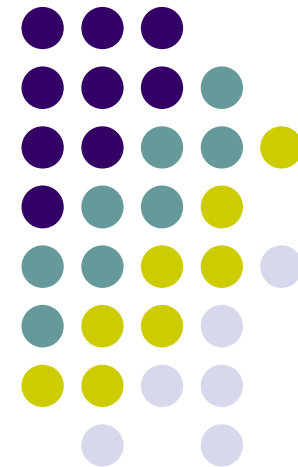




Accelerating nanotechnology development in Thailand



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Message From The Executive Director



Research must be relevant to society's needs

Welcome to the National Nanotechnology Center (NANOTEC).

When people think about research centers they often picture an ivory tower that shows researchers going about their research work that is not related or relevant to their life. Our job at NANOTEC is to break that frame of mind by using high technology to produce products that people can see and that matters to them. Various research projects that we decide to undertake must be of national importance. This is one of the key prerequisites that we will base our decision whether to engage in a research program or not.

The information before you will outline who we are, what research projects we are undertaking, and available approved policies necessary to achieve our goal. It is our hope that the information will act as a catalyst to encourage your appetite to explore mutual interests and research collaboration efforts.

We realize that in working together with our partners, we can foster the development of nanotechnology.

Lets us be your partner of choice to produce research output that matters to society.

Prof. Sirirurg Songsivilai, M.D., Ph.D
Executive Director
National Nanotechnology Center (NANOTEC)



About NANOTEC

NANOTEC is the leading agency on nanotechnology development in Thailand. Established on 13 August 2003, NANOTEC is one of four research agency operating under the jurisdiction of the National Science and Technology Development Agency (NSTDA) and the Ministry of Science and Technology (MOST). NANOTEC basic principle is to contribute to society through Research and Development.

NANOTEC mission is to conduct and support research, development, design and engineering in nanotechnology, and transfer the technology to industrial sector in order to increase Thailand's competitiveness, and improve the quality of life and the environment.

Research Units of NANOTEC

Currently, NANOTEC Central Laboratory consists of 12 units located at the Thailand Science Park:

- Nano Delivery System Lab
- Nanomaterials for Energy and Catalysis Laboratory
- Nano-cosmeceutical Laboratory
- Hybrid Nanostructure and Nanocomposites Laboratory
- Nano Safety and Risk Assessment Laboratory
- Integrated Nanosystem Laboratory
- Nanoscale Simulation Laboratory
- Functional Nanomaterials and Interfaces Laboratory
- Nano-Molecular Target Discovery Laboratory
- Nano Characterization Laboratory
- Nano Functional Textile Laboratory
- Engineering and Manufacturing





One of the major goals of NANOTEC is to be a “solution provider in nanotechnology”, