【Germany】 In the Bayern of Germany, Cluster Nanotechnology was established about 11 years ago to support the nanotechnology commercialization through networking activities of participating partners. The main mission is to link the materials knowledge to products and to scale up the material production volume from “mg” to “ton”. The activities are expanding from the Bayern to whole the Germany and overseas, and 1100 partners are joining the Cluster Nanotechnology currently. Major activities of the Cluster Nanotechnology are the promotion of networking and collaboration, management of nanotechnology projects, commercialization support, operation of seminars, workshops, and exhibitions, and the development of new technology and partners. Recently, the organization of nanoanalysis was established due to the importance in the measurement and characterization of materials, and their manufacturing automation.

【Taiwan】 Two national nanotechnology programs are running. One is a national program of nanoelectronics and displays with ITRI, universities, and companies participating, aiming at bringing the technology in laboratories to the market. The other is a national program for universities to validate new materials and new device concept from the technological standpoint. Taiwanese government provides NanoMark certification to nanotechnology products with high added values. NanoMark certification has been provided to 52 products so far.

【Japan】 Japan Science and Technology Agency (JST) which is a major government science and technology funding agency conducts strategic basic research program with a budget of 53.6 billion yen, and academia-industry collaboration program with a budget of 23.4 billion yen. JST conducts the START program which supports universities to start business with their own technologies. So far, 28 start-up companies have been created in the START program. JST also has a funding program for academia-originated start-up companies and has invested 17 companies so far.

【Malaysia】 NanoMalaysia is an organization under Ministry of Energy, Science, Technology, Environment and Climate Change and has a mission to link the R&D of nanotechnology to commercialization, such as the development of nanotechnology, market exploration, and human resource fostering. Two important national programs are running. One is the Innovation Based Program covering the R&D of IoTs, energy efficient device technology including electronic and energy devices, and foods and agriculture. The other is the National Graphene Program focusing on enlightening industry about the industrial importance of the graphene technology, supporting the graphene technology development and its IP policy. Lubricants, electrical conducting inks, and Li-ion batteries are regarded as promising application candidates of graphene. Malaysian government provides NanoVerify certification to important nanotechnology products.

【Iran】 Iran Nanotechnology Initiative Council (INIC) is an agency in Iran under vice presidency for science and technology with close collaboration with ministries of Industry, Health, Agriculture, Science, Oil and Gas, and Economy, conducting broad activities, such as education of nanotechnology for a young generation, the technology development, and its commercialization. INIC is strengthening the activities of nanotechnology standardizations by participating in ISO/TC229 and is also promoting actively the nanoproduct certification similarly to Taiwan and Malaysia.

【Thailand】 NANOTEC of Thailand specifies four areas as the core of the nanotechnology, which are nanomaterials, nanoprocessing, nanodevices and systems, and nanocharacterization and standardization. Health sensors, food sensors, and coating technology for energy devices are shown as examples of the nanotechnology product commercialization.



In the latter half of the program, business activities and unique technologies of active university-originated start-up companies in Japan were presented. FLOSIA is conducting a business of GaO power devices for power source adapters of electronic equipment including PCs and is aiming at replacing SiC and GaN markets in the future. PGV presented its business of brain wave sensors attachable on human's forehead to probe EEG signals on the brain which make the burden of the person tested far less than that of headgear-type brain wave sensors. The brain sensors are expected to be used in the diagnostics of brain diseases including Alzheimer and the healthcare management by measuring brain activities during a sleep, for example. Riverfield presented its business of surgery robots. The arms of the robots are driven by air pressure, and the pressure on the arms caused when touching on the diseased parts can be monitored by the change of the air pressure, which can be transferred to hands of operators who control the surgery in a remote place. Kyulux presented its business activities to develop and sell the organic electroluminescent materials in the next generation, which are low cost and high luminescent, and are produced with no use of rare-earth materials. It is a promising technology to realize the next generation OLED displays and many global companies in the display business are investors of the Kyulux. Photo electron Soul presented its unique technology to produce electron beams using semiconductors, such as GaAs and GaN, which is promising to realize the electron beam sources to be used in the electron microscopes, semiconductor device manufacturing and inspection, and industrial equipment such as metal 3D printers.

Standardization Working Group

by Dr. Bin-Cheng Yao, ITRI, Taiwan

External liaisons

Organization ISO TC 229	Title International Organization for Standardization TC 229 Nanotechnologies Type-A Liaison Liaison officer: Dr. Ali Beitollahi (IUST, Iran)
IEC TC 113 WG 3	International Electrotechnical Commission TC 113 Nanotechnology for electrotechnical products and systems WG 3 Type-D Liaison Liaison officer: Dr. Bin-Cheng Yao (ITRI, Taiwan)

1. Working project, publications and standards reports

Published Standards

- a. IEC/TS 62844:2016 Guidelines for quality and risk assessment for nano-enabled electrotechnical products

This TS provides a recommended methodology for identifying relevant parameters of nanomaterials as well as providing generic guidelines on implementation of quality assessment and environment/health/safety assessment for nano-enabled/nano-enhanced electrotechnical products.

- b. IEC TS 62607-4-4:2016: Nanomanufacturing - Key control characteristics - Part 4-4: Nano-enabled electrical energy storage - Thermal characterization of nanomaterials, nail penetration method

This TS provides a measurement method for thermal runaway quality level test for nano-enabled energy storage devices (e.g. Li battery). This method can decide whether or not the nanomaterial additives used in energy storage devices are resilient against the thermal runaway caused by a faulty or accidental low resistance connection between two or several internal points.

New working standards project

List of under development standard projects in ISO/TC229 lead by ANF member countries

	Project reference	Title	Project leader country	Working group
1	ISO/NP TS 10867	Nanotechnologies -- Characterization of single-wall carbon nanotubes using near infrared photoluminescence spectroscopy	Japan	WG2
2	ISO/NP TS 11251	Nanotechnologies -- Characterization of volatile components in single-wall carbon nanotube samples using evolved gas analysis/gas chromatograph-mass spectrometry	Japan	WG2
3	ISO/TS 16195	Nanotechnologies -- Specification for developing representative test materials consisting of nano-objects in dry powder form	Japan	WG2

4	ISO/PRF TR 19733	Nanotechnologies -- Matrix of properties and measurement techniques for graphene and related two-dimensional (2D) materials	Korea	WG2
5	ISO/DIS 19749	Nanotechnologies -- Measurements of particle size and shape distributions by scanning electron microscopy	Japan	WG2
6	ISO/TR 20489	Nanotechnologies -- Sample preparation for the characterization of metal and metal-oxide nano-objects in water samples	Singapore	WG2
7	ISO/AWI TS 21346	Nanotechnologies - Characterization of individualized cellulose nanofibril samples	Japan	WG2
8	ISO/AWI TR 23397	Measurement of film thickness of nanomaterials by using ellipsometry	Japan	WG2
9	ISO/DIS 20814	Nanotechnologies -- Testing of the photocatalytic activity of nanoparticles for NADH oxidation	Korea	WG3
10	ISO/NP TS 22082	Nanotechnologies --- Toxicity assessment of nanomaterials using dechorionated zebrafish embryo	Korea	WG3
11	ISO/AWI TR 22455	High throughput screening method for nanoparticles toxicity using 3D cells	Korea	WG3
12	ISO/AWI TS 23034	Method to estimate cellular uptake of carbon nanomaterials using optical absorption	Japan	WG3
13	ISO/AWI TR 23463	Nanotechnologies -- Characterization of carbon nanotube and carbon nanofiber aerosols in relation to inhalation toxicity tests	Korea	WG3
14	ISO/AWI TS 23459	Nanotechnologies -- Assessment of protein secondary structure following an interaction with nanomaterials using circular dichroism spectroscopy	Iran	WG3
15	ISO/CD 17200	Nanotechnology -- Nanoparticles in powder form -- Characteristics and measurements	Japan	WG4
16	ISO/DTS 20660	Nanotechnologies -- Materials specification -- Antibacterial silver nanoparticles	Korea	WG4
17	ISO/DTS 21236-1	Nanotechnologies -- Clay nanomaterials -- Part 1: Specification of characteristics and measurement methods	Iran	WG4
18	ISO/AWI TS 21236-2	Nanotechnologies -- Clay nanomaterials -- Part 2: Specification of clay nanomaterials used for gas barrier films	Japan	WG4
19	ISO/NP TS 21237	Nanotechnologies -- Nano-enhanced air filter media using nanofibres -- Characteristics, performance and measurement methods	Iran	WG4
20	ISO/AWI TS 21412	Nanotechnologies -- Nanostructured layers for enhanced electrochemical bio-sensing applications -- Characteristics and measurements	Korea	WG4
21	ISO/AWI TS 21975	Nanotechnologies -- Polymeric nanocomposite films for food packaging -- Barrier properties: characteristics and measurement methods	Iran	WG4

Reports

External Liaison Report to ISO TC 229/IEC TC 113 and ISO TC 229/IEC TC 113 meeting reports -1or 2 report per year from 2005 to 2017

2. Recent activities

Standards Meeting

- a. IEC TC 113/ISO TC 229 WG2 joint spring meeting: 7-11 May 2018, Ottawa, Canada (ANF attendee: Bin-Cheng Yao (ITRI, Taiwan))
- b. 21th ISO/TC 229 plenary: October/November 2018, Kuala Lumpur, Malaysia (planned ANF Attendee: Ali Beitollahi (IUST, Iran), Wei-Fang Su (NTU, Taiwan), Tsing-Tang Song(ITRI, Taiwan), Hsial-Ching Weng(CMS, Taiwan))

Inter-laboratory comparison activities

- a. NanoMalaysia – Tanida(Taiwan) inter-laboratory comparison on size measurement of gold nanoparticles (10 nm and 30 nm) by Transmission Electron Microscopy (TEM). (done)
- b. Nanotec (Thailand) on nanoparticle size characterization of polystyrene latex, TiO₂ and gold (diameter range from 10 nm - 700 nm), 16 research institutions from 8 countries have registered to participate. (result submission deadline is end of May 2018, a workshop to discuss result is scheduled for 24 Sept at Thailand Science Park)

ANF members' mutual collaboration of nano-enabled product certification program

- a. Industrial Technology Research Institute (ITRI) from Taiwan and MIMOS Semiconductor Sdn Bhd from Malaysia agreed that results from the laboratories be accepted for the registered testing laboratory (TEM) for both NanoMark & NanoVerify system from the interlaboratory comparison result. They agreed to initiate the pilot program of mutual application of NanoMark & NanoVerify with the testing laboratories participation to simplify the application process, the pilot companies from both sides are: a. JM Material Technology Inc. (Taiwan), b. NanoTextile Sdn Bhd (Malaysia), more companies will participate later.
- b. “Asia-Europe Dialogue on Nanosafety and Nanoproduct Certification” was held at Tehran Iran 28 Nov. 2017, Co-organized by EC Research and Innovation DG, and ANF. The need for continued dialogue, harmonization on regulatory issues and enhancement of collaborations on nanosafety, nano certification, nanostandardization through the possible initiation of appropriate means was one of the important challenges identified.

Education Working Group

By Prof. Jason Chang, Academia Sinica, Taiwan

1. Taiwan participated in the 1st International Nanotechnology Olympiad (INO 2018)

The 1st International Nanotechnology Olympiad (INO) was initiated by Iran and held this April in Tehran. Dr. Maw-Kuen Wu from Taiwan, representative of INO founding member institution, also joined the INO Steering Committee (INOSStC) to participate in the development of strategy, establishment of regulation, determination of thematic focus, etc. Participating teams from Iran, European Union, Russia, Malaysia, South Korea, and Taiwan presented their solutions for the global challenges related to the theme of

“Water and Environment” using nanotechnology in INO 2018. Taiwanese team came out with the best total score in the three aspects of novelty, business and science/technology and won 3,000 euros for their idea on “Nature-inspired Omniphobic Membranes and Photocatalysts Design Toward a Near-Zero Liquid Discharge” which uses nanotechnology to address problems related to this year’s theme.



Nanosafety Working Group

by Dr. Wannee Chinsirikul, NANOTEC, Thailand

1. ANF-Asia Nano Safe Prize:

This ANF-sponsored prize was awarded at the 11th International Particle Toxicology Conference (IPTC) in Singapore (26-30 Sept. 2016; <https://iptc2016.sg/>). Congratulations to the winner Dr Atsuto Onoda (Tokyo University of Science, Japan), who received the winner's certificate and USD\$500 prize from ANF for his presentation on the “Effects of antioxidant preadministration on the long-term damage of astrocytes induced by maternal exposure to carbon black nanoparticle in mice”. Congratulations also to the runner-up Kuo-Liang Huang (Taipei Tzu Chi Hospital and National Taiwan University, Taiwan) who received a certificate from ANF for his presentation on “The effect of size-segregated ambient particulate matter on allergic airway inflammation in mice”. Many thanks to Prof. Gaku Ichihara (Tokyo University of Science, Japan) for awarding the prize at the IPTC2016 Awards session and to the ANF Executive Committee for the prize money (judging of prize by Assoc. Prof. Paul Wright, RMIT University, Australia).

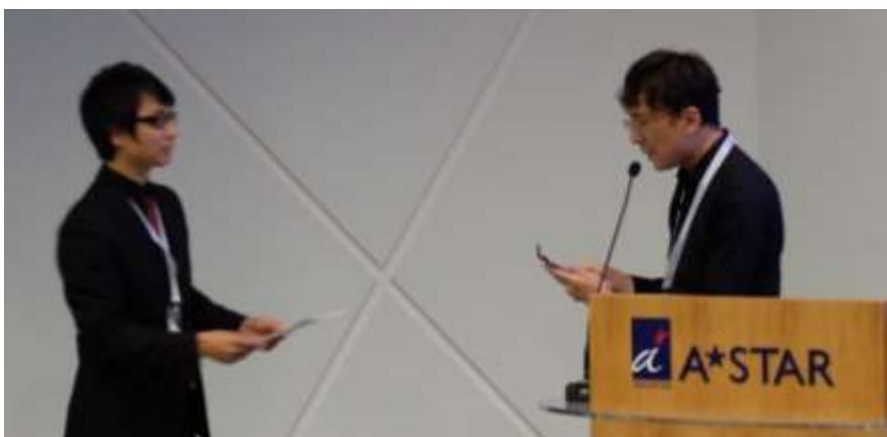


Photo: Prof. Gaku ICHIHARA presenting Award Dr. Atsuto ONODA at IPTC2016.

2. ANF co-hosted Nanosafety Session at NanoThailand:

This important nanosafety session was held at the Greenery Resort in Khao Yai, Thailand (on 28 November, 2016). Many thanks to Mr. Ramjitti Indaraprasirt (NANOTEC) and the other organizers and participants. Many thanks to our ANF speakers and the ANF Executive Committee for providing travel support to:

Prof. Gaku Ichihara, Tokyo University of Science, Japan
Prof. Chuen-Jinn Tsai, National Chiao Tung University, Taiwan
Dr. Seokjoo Yoon, Korea Institute of Toxicology, Daejeon, South Korea
Mr. Mohd Helme Mohd Helan, National Nanotechnology Centre, Ministry of Energy, Science, Technology, Environment and Climate Change, Malaysia

3. New Nanosafety WG members:

We welcomed the following new members during 2017:

- Philippines: Dr Blessie A. Basilia, Industrial Technology Development Institute (ITDI);
- Singapore: Dr WANG Zheng Ming, Agri-Food and Veterinary Authority.

4. Asia-Europe Dialogue on Nanosafety and Nano product Certification:

This international workshop involved participants from 11 countries and was hosted by the Iran Nanotech Initiative Council (INIC) in Tehran, Iran (on 28 November 2017). Well done to Prof. Dr. Ali Beitollahi and co-organisers.



5. Nanosafety Technical Forum 2018 at NanoThailand 2018:



NANOTEC in collaboration with ANF will organize a one-day workshop on “Nanosafety Technical Forum 2018” on 12 December 2018 during the 6th Thailand International Nanotechnology Conference (NANO THAILAND 2018). 6 speakers nominated from ANF members will be sponsored by ANF to participate the event. For more information about NANO THAILAND 2018, please visit:
<http://www.nano-thailand.com/2018/Annual/>

ANF Summit Report

The 15th Asia Nano Forum Summit (ANFoS 2018) was held on May 17-18, 2018 in Taipei, hosted by the Academia Sinica, Taiwan. The 11th Annual General Meeting as the main part of the summit was held during the Summit program. During the decade since its foundation in 2007 in Singapore, the ANF played significant roles and acquired the firm presence in the nanotechnology community in Asia and related regions, thanks to the great effort of the founding members and their successors. This year's Summit and Annual General Meeting discussed how ANF continues and strengthens its activities for another prosperous decade and further.

Outline of the 15th ANF Summit 2018 Program (ANFoS 2018)

17-18th May, 2018, Taipei, Taiwan

Organized by: Asia Nano Forum (ANF)

In cooperation with and hosted by:

Ministry of Science and Technology (MOST), Taiwan

Institute of Physics, Academia Sinica

Taiwan Nanotechnology Industry Development Association (TANIDA)

Asia-Pacific Industry Collaboration Office, Taiwan (APIC)

THURSDAY, MAY 17, 2018

09:30-17:15 International Workshop on Nanotechnology: From Innovation to Application

Venue: Auditorium, 1st Floor, Institute of Physics, Academia Sinica

Venue: No. 128, Sec. 2, Academia Road, Nangang Dist., Taipei City, Taiwan

18:30-20:00 Welcome Hi-Tea

ANF Delegates and invited speakers for International Workshop on Nanotechnology

Venue: Ball room 1, 9th Floor, COURTYARD TAIPEI

FRIDAY, MAY 18, 2018

09:00-10:15 ANF Annual General Meeting

Venue: Ball room 1, 9th Floor, COURTYARD TAIPEI

11:00-12:30 Meeting with honourable ROC Vice President, Dr. Chien-jen Chen (Place: Office of the President)

12:30-18:00 ANF Annual General Meeting,

Venue: Ball room 1, 9th Floor, COURTYARD TAIPEI

18:30-20:30 Networking Dinner

Venue: Sunrise, 7th Floor, COURTYARD TAIPEI



Partnership/Collaboration

Australia – Partnership/Collaboration

1. International Conference on Nanoscience and Nanotechnology (ICONN2018)

The main event in the Australian nanotechnology space was the International Conference on Nanoscience and Nanotechnology (ICONN2018). The conference was held on Monday the 29th January to Friday, 2nd February 2018 at the University of Wollongong. It attracted 700 delegates from 22 countries around the world. 19 Companies also took part in the Exhibition.

ICONN 2018 featured notable international experts who addressed the latest developments and challenges in nanotechnology. The conference is a platform for researchers, PhD students, Early Career Researchers, industry professionals and practitioners to meet and discuss new and exciting advances in the field.

ICONN covered nanostructure growth, synthesis, fabrication, characterization, device design, theory, modelling, testing, applications, commercialisation, and health and safety aspects of nanotechnology. A Centre of Excellence Showcase was held on Monday the 29th January, with dedicated burst sessions for ECR and PhD students and created the opportunity for delegates working in translational nanotechnology to present in industry sessions. There was also an Australian National Fabrication Facility workshop, engineering your Imagination and an Aberration-Corrected Electron Microscopy workshop.

Conference Chairs were Prof Gordon Wallace, Associate Professor Michael Higgins and Associate Professor Atilla Mozer, all from University of Wollongong. Plenary speakers included Sir Fraser Stoddart,



Professor Ada Yonath, Professor Steven Chu, Professor Shanhui Fan, Professor Laura Na Liu, and Professor Martina Stenzel. In addition, 56 invited keynote speakers presented their scientific work.

Iran– Partnership/Collaboration

1. Asia-Europe dialogue on nano-safety and nano-product certification

The first Asia-Europe dialogue on nano-safety and nano-product certification was held on November 28, 2017, at Tehran University of Medical Sciences, where participants emphasized on the importance of designing and implementation and adoption of coherent strategies across the globe regarding nanotechnology. With more than a decade of scientific and technological achievements in nanotechnology, Islamic Republic of Iran is seeking to contribute to formulation of harmonized policies and regulations at international level which will affect export of nano-products.

At the meeting, Iranian representatives proposed a direct dialogue and mutual collaboration between Europe and Asia to develop the required scientific knowledge, tools and standards for evaluation nano-products safety via a harmonized legislations and certification methodology. The aim of this strategy is to guarantee the safety and health of nano-products and build the consumers' confidence and trust.



2. Metal Oxide Nanoparticles to reduce pollution

Researchers at Ferdowsi University of Mashhad has published their recent work on the positive effect of adding metal-oxide nanoparticles to reduce pollution and increase the efficiency of diesel motors. The main goal of the project was to lower the emission of environmental pollutants from diesel motors by adding metal-oxide nanoparticles to the fuel.

The results show that using the designed additive drops fuel usage by 4 percent, boosts the efficiency of the diesel-motor and lowers the emitted nitric oxide and carbon monoxide by 40 and 25 percent, respectively. The results are published in the recent edition of Fuel Journal.



3. International Nanotechnology Olympiad 2018

Info International Nanotechnology Olympiad (INO) is a bi-annual competition among different member economies that aims at motivating university students to practice their knowledge and skills in solving real-world challenges. This enables relevant start up teams and creates a global network of students and experts to tackle global problems. INO was originally initiated by the Iran Nanotechnology Innovation Council (INIC). Among founding members are credible institutions from Korea (KoNTRS), Iran (INIC), Taiwan (Academia Sinica), RUSNANO, and Moscow State University from Russia. The INO steering committee is composed of EU, Korea, Iran, Russia, and Taiwan representatives.

The first INO event was hosted by INIC on April 10-16, 2018 in Tehran. The theme of the event was water and environment where the competing teams from Russia, Taiwan, Malaysia, Korea, Iran and the European Union took part in the event. According to the INO 's evaluation model, every presented project is assessed on core concept and idea novelty, science and technology aspects, and business aspects, that highlights the key difference between INO's approach and most other scientific competitions.



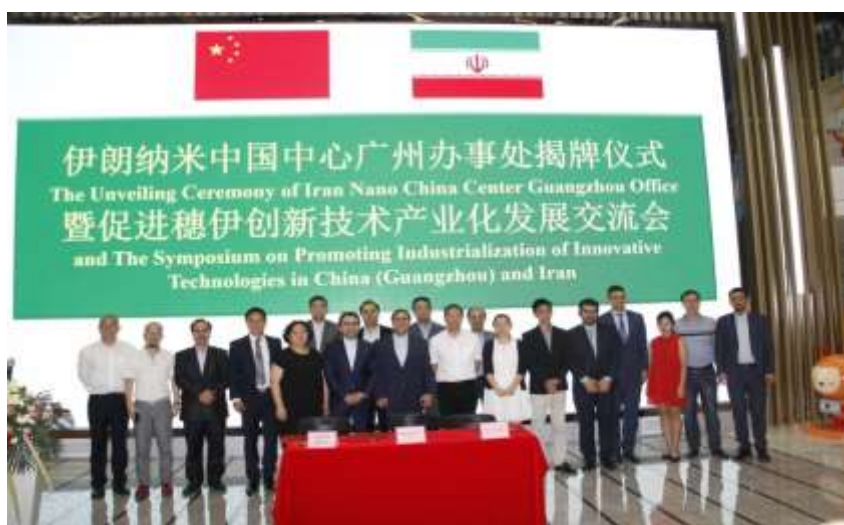
4. The Unveiling Ceremony of Iran Nano China Center (INCC) in Guangzhou

Prof. Saeed Sarkar, the secretary-general of Iran Nanotechnology Initiative Council, Dr. Khalil Shirgholami, the consul general of Iran in Guangzhou, and delegates from various Chinese companies and institutions participated in the opening ceremony of Iran's Guangzhou office on July 6, 2018.

During this ceremony, both parties spoke about the scientific and industrial potential partnerships in nanotechnology.

In his remarks, Dr. Shirgholami pointed out the successful experience of Iran's first nanotechnology office in Suzhou and hoped for a similar and even better future for the Guangzhou office. Later, the senior vice president of WTOIP, Edmont Rao, talked about opportunities brought by INCC for Chinese nanotechnology industry. "It is at events like this what we get a closer introduction to Iran's potentials in nanotechnology" he stated.

On the sidelines of the ceremony, the symposium on "promoting industrialization of innovative technologies in China and Iran" was held and a strategic cooperation was signed between the two parties.



5. Iran Pavillion in nano tech 2018, Japan

Several Iranian companies active in the field of nanotechnology attended at the Pavilion of Iran Nanotechnology Innovation Council in JapanNanoTech 2018. The participants companies presented nano products in areas such as anti-cancer nano-medicine, nano-textile, high-strength nano-composite PVC pipes, nanostructured copper welding tips, nano-enhanced air filters for turbines power plants, lab instruments as well as different types of nanomaterials.

Iran ambassador in Japan, as well as a group of Iranian students studying in Japan, visited the exhibition. The Iran pavilion was also visited by top officials from Japan and other countries as well as local Japanese companies.



Japan– Partnership/Collaboration

1. Tsukuba Innovation Arena (TIA)

TIA is an open innovation hub cooperatively operated by National Institute of Advanced Industrial Science and Technology (AIST), National Institute for Materials Science (NIMS), University of Tsukuba, High Energy Accelerator Research Organization (KEK), and University of Tokyo as shown in Fig. 1 [1]. It is supported by those institutes and the Japan Business Federation. TIA will combine the comprehensive R & D capabilities (human resources, facilities, intellectual property etc.) of the five organizations and will consistently support from creation of knowledge to industrialization. Since its establishment in 2009, TIA has made significant contributions to contributing to the practice of open innovation in numerous research fields such as innovative nanodevice research and development based on super clean room (SCR) in AIST [2] and development of next generation aircraft materials through the use of light and quantum beam technology of TIA 5 organizations [3]. Here we would like to raise two concerning recent developments in TIA activities related to the activities of ANF in relation to the paper.



Fig. 1 Structure of TIA.

The first is Nanotech CUPAL (Nanotech Career-up Alliance), a human resource development program for nanotechnology [4]. The Nanotech CUPAL project has started since FY2008 in order to improve careers and improve mobility of researchers in the field of nanotechnology of 15 organizations (12 universities and 3 national research institutes) in Japan. TIA and Kyoto University are centers of industry-academia-government resonance fields in the area of nanotechnology. In the resonance fields, two courses are prepared as research and practical environments with advanced expertise and state-of-the-art equipment. The first is a collaborative research type NRP (Nanotech Research Professional) course aiming to train professionals who lead the creation of new knowledge, the second is a practical training type NIP (Nanotech Innovation Professional) course aimed at nurturing professionals who drive innovation creation as shown in Fig. 2.



Fig. 2 Practice and completion ceremony photos in the NIP course of Nanotech CUPAL.

The second is a project "Kakehashi" which means bridging between different organizations in Japanese [5]. This project supports research study for five TIA core organizations to cooperate beyond organizational boundaries and develop new fields. Beginning in FY2008, TIA is seeking joint proposals from two or more organizations. TIA is looking for proposals for research and development in new fields such as Nanobiology, big data, etc. that can be pillars of future TIA activities, as well as proposals from conventional nanotechnology. The 39 entries were adopted from 79 entries in FY 2017, and the 50 projects including continuation were adopted in FY 2018. The adopted fields have expanded into new fields such as biotechnology, computational material science, big data analysis, integration areas, etc.

Next the activity of the user facility services project in Japan will be described. The "Nanotechnology Platform Japan (NTPJ)" [6] is the project by the Minister of Education, Culture, Sports, Science and Technology (MEXT) in Japan and is promoted for any of researchers from young to industrial one to do

the share-use of the equipment, and to provide the shortest way to solve the urgent problems in science and technology. Therefore, all of scientists are invited to participate in this project to share equipment beyond the barrier of scientific communities and research organizations. In this program, 37 groups from 25 institutes and universities are joined and establish one single structure for "Share-Use Cutting-Edge Facility for Nanotechnology", which will be supported by MEXT for 10 years from 2012. Six excellent research results were selected and awarded in JAPAM NANO 2018 held at Tokyo on Feb. 16, 2018.

References

- [1] <https://www.tia-nano.jp/page/dir000002.html>
- [2] https://unit.aist.go.jp/tia-co/orp/index_en.html
- [3] <https://staff.aist.go.jp/m.ohkubo/SIP-IMASM/index.html>
- [4] <https://www.nanotechcupal.jp/>
- [5] <https://www.tia-nano.jp/page/page000077.html>
- [6] <http://nanonet.mext.go.jp/english/>

Korea– Partnership/Collaboration

1. NANO KOREA 2017 and 2018

NANO KOREA, the largest international event in the field of nanotechnology in Korea was held in Goyang KINTEX, in July 2017 and also in July 2018 with the slogans ‘Nanotechnology, The Great Beginning’ and ‘The key driver of the 4th Industrial Revolution’, respectively.

Name	NANO KOREA 2017 - The 15 th International Nanotech Symposium & Nano-Convergence Expo
Slogan	Nanotechnology, The Great Beginning
Date	July 12 th (Wed) ~ 14 th (Fri), 2017
Venue	Goyang KINTEX, South Korea
Registration	1,726 people from 20 nations
Presentation	984 presentations (including 126 invited lectures) from 14 nations




Particularly this year, a Tutorial Session was newly organized to provide the technical reviews of the convergence of nanomaterials and nanodevices with other technologies. In addition, a public session was introduced in the program for the increased exposure of nanotechnology to the teenagers as well as a session designed to offer short hands-on experience on nanotechnology experiments.

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

Name	NANO KOREA 2018 - The 16 th International Nanotech Symposium & Nano-Convergence Expo
Slogan	The key driver of the 4 th Industrial Revolution
Date	July 11 th (Wed) ~ 13 th (Fri), 2018
Venue	Goyang KINTEX, South Korea
Registration	1,802 participants from 27 nations
Presentation	989 presentations (including 179 invited lectures) from 20 nations



2. Korea-Japan-China Nanotechnology Cooperation Forum

Since the four agencies (Korea Nano Technology Research Society, Korea Infrastructure Organization for Nanotechnology, Japan nanotech executive committee, China National Center for Nanoscience and Technology) signed in July 2015 a memorandum of understanding for the promotion of cooperation in science and technology among the three countries Korea-Japan-China Nanotechnology Cooperation Forum has been held annually with participation of experts and researchers of nanotechnology in three countries to share the latest developments and to explore and update the cooperation issues. Following the first forum in January 27th, 2016 during Japan Nanotech 2016, the second one was held in August 29th, 2017 during China NANO 2017 and the third one lately in July during NANO Korea 2018 in Goyang, Korea.

Name	The 2 nd China-Japan-Korea Trilateral Nanotechnology Cooperation Forum
Date/Venue	August 29 th (Tue), 2017 / Beijing, China
Attendances	20 people including the government officials and nanotechnology experts



3. Korea-Iran International Cooperation

Korea Nano Technology Research society (KoNTRS) and Iran Nanotechnology Initiative Council (INIC) had signed a memorandum of understanding for the promotion of cooperation in the field of nanoscience and nanotechnology. As a follow-up action, Korea joined the steering committee of the International Nano Olympiad and also sent to the INO the winner of domestic ‘NANO young challenge’ event in Korea.

Date/Venue	April 10 th (Tue)~16 th (Mon), 2018 / Teheran, Iran
Attendances	Iran, Korea, Taiwan, Russia, Australia, Austria, etc. / 9 teams, 60 people
Main Achievement	1) Each team (composed of mentors and mentees) made presentations on standardization, safety, eco-friendliness, business model and systematic commercialization of nanotechnology, and visited research institutes related to nanotechnology in Iran 2) The winner of NANO young challenge in Korea won the ‘Innovation Awards’



Malaysia– Partnership/Collaboration

1. International Waqf and Blockchain Forum

March 2018 - NanoMalaysia Berhad was one of the strategic partners for the International Waqf & Blockchain Forum 2018 in Kuala Lumpur, Malaysia to support use of Blockchain technology. A Memorandum Of Understanding (MOU) was exchanged between NanoMalaysia Berhad and Finterra Technologies Sdn Bhd during the forum. The collaboration with Finterra Technologies is to set up a blockchain platform for the Internet of Nano-Things (IoNT) which will greatly enhance the security of data on interconnected nanotechnology devices applicable to various industries.



2. MOU with Scomi Engineering

March 2018 - NanoMalaysia and Scomi Engineering signed a facilitation agreement for a project under the National Graphene Action Plan (NGAP). Scomi Engineering is a subsidiary of Scomi Group and is a provider of transportation solutions ranging from monorail systems, buses and special purpose vehicles in the Middle East, Asia Pacific and Brazil. The project includes the development of a Graphene-based supercapacitor.



3. Nanotechnology in the Oil & Gas Industry

April 2018 - NanoMalaysia participated in the Meet the Enabler Session organised by the Malaysian Petroleum Resources Corporation (MPRC) at the Offshore Trade Conference (OTC) 2018 which was held at the KL Convention Centre. The conference is a biennial gathering for regional energy professionals to advance scientific and technical knowledge for offshore resources and environmental matters. The one-on-one meeting between the National Graphene Action Plan (NGAP) section of NanoMalaysia and the oil and gas services and equipment (OGSE) companies in Malaysia discussed opportunities for companies to adopt nanotechnology specifically graphene in their products, services and equipment.



4. Sarajevo Business Forum 2018 & Visit to SUNUM, Turkey

April 2018 - NanoMalaysia attended the 9th Sarajevo Business Forum (SBF2018) with HLAF (Human Life Advancement Foundation) in Sarajevo, Bosnia. The two-day event started at the National Parliament Building with a Technology Transfer Showcase presentation by NanoMalaysia's Mr Mohamad Hafiz Zolkipli, Senior Vice President (Operations) and an exhibition was held the following day on Malaysian products and services based on nanotechnology with opportunities for licensing and investment. NanoMalaysia Berhad's Chairman, Prof. Emeritus Dato Ir Dr Mohamad Zawawi Ismail, was also one of the roundtable contributors during the SEE - Asia Business Roundtable at the Forum.

Later, NanoMalaysia visited the Sabanci University Nanotechnology Research and Application Centre (SUNUM) in Tuzla, Turkey. SUNUM was established by the Sabanci Foundation and the Turkish Ministry of Development in 2011 as "a multidisciplinary research centre for nanotechnological value-added solutions in collaboration with leading industries and universities." SUNUM's Director, Prof Dr Fazilet Vardar Sukan, shared information and activities about the centre and the delegation was later given a tour of the facilities by Dr Cenk Yanik. NanoMalaysia is exploring potentials to enervise industries in Malaysia through selected partnerships with institutions and industries worldwide



5. Team Malaysia at the International Nanotechnology Olympiad 2018

April 2018 - Team Malaysia won the Gold Medal in the Science, Technology and Innovation category at the International Nanotechnology Olympiad 2018 in Tehran, IR of Iran. The team consisting of students Joshua Soo Zheyen, Ho Kah Chun, Muhammad Sollehin bin Idris, and Rabiatal Adawiyah binti Zayadi were guided and prepared by NanoMalaysia Berhad and the National Nanotechnology Centre.



6. NANOVerify Mark (Malaysia) x NanoMark (Taiwan)

May 2018 - Following the Steering Committee Meeting between NanoVerify Sdn Bhd and the Taiwan Nanotechnology Industrial Development Association (TANIDA) at the Asian Nano Forum (ANF) 2018 in Taipei, the NANOVerify Mark (Malaysia) & NanoMark (Taiwan) are now officially accepted nanoverification logos in both Malaysia and Taiwan ROC. The collaboration between Malaysia & Taiwan aims to align NANOVerify Programme process and method (SOPs) of “verification of nanomaterials” with TANIDA’s NanoMark. This collaboration also helps to acknowledge nanotechnology products to be accredited by both NANOVerify and NanoMark which will be marked as “dual logo” product. Bringing greater protection for consumers and increased prominence for our product partners.

Philippines– Partnership/Collaboration

1. 2017 ASEAN Conference on Advanced Functional Materials and Nanotechnology (ASEAN-CAFMN)



2017 ASEAN Conference on Advanced Functional Materials and Nanotechnology (ASEAN-CAFMN) in conjunction with the 19th Samahang Pisika ng Visayas at Mindanao National Physics Conference and the 5th International Meeting on Complex Systems were held on October 19-21, 2017 at the University of San Carlos-Talamban, Cebu City. Dr. Blessie A. Basilia, was an invited speaker and gave a talk on “Nanotechnology: Risk Assessment and Safety Initiatives”. The event was organized by Samahang Pisika ng Visayas at Mindanao (SPVM) and was attended by 700 participants.

Dr. Basilia delivers a talk on Nanosafety



2. 2018 DOST-ITDI Technology Offering – Fifth Series (Advanced Technologies)

In-line with the Mission of ITDI in making local industries globally competitive, ITDI-DOST held a Technology Offering on Advanced Technologies on February 15, 2018. The technology highlights are the following:

1. Nanoclay Production Technology

This is a process of producing nanoclay from local bentonite deposits by purifying the mineral montmorillonite and modifying the surface of the particles to convert it into an organoclay. The clay platelet of the material is about one nanometer thick. It is a multifunctional additive or filler in polymer nanocomposites.

2. Nano Precipitated Calcium Carbonate

An innovative process to produce nano precipitated calcium carbonate (NPCC) from indigenous limestone minerals was developed. NPCC in a nanomaterial has a broad range of industrial application as in: polymer, rubber, paint, paper, food, agriculture, pharmaceutical, and environment.

3. Biodegradable polymers production technology

This technology makes use of widely-available renewable resources and locally- produced nano materials in the production of various biodegradable plastic products such as cutleries and packaging materials. The use of these materials can help reduce solid waste problems and minimize carbon dioxide emissions and dependence on fossil resources.



3. Environmental, Health and Safety Research in the Risk Assessment of Nanomaterials (Nanosafety Project)

The project Environmental, Health and Safety Research in the Risk Assessment of Nanomaterials (Nanosafety project) spearheaded by Dr. Blessie A. Basilia of the Industrial Technology Development Institute (ITDI-DOST) started on June 1, 2018. The project is a collaborative work between ITDI-DOST and universities in the Philippines strongly involved in nanotechnology research and development. The specific objectives of the two year project funded by the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) - Department of Science and Technology (DOST), Philippines are (i) to establish capability on the assessment of nanomaterials in terms of safety (ii) to gather primary safety data for nanomaterials in the Philippines and (iii) to review and assess the testing manuals on nanotechnology based on the existing international standards, protocols and guidelines of the International Organization for Standardization (ISO).

A consultative meeting with representatives of Local Regulatory Agencies was held last January 24, 2018 (Wednesday), 9:00 AM at the Conference Room of PCIEERD, DOST Compound, Bicutan, Taguig City, Philippines to identify the requirements and protocols on evaluating the safety of nanomaterials. The meeting was attended by representatives of the Bureau of Philippine Standards Department of Trade and Industry (BPS-DTI), Center for Cosmetics Regulation and Research (CCRR) and Center for Device Regulation, Radiation, Health and Research (CDRRHR) of the Food and Drug



Administration (FDA), Disease Prevention and Control Bureau of the Department of Health (DOH), Occupational Safety and Health Center (OSHC) of the Department of Labor and Employment (DOLE) and Philippine Council for Health Research and Development (PCHRD). The collaborators of the proponent from the University of Santo Tomas, University of the Philippines Los Baños and University of the Philippines Diliman were also present.

Consultative meeting with representatives of Local Regulatory Agencies held last January 24, 2018 (Wednesday), 9:00 AM at the Conference Room of PCIEERD, DOST Compound, Bicutan, Taguig City, Philippines.

4. 2019 Asia Nano Forum Summit and International Nanotechnology Conference on May 15-17, 2019 with the theme “Nanotechnology for Sustainable Development”.

The Department of Science and Technology - Industrial Technology Development Institute (DOST-ITDI) will be hosting the 2019 Asia Nano Forum Summit and International Nanotechnology Conference on May 15-17, 2019 with the theme “Nanotechnology for Sustainable Development”. The event will be held at Taal Vista Hotel in Tagaytay City. The three-day affair will feature the ANF Summit 2019 and a 2-day Scientific conference. The ANF Summit is the ANF annual meeting, wherein top leaders and experts from industry, government, academia and other bodies from the ANF member economies meet to update the developments on Nanotechnology and discuss related issues such as policy, R&D and commercialization, EHS & Standardization, infrastructure and Education. The International Nanotechnology Scientific Conference 2019 will be composed of Oral Paper presentation, Poster Paper presentation and Photomicrograph Exhibit and Competition. This is a great venue to further enhance our knowledge in nanotechnology since international experts will be invited as resource speakers. In addition to this, the target audiences for the event are academicians, R&D researchers and analysts involved in nanotechnology research and development.

Taiwan – Partnership/Collaboration

1. Taiwan continues to participate in the M-ERA.NET

Dr. Ting-Kuo Lee, representative of National/Regional funding organization of Taiwan, the Ministry of Science and Technology (MOST), continued to participate in the Steering Board Meeting of M-ERA.NET Consortium held in 2017 and 2018. The main function of the meeting is to determine the list of proposals agreed to be funded by all participating funding agencies. The rules are that the proposal must have the support from at least two EU and associated countries and three funding agencies. Six research topics of Call 2017 are Integrated computational materials engineering (ICME); Innovative surfaces, coatings and interfaces; High performance composites; Multifunctional materials; New strategies for advanced material-based technologies in health applications; and Materials for additive manufacturing. M-ERA.NET is a program setup by EU in 2012. It invites research organizations in EU countries to join together to promote the research in material science and application. These member countries invest about 2/3 budget and EU provides about 1/3. Taiwan Ministry of Science and Technology (MOST) also joint as an observer with one million euros to support joint research projects every year. In 2016 EU started the phase II or M-ERA.NET 2. In Phase I, there are 29 national and 12 regional funding organizations. In phase II there are new members and some old members have departed. Hence there are now about 35 research funding agencies from 26 countries including three countries outside Europe, i.e. Taiwan, Brazil and South Africa.

2. Taiwan-US New Joint Program

Taiwan Ministry of Science and Technology (MOST) and the US Air Force Office of Scientific Research (AFOSR) cooperated to initiate a new joint program “Taiwan/USAF Program on Nano-Structured Materials for Sensing and Sustainment” which mainly focuses on materials research and has the Technology Readiness Level (TRL) between 1 and 1.5. Cooperation between Taiwan and USAF could be traced back to 2004. The past decade has witnessed a successful model to further international collaboration on nanoscience and nanotechnology between Taiwan and USA. As a result of these joint projects, a number of international, particularly interdisciplinary research teams have been formed to challenge established boundaries in science and open up many new fields of research. The kick-off meeting of the new joint program was held in June, 2017 in Taiwan to determine the topics, budget and schedule of the Joint Call announced every 3 years. Six research topics this year are Novel multifunctional materials, Materials for quantum phenomenon, Materials for flexible energy systems, Materials for infrared sensing/imaging, Bio-inspired materials for sensing, and Predictive functional materials.

3. 2017 Canada Taiwan Strategic Partnering Forum on Nanotechnology Applications

2017 Canada Taiwan Strategic Partnering Forum on Nanotechnology Applications was held in Taipei, Taiwan on 23 February 2017. There were about 60 participants in this forum and One-on-One meetings. The visit of Canadian Delegation, led by NanoCanada which brought together ChemRoutes Corporation, Grafoid Inc., Luxmux Technology, Nanalysis Corp, NEMSOR Technologies Inc., Precisely Microtechnology Corp., SensorUp Inc., and Wedge Networks Inc., is expected to build long-term bilateral relationship in product development and market exploiting of nanotechnology with potential Taiwan companies. Also, on 22 February, the day before the forum, the Delegation paid a visit to Dr. Ting-Kuo Lee at Academia Sinica. Dr. Lee has been the director of Institute of Physics, Academia Sinica since 2012 as well as the Chair of International Affairs Committee of Taiwan Nanotechnology Industry Development Association (TANIDA). At that time, he was also the Secretary of ANF ExCo Committee.



Thailand – Partnership/Collaboration

1. Interlaboratory Comparison by NANOTEC (Thailand)

NANOTEC presented the idea for its first call for nanoparticle size comparison to ANF on August 2017 during ANFoS 2017 in Malaysia. The comparison is being piloted by NANOTEC and is opened primarily to ANF member countries. The aim of the interlaboratory comparison initiative is to promote networking among research labs, validate testing method and determine the uncertainty of results via the determination of the standard deviations of repeatability and reproducibility, determine the characteristics of a product intended for be used as a reference material, and assess the reliability of the test results of the participating laboratories. The nanoparticles identified for this comparison include polystyrene latex and TiO₂ (diameter range from 10 nm - 700 nm). The measurement methods are open to all techniques such as Dynamic Light Scattering (DLS), Atomic Force Microscopy (AFM), Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM). A total of 17 labs from 7 nations (Iran, Indonesia, Malaysia, Taiwan, Philippines, United Kingdom, and Thailand) have confirmed participation and have submitted comparison results. The results will be discussed at NANOTEC on 24 September 2018. Some research agencies have confirmed their participation in this discussion. NANOTEC is also planning to conduct another call for interlaboratory comparison in 2019 for gold nanoparticles.

2. Thai-German Joint Workshop on “Nanostructured and Responsive Soft Materials: Molecular Design, Synthesis, Characterization”



The Petroleum and Petrochemical College, Chulalongkorn University, NANOTEC (Thailand) and Max Planck Institute for Polymer Research: MPIP (Germany) jointly organized the workshop on “Nanostructured and Responsive Soft Materials: Molecular Design, Synthesis, Characterization” on 16-18 January 2018 at Dusit Thani Hotel, Bangkok. The objective of this workshop is to bring together leading Thai and German researchers and scientists to exchange research ideas related to “soft” nanotechnology and their importance to future generation of functional materials for a wider range of applications.

3. Thailand Pavilion in nano tech 2018, Japan



nano tech 2018 – The International Nanotechnology Exhibition & Conference is the world's largest and one of the most comprehensive events for nanotechnologies. It was held at Tokyo Big Sight, Tokyo, Japan for the 17th time from February 14-16, 2018.

H.E. Mr. Bansarn Bunnag, Thai Ambassador to Japan, H.E. Suvit Maesincee, Minister of Science and Technology, Prof. Dr. Pairash Thajchayapong, Chairman of NANOTEC Executive Board, Dr. Narong Sirilertworakul, NSTDA President, Dr. Wannee Chinsirikul, NANOTEC Executive Director and Prof. Sirirurg Songsivilai, Secretary-General of National Research Council of Thailand jointly attended in the opening ceremony of Thailand Pavilion in the theme of “Nano Solution by Innovation”. There were 15 private sector exhibitors including 14 government and private agencies.

The objective of Thailand Pavilion is to demonstrate the potential of Thailand's nanotechnology, promote business matching and the incentives for SME investment in Eastern Economic Corridor of innovation (EECi).

4. Chinese Academy of Sciences (CAS)-Thailand Collaboration on Nanotechnology, Information and Communication Technology, and Astrophysics



The National Science and Technology Development Agency (NSTDA), as the secretariat to the Princess Sirindhorn's Information Technology Foundation, organized a Seminar “Chinese Academy of Sciences

(CAS)-Thailand Collaboration on Nanotechnology, Information and Communication Technology (ICT), and Astrophysics” during NSTDA Annual Conference 2018 (NAC2018) on 10 March 2018 at Thailand Science Park, Pathum Thani, Thailand. The purpose of this seminar is to share and exchange knowledge and experiences that result from the collaboration between CAS institutes and Thai universities or research institutes. NANOTEC invited Prof. Dr. Bao-Hang Han and Prof. Dr. Xing-Jie Liang from National Center for Nanoscience and Technology (NCNST), P.R. China as speakers of this seminar. They have collaboration with NANOTEC in terms of Nanoagriculture and Nanomedicine.

University of the Chinese Academy of Sciences (UCAS) and the Office of the Civil Service Commission (OCSC), Thailand have developed collaboration to promote educational excellence, academic ties, and international cooperation between China and Thailand since 2008 when the first memorandum of understanding (MOU) was signed.

5. ASEAN Next 2018 Seminar



The Ministry of Science and Technology, National Institute of Metrology (Thailand) and NANOTEC organized the seminar “Standards and Harmonization: ASEAN Challenges and Opportunities” during ASEAN NEXT 2018 on 20 March 2018 at Royal Orchid Sheraton Hotel, Bangkok.

This seminar was attended by 15 ASEAN representatives, 5 speakers, and 40 public participants from research agencies, academia, and private sector totally 60 participants.

Overall the seminar helps to promote new understanding of standards and harmonization from EU and ASEAN perspectives, identify challenges, opportunities, and how ASEAN can move forward on this topic. Several interesting viewpoints were discussed during the Round Table Discussion session.

The Thai government is adopting various measures to boost economic growth. One of the factors that will help this drive is to encourage Thai exporting companies to comply with international standards acceptance. The Ministry of Science and Technology for its part is developing STI Infrastructures that will assist local industries to compete effectively in global economy setting. The ministry established the National Quality Infrastructure (NQI) which is part of the MSTQ initiative that act as a one stop service for companies to access information on available testing services in Thailand. Various research agencies from public and private sector have assisted in providing necessary information to the data base. Information on NANOTEC testing and services are also available for review.

NANOTEC for its part have form a research collaborative agreement with National Institute of Metrology (Thailand) NIMT since 2010. The collaboration marked the country’s first research collaboration to provide quality infrastructure in areas related to nano-scale measurement, calibration, and nanometrology.

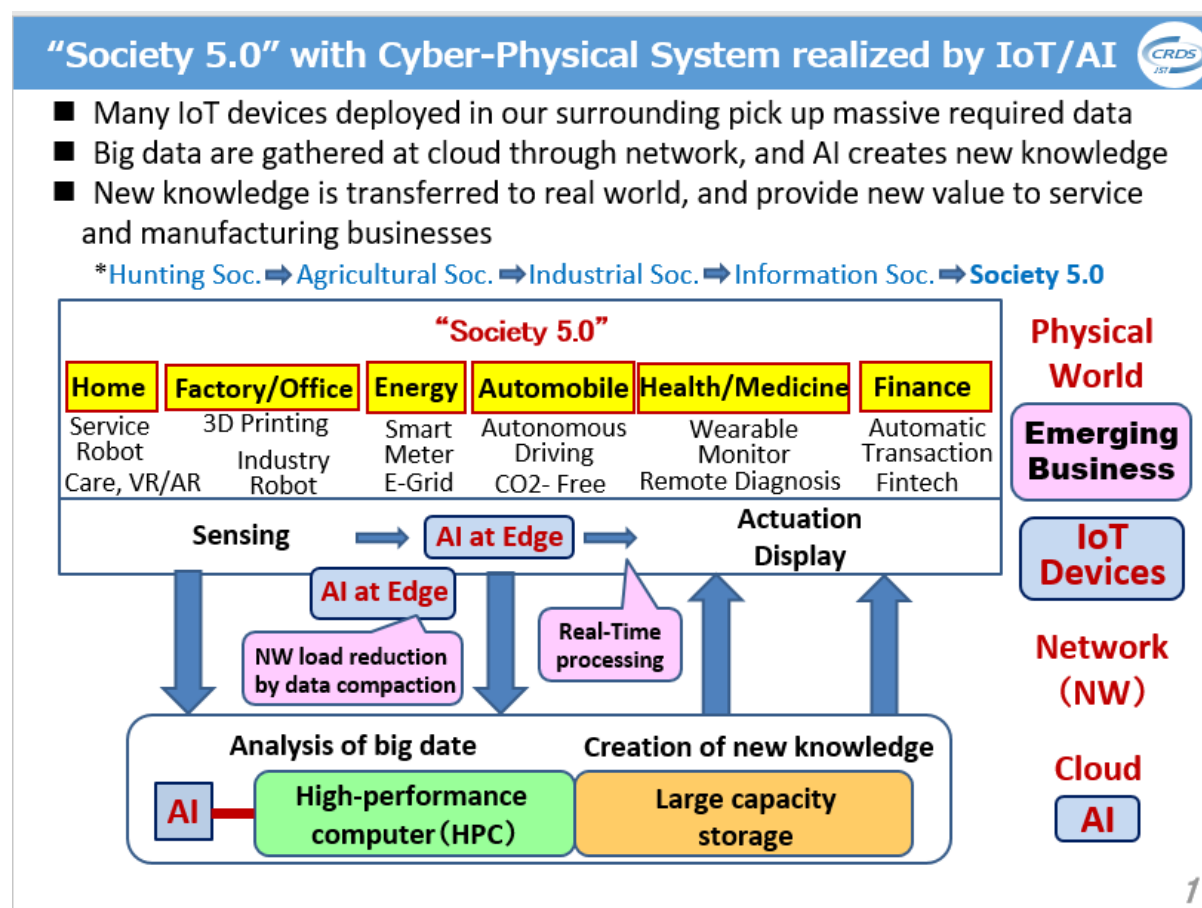
Nanotech Policy

Japan - Nanotech Policy

1. Outlook of Nanotechnology and Materials in Japan

Fiscal year 2018 is right in the middle of the 5th science and technology basic plan (FY 2016~FY2020) in Japan. Government's budget for the 5-year basic plan is 260 Billion USD, and its major target is to the Society 5.0, which is a society with the cyber world and the physical world being fused together. Society 5.0 is expected to emerge after the hunting society (Society 1.0), agriculture society (Society 2.0), industrial society (Society 3.0), and information society (Society 4.0). Figure 1 is an image of the society 5.0 promoted by IoT (Internet of Things) and AI (Artificial Intelligence). A lot of IoT devices with sensors are deployed in our surroundings and picking up massive amount of data regarding changing our environment and human's activities. And the big data is transferred to the cloud computing through networks, and new knowledges and useful information are created there by the high-performance computers with AI. They provide new business values to the service and manufacturing sectors in the physical world, and our society is expected to change dramatically. In these processes, nanotechnology and materials are expected to play a key role through the technological innovation.

Figure 1. Society 5.0 with cyber and physical system realized by IoT/AI.



JST CRDS made many strategic proposals about the possible innovative technologies paving the way to the society 5.0. These proposals are issued in the website of JST-CRDS (<http://www.jst.go.jp/crds/>). Here, we will raise two strategic proposals below which show the new possibilities of nanotechnology and materials.

Figure 2 shows the summary of the strategic proposal on material informatics, which affected largely the Japanese government's R&D policy. Material informatics provide new approach to explore and develop new materials based on data science. Cabinet Office, MEXT, and METI launched new national programs for materials developments respectively which took account of the concept of the material informatics.

Figure 2. Strategic proposal of material informatics.
It is a proposal of a new approach on material design through data science.

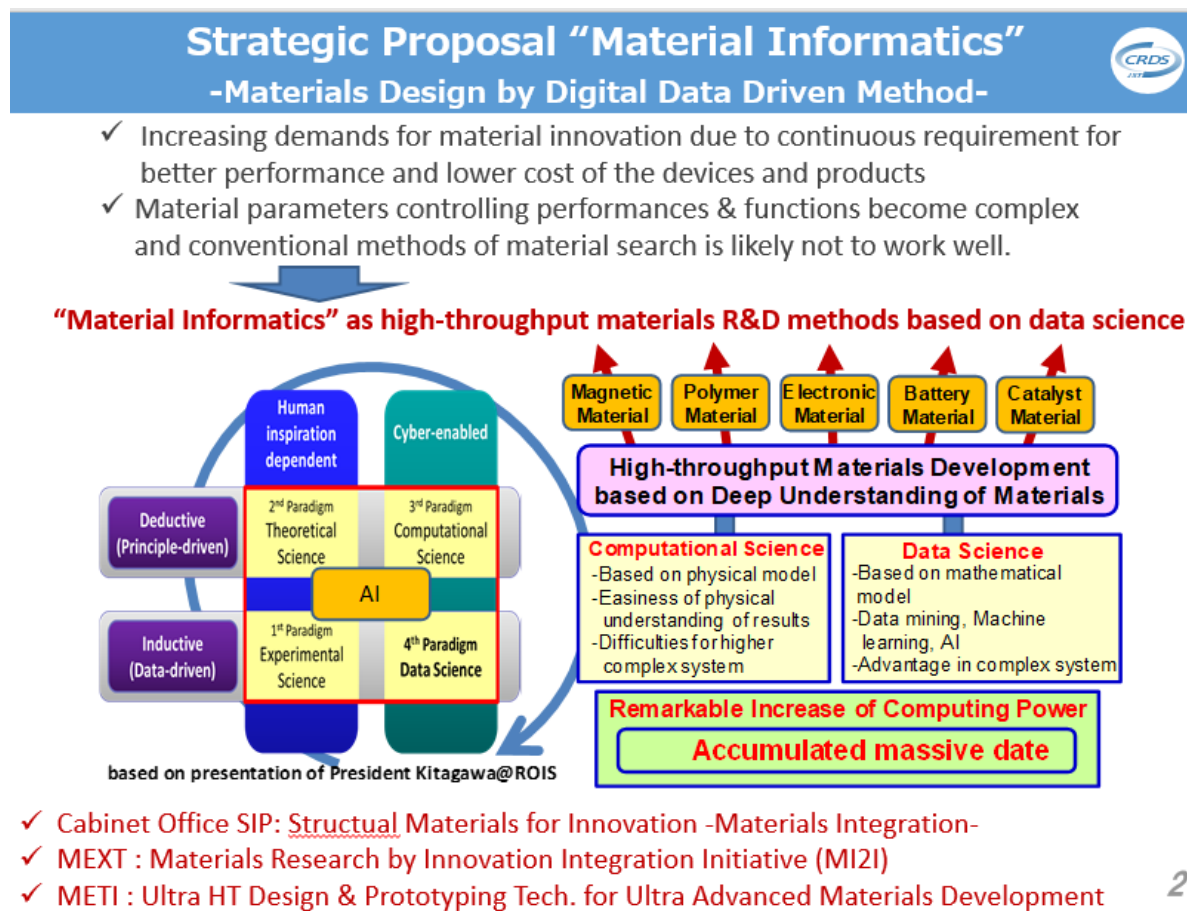
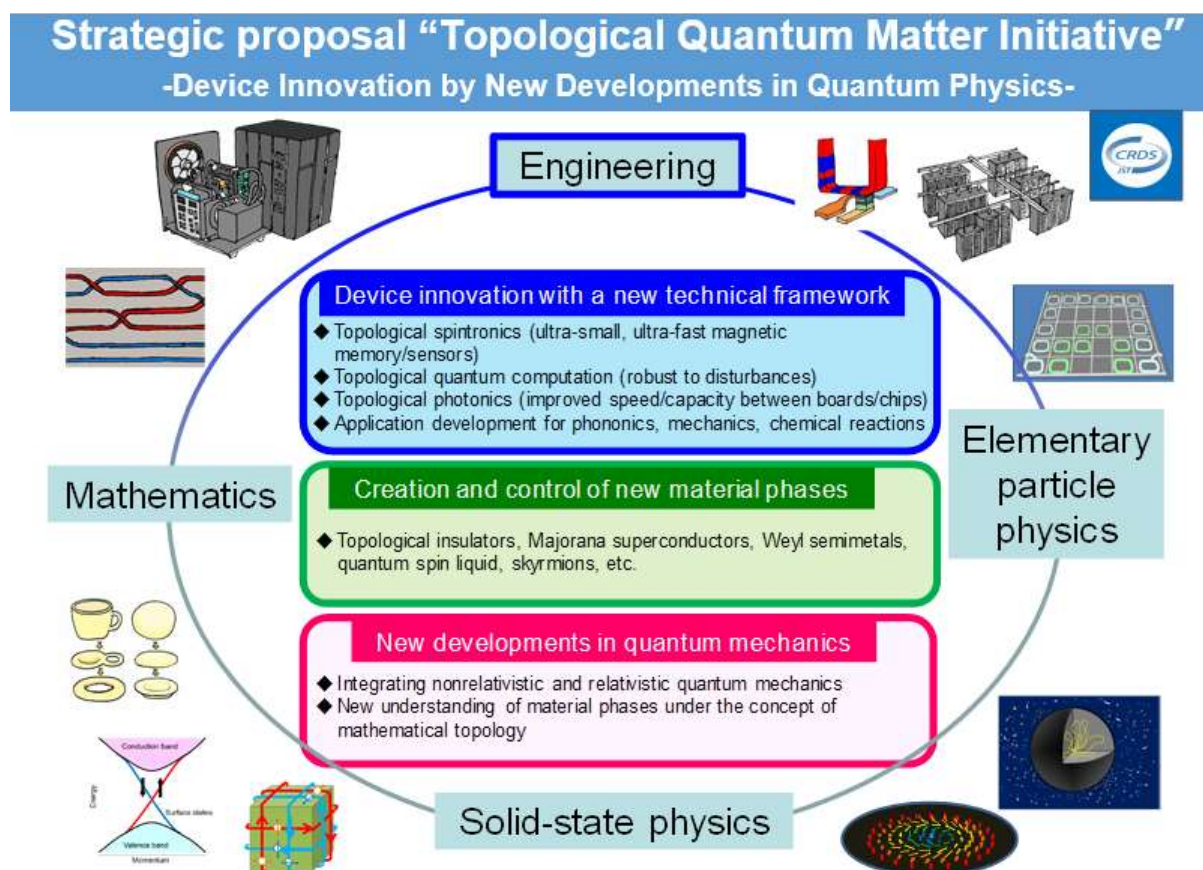


Figure 3 shows the summary of the strategic proposal on topological quantum matter initiative. New development in quantum mechanics is emerging based on the concept of mathematical topology, which enables new understanding of material phases and provides the possibilities of drastic device innovations in the technological areas of quantum computing, spintronics, and photonics. PRESTO and CREST programs of JST was launched just in 2018 based on the CRDS strategic proposal on topological quantum matter initiative.

Figure 3. Strategic proposal of topological quantum matter initiatives.
Device innovation is expected in quantum computing, spintronics, photonics,
and others by new developments in quantum physics.



✓ Presto & CREST : Creation of Core Tech. based on Topo. Materials Sci. for Innovative Device

Korea – Nanotech Policy

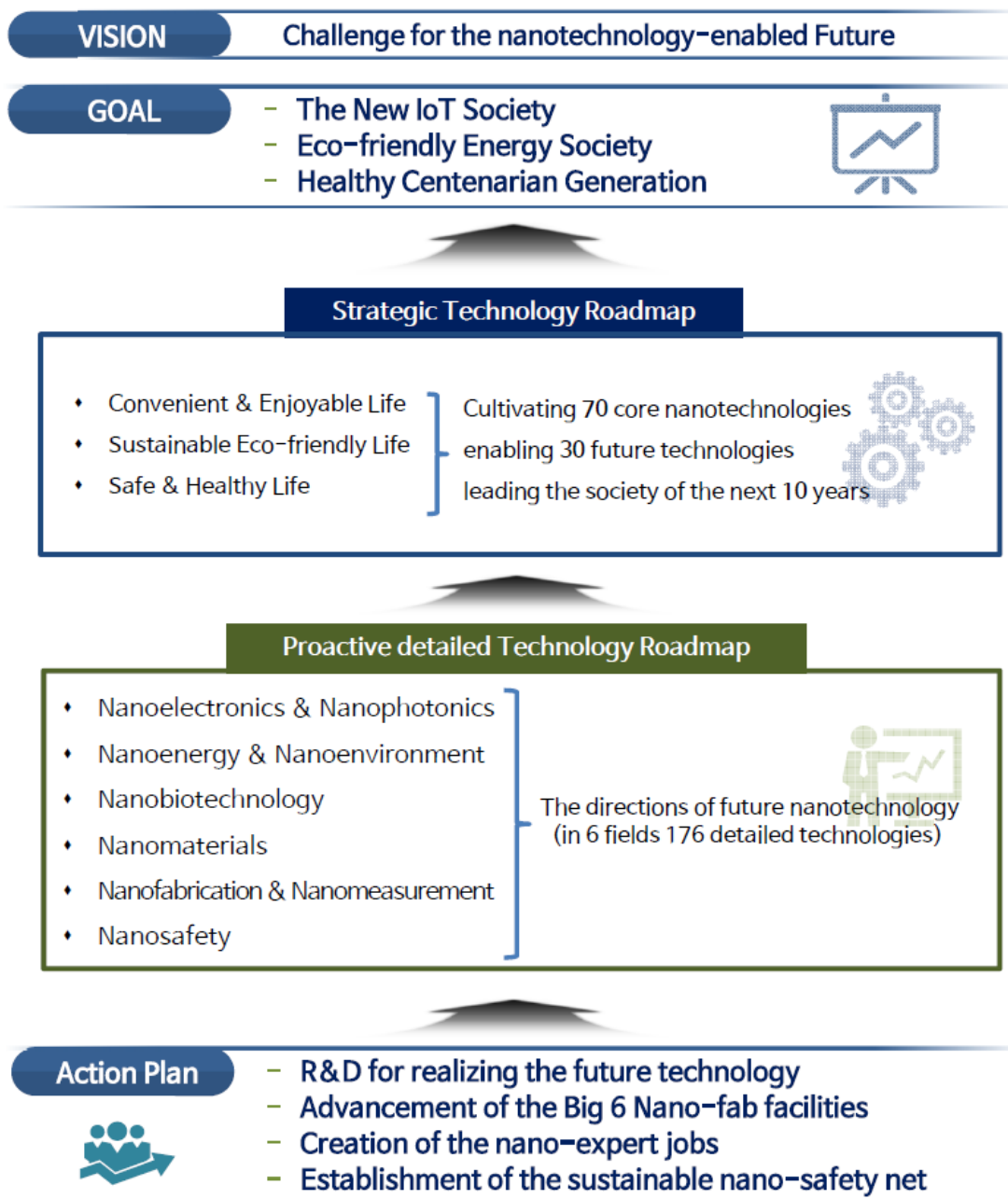
1. National Comprehensive Development Plan on Nanotechnology

The fourth decadal national plan on the comprehensive development of nanotechnology was enacted in 2016 following the preceding three plans. The new plan for the 2016-2025 decade named Korea Nano Innovation 2025 reflects the internal and external changes in the socio-economical and technical environment of the emerging era and lays out vision, goals and key tasks of the next decade. The plan aims to promote the dissemination of the mature, qualified nanotechnology to the manufacturing sector and to take the lead in nanotechnology-driven innovation globally by early investments in promising advanced technologies.



2. Nanotechnology Roadmap

In order to guide the nation's innovation-driven growth by cultivating the key nanotechnology, the Ministry of Science and ICT of Korea has established the 3rd Nanotechnology Roadmap by joint cross-ministry collaboration, and the Roadmap has been approved by Presidential Advisory Council on Science & Technology in June 2018, following the first and the second Nanotechnology Roadmap published in 2008 and 2014, respectively.



Malaysia – Nanotech Policy

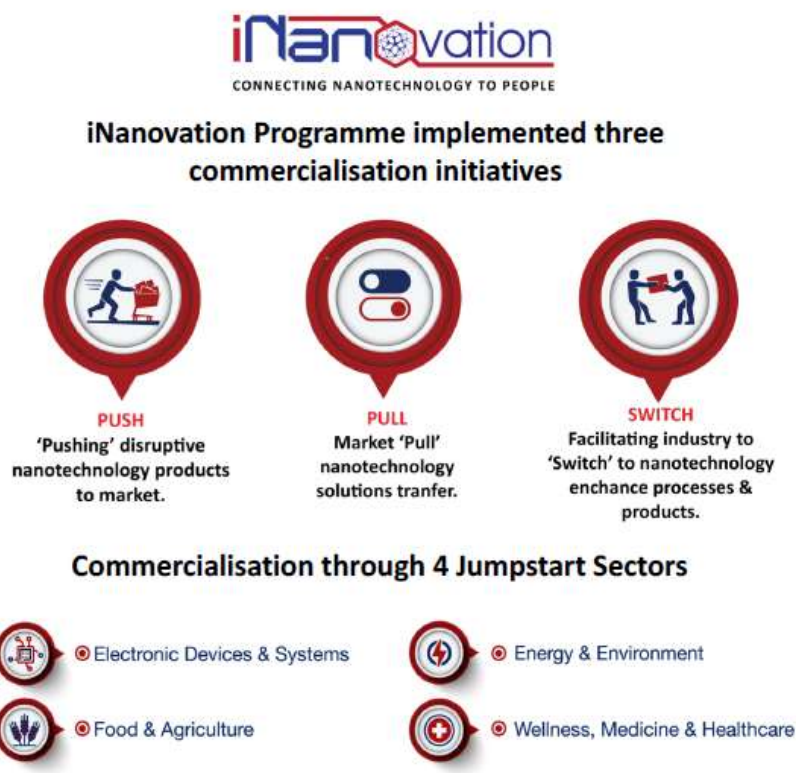
In 2011, NanoMalaysia Berhad was incorporated as a Company Limited by Guarantee (CLBG) under the Ministry of Science, Technology and Innovation (now known as the Ministry of Energy, Science, Technology, Environment and Climate Change) to consolidate and spearhead the commercialisation and industrialisation of nanotechnology activities in Malaysia. Led by CEO Dr Rezal Khairi Ahmad, NanoMalaysia roles and services include:

1. Technology & Business Due Diligence Service
2. Facilitation of Investment in Nanotechnology
3. Nanotechnology Landscaping and Business Opportunities
4. Development of Human Capital in Nanotechnology
5. Strategic Planning and Consulting in Commercialisation and Industrialisation of Nanotechnology Research and Development

To assist companies in Malaysia through nanotechnology commercialisation and development, NanoMalaysia have introduced several programmes under the 11th Malaysia Plan (2011-2020). The programmes are:

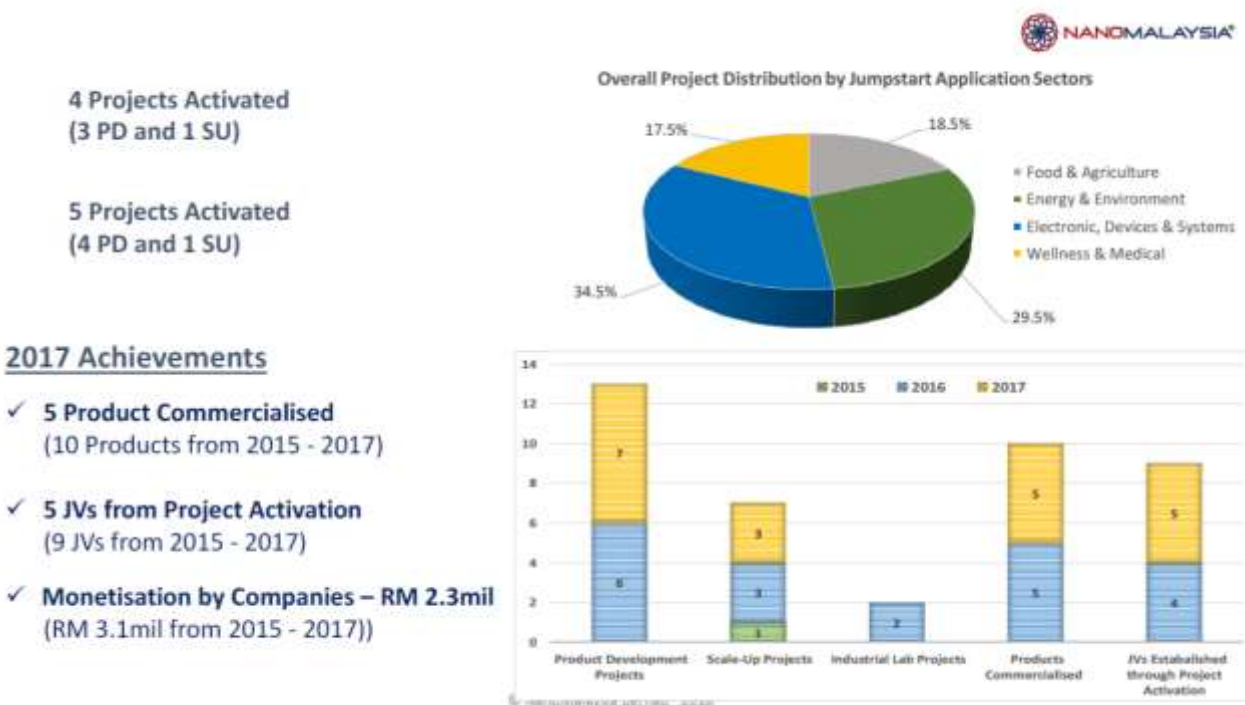
1. iNanovation programme
2. National Action Graphene Plan (NGAP)
3. Advanced Materials Industrialisations
4. NANOVerify Programme.

These programmes will focus on four key sectors namely Electronic Devices & Systems, Energy & Environment, Food & Agriculture, and Wellness, Medicine & Healthcare.



1. iNanovation

iNanovation is designed for the industries, small and medium enterprises (SMEs) and start-up companies to establish market share, introduce new process/material and switch from current conventional to nanotechnology-enabled through the iNanovation platform. The platform consists of pushing nanotechnology products and services into the market, improve products, increasing market share and venture into new markets, and enhance its current production process from conventional manufacturing to nanotechnology-enabled process. These facilitation scheme includes Venture funds, Soft loans, Business partners and Technology Expertise.



2. National Graphene Action Plan (NGAP)

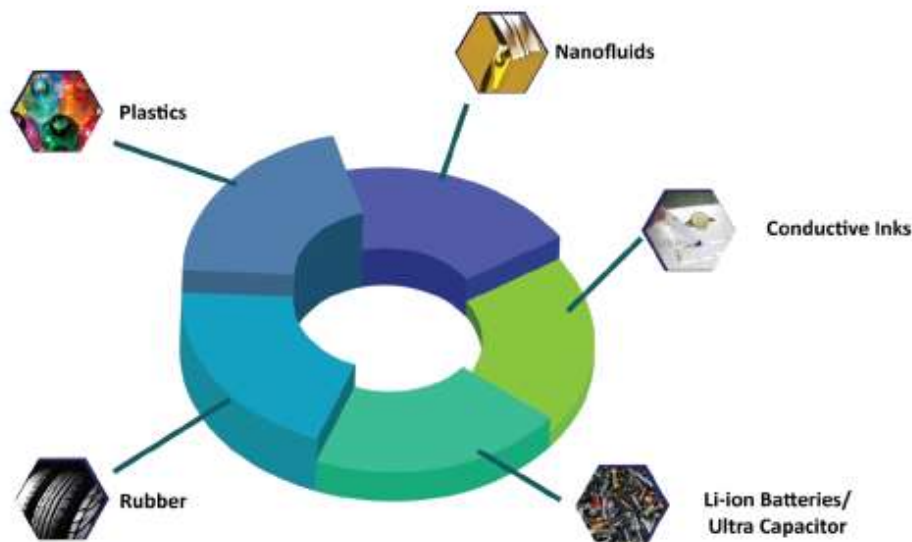
National Graphene Action Plan (NGAP) is a commercialisation programme focusing on Graphene applications in five application areas:

- Lithium-ion battery anodes / ultracapacitors
- Conductive inks
- Rubber additives
- Plastics additives
- Nanofluids

The aim of NGAP is to enhance downstream applications relevant to Malaysia and eventually enabling a local Graphene eco-system to accelerate downstream adoption. By 2020, the National Graphene Action Plan has the potential to add more than RM 20 Billion in GNI impact and help create 9,000 Highly Skilled Malaysian jobs.



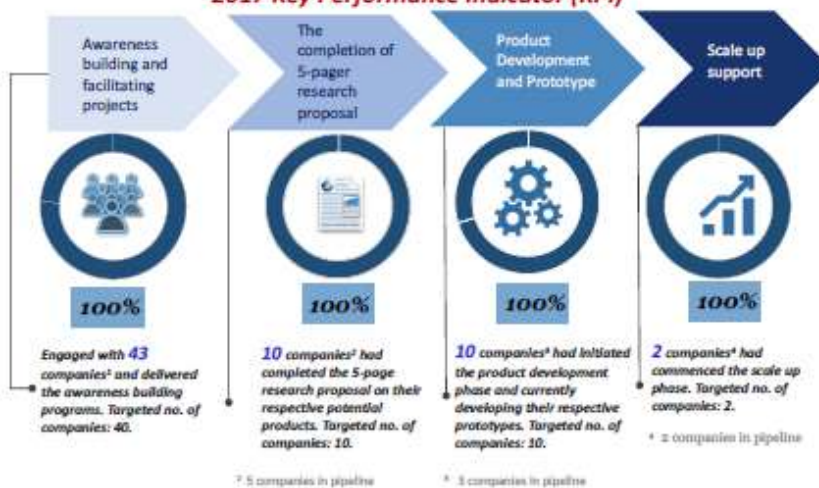
Prioritisation of five application areas to enhance downstream applications relevant to Malaysia



1. NGAP 2017 : 2017 Achievements & Highlights



2017 Key Performance Indicator (KPI)



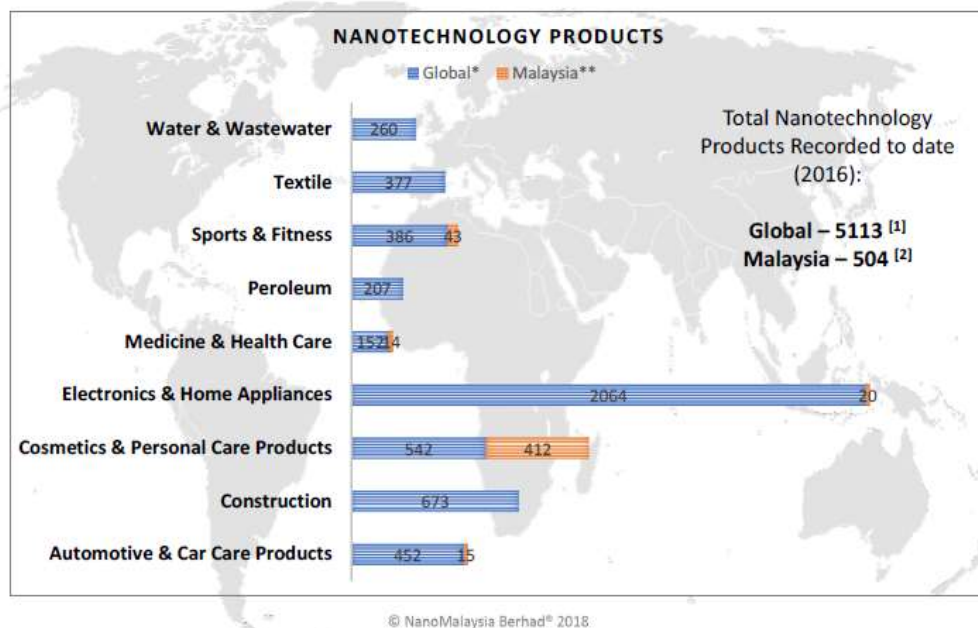
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3. Advanced Materials Industrialisation & NANOVerify Programme

Advanced Materials Industrialisation Programme provide exclusive services through technology adoption of Industrialisation of Advanced Materials products. The program also provide governance, avoid consumer confusion and market advantage to local manufacturers through verification and certification in terms of nanotechnology adoption. Some of the services include Scale-up, Productivity Improvement & Capacity Building; Technology Platform & Product Development with Industry; Up-Scaling of Existing Shared Industrial Labs, and enhancement of NANOVerify Programme.

Nanotechnology Products in the Market

[1] <http://statnano.com/> (2016)
[2] NanoVerify Sdn. Bhd. Database (2016)



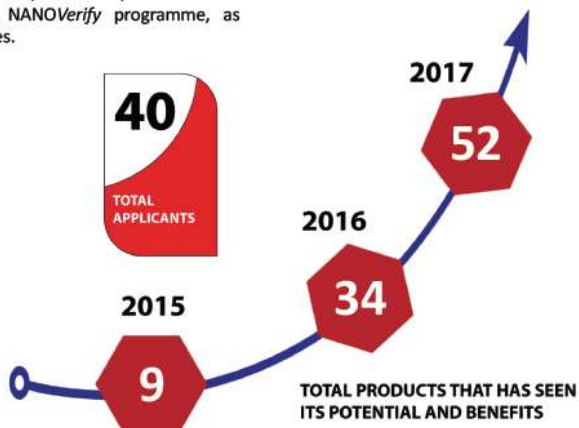
4. The NANOVerify Programme

The NANOVerify Programme is a voluntary certification programme for processes and products with claims of nano-elements in the range of 1 to 100 nm, as well as performance enhancements related to such elements. The “NANOVerified” mark will be awarded to the processes and products upon successful completion of the NANOVerify programme. The aim of the programme is to help genuine nanotechnology-based products in the market, increase public trust in new technology, facilitate and certify the presence and quality of nanomaterial-based products and services.

NANOVerify Certifications Issued



"NANOVerified" is the mark that will be awarded to the processes and products upon successful completion of the NANOVerify programme, as determined by Parties.



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As we enter the 4th Industrial Revolution, NanoMalaysia aims to continue to energise and re-energise industries and innovation in Malaysia through successful development and commercialisation of nanotechnology especially in the adoption of the "Internet of Nano Things" (IoNT). Under REVOLUTIoNT 4.0, NanoMalaysia is heading the revolution of the Internet of Nano-Things in Malaysia through various applications in several industries including transportation, healthcare, agriculture and services.



Achievements since 2016 (11th Malaysia Plan)



7 companies for JV/Start-Up



Created 1679 high-value jobs



45 Project IPs developed. 5 patents and 3 copyrights filed.



51 products developed by industries



12 products commercialized

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Philippines – Nanotech Policy

1. Nanotechnology Techno Transfer Protocol and Commercialization: The Philippine Experience

Nanotechnology technology transfer and commercialization in the Philippines depends much on the Government Funding Agencies, Government Research Institutions, and other Research Organizations with respect to both R&D and commercialization. The Research & Development in nanotechnology takes a very long time, but the Commercialization phase does not differ very much from other advanced technologies. Nanotechnology R&D and commercialization should take into consideration the global dimension of the technology. The R & D phase is already extremely capital intensive. Nanosafety issues need to be considered already in R & D phase of the material and along the whole value chain, not only at the end-product phase. There are still uncertainties with regard to the long-term effect of nanomaterials on human health and environment. Nanotechnology techno transfer and commercialization in the Philippines has a legal framework. It comprises of the following: Technology Transfer Act, Guidelines on Intellectual Property Validation, Commercialization of Information Sharing, and Technology Transfer Protocol. It also includes the technology marketing strategies: social marketing and promotional activities, commercial enterprise module with technical and financial analyses, licensing protocols, and post-monitoring and impact assessment of technologies transferred. Start-ups can have access to experts that can help in the commercialization of nanotechnologies and access to government laboratory facilities.

Taiwan – Nanotech Policy

1. Taiwan's IANTP to the next stage

Taiwan's Innovation and Application of Nanoscience Thematic Program (IANTP) is initiated in 2015 and aims to encourage scholars to engage in translational research based on scientific discoveries, from a basic Technology Readiness Level (TRL) of "Concept Development" to a more advanced "Prototype Validation", to produce original nanomaterials, components/devices and technology, and to meet the societal needs and to strengthen the industry competitiveness through Call for Proposal. IANTP focuses on 4 key areas, including "Nanomedicine and Biotechnology", "Nanomaterials for Energy and Environment", "Nanoelectronics and Optoelectronics" and "Fabrication, Characterization and Mechanics of Nanostructures". In 2018 Ministry of Science and Technology (MOST) developed a new operating procedure for some programs with high uncertainty like IANTP. The mechanism for the Defense Advanced Research Projects Agency (DARPA) of the United States Department of Defense was also introduced into the especial programs where an appropriate risk management is critical. To follow up the policy and implement the rolling wave planning, a new strategy for the next stage of IANTP with well-defined program scope and impact from the outset is requested. Furthermore, MOST has also launched an "Academic Research Results Industrialization and Values Enhancement (ARRIVE)" program recently. By matching these diverse policies, it is expected to maximize the grant and impact of academia-industry collaboration and to respond to the societal needs in the future.

2. Entrepreneur Seminar

Entrepreneur Seminar is a two-stage training and matching activity that gives the young researchers, mainly Postdoctoral researchers and PhD students, an opportunity to interact with technology experts and entrepreneur mentors. The first stage of the activity is expected to inspire young researchers' in-depth thinking of technology commercialization after an advanced Technology Readiness Level (TRL) of "Prototype Validation". Invited teams would enter the second stage, a One-on-One matching with venture capital. The Entrepreneur Seminar, held in April 2017, was organized by MOST's Innovation and Application of Nanoscience Thematic Program (IANTP) and co-organized by Germination Program which is also a plan under the auspices of MOST. IANTP focuses on 4 key areas, including "Nanomedicine and Biotechnology", "Nanomaterials for Energy and Environment", "Nanoelectronics and Optoelectronics" and "Fabrication, Characterization and Mechanics of Nanostructures". An orientation was also held to help participants to prepare for their presentations before the seminar.

Thailand – Nanotech Policy

Nanotechnology Policy in Thailand

NANOTEC is a research organization under the jurisdiction of the National Science and Technology Development Agency (NSTDA), and the Ministry of Science and Technology. NANOTEC focuses on Nano Science and Technology based projects and aims to transfer the developed know-how and technology to industrial and service sectors in a constructive manner to increase Thailand's competitiveness, promote social awareness and improve the quality of life and the environment. Based on the 3rd National Nanotechnology Roadmap (2016-2021) and strategic areas of Thailand 4.0, NANOTEC's core technologies lie in the pathways towards developments in life and health, food and agriculture, energy and environment, industrial coatings and textile, whereas nanometrology, characterization and nanosafety are also included.

Nanosafety & Ethics Strategic Plan (2017-2021) is one of the 3 plans included in the National Nanotechnology Policy Framework (2012-2021). The other 2 are NANOTEC Master Plan (2017-2021) and Nanotechnology Roadmap (2017-2021). At NANOTEC, the nanosafety and standards initiatives are being coordinated by the Nanosafety Alliance Unit (NSA) with collaboration from various agencies both within NANOTEC such as Safety and Risk Assessment Lab (SRA) and Nano Characterization Lab (NCL) and external partners such as National Institute of Metrology Thailand (NIMT), Thai Industrial Standards Institute (TISI, Ministry of Industry), Thai FDA, and National Science Technology and Innovation Policy Office (STI).

The NANOTEC Nanosafety Program focuses on 3 strategies: Public Engagement, Promotion of Policy Development, and Establishing Access to Knowledge. We are also looking at ways to incorporate the Nanosafety and Standards initiatives with the concept of Sustainability Development Goals (SDG) and Circular Economy. Addressing nanosafety and standards at NANOTEC is conducted in manners that embraces harmonization and enhances the overall goal of technology development which complements with safety awareness in order to achieve sustainability.

NANOTEC and Thai Industrial Standards Institute (TISI) joint force to work on adapting ISO Standards for 7 industrial standardization manuals related to nanotechnology for Thailand. The Royal Thai Government Gazette have officially announced the 7 industrial standardization manuals related to nanotechnology. To help promote the utilization of the existing 7 industrial manuals, the Nanotechnology Association of Thailand have decided to incorporate information from the manuals as part of their NanoQ label application process. Companies wishing to apply for NanoQ label will need to adhere to the manual guidelines.

From 2018 to 2021 NANOTEC have proposed to work on 7 additional industrial standards related to nanotechnology which will be submitted to TISI for review and approval. The standards are voluntary basis.

NanoQ Voluntary Label



NANOTEC celebrated their 15th Anniversary on 15 August 2018

National Nanotechnology Center (NANOTEC) is moving forward. We just celebrated the 15th Anniversary on August 15, 2018 in our facilities at INC2, Thailand Science Park. As an energetic young national center, we are in-charge of development and execution of Thailand's nanotechnology policy and research that lead to significant impacts on society. In collaboration with the National Science Technology and Innovation Policy Office, the two agencies work together as the secretariat of "the National Nanotechnology Policy Framework (2012-2021)" in order to strengthen national competitiveness and improve quality of life. Today, NANOTEC has 226 staff including 138 research staff from 16 laboratories. The new research mechanism to working under the concept of NANOTEC's core technology has been created which comprises NANO Processing, NANO Materials, NANO Devices & Systems and NANO Characterization & Standardization.

MAJOR EVENTS 2017-2018

Date	Avenue	Events
23/2/2017	Taipei, Taiwan	2017 Canada Taiwan Strategic Partnering Forum on Nanotechnology Applications
12/7/2017- 14/7/2017	Goyang KINTEX, South Korea	NANO KOREA 2017 http://sympo.nanokorea.or.kr/2017/eng/main/
21/8/2017- 22/8/2017	Johor Bahru, Malaysia	Asia Nano Forum Summit 2017 https://www.asia-anf.org/event_cat/anf-summit/
29/8/2017	Beijing, China	The 2nd China-Japan-Korea Trilateral Nanotechnology Cooperation Forum
19/10/2017- 21/10/2017	Cebu City, Philippines	2017 ASEAN Conference on Advanced Functional Materials and Nanotechnology (ASEAN-CAFMN)
28/11/2017	Tehran, Iran	Asia-Europe dialogue on nano-safety and nano-product certification
29/1/2018- 2/2/2018	NSW, Australia	International Conference on Nanoscience and Nanotechnology (ICONN2018) http://www.ausnano.net/iconn2018/
14/2/2018- 16/2/2018	Tokyo, Japan	nano tech 2018 https://www.nanotechexpo.jp/2018/
15/2/2018	Tokyo, Japan	ANF EXCO Meeting
15/2/2018	Tokyo, Japan	NBCI the 10th Nano tech Association Conference
16/2/2018	Tokyo, Japan	ANF Commercialization Workshop
10/4/2018- 16/4/2018	Tehran, Iran	International Workshop on Nanotechnology: From Innovations to Applications
10/4/2018- 16/4/2018	Tehran, Iran	International Nanotechnology Olympiad 2018 http://nanoolympiad.org/
25/4/2018- 26/4/2018	Sarajevo, Bosnia	The 9th Sarajevo Business Forum (SBF2018)
30/4/2018- 3/5/2018	Houston, TX, USA	The Offshore Technology Conference (OTC) http://2018.otcnet.org/
17/5/2018- 18/5/2018	Taipei, Taiwan	Asia Nano Forum Summit 2018 https://www.asia-anf.org/event_cat/anf-summit/
17/5/2018	Taipei, Taiwan	Commercialization WG on its workshop
6/7/2018	Guangzhou, China	The Unveiling Ceremony of Iran Nano China Center (INCC) in Guangzhou
11/7/2018- 13/7/2018	Goyang KINTEX, South Korea	NANO KOREA 2018 http://sympo.nanokorea.or.kr/2018/eng/main/
26/09/2018- 28/09/2018	Tehran, Iran	The 7th international congress on nanoscience and nanotechnology, ICNN 2018 http://www.icnn18.com/
13/10/2018- 16/10/2018	Tehran, Iran	11th Iran nanotechnology festival 2018 http://festival.nano.ir
29/10/2018	Wien, Austria	The 2nd EU - ANF dialogues on Nanosafety
30/10/2018	Manama, Bahrain	International Waqf and Blockchain Forum (IWBF) https://www.waqfblockchain.com/
12/12/2018	Pathum Thani, Thailand	Nanosafety Technical Forum 2018 at NanoThailand 2018 http://www.nano-thailand.com/2018/Annual/

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

Korea Institute of Science and Technology (KIST, South Korea)

Korea Nano Technology Research Society (KoNTRS, South Korea)

Nano Malaysia Berhad (Malaysia)

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

Institute of Physics, Academia Sinica (Taiwan)

Industrial Technology Research Institute (ITRI, Taiwan)

National Nanotechnology Center (NANOTEC, Thailand)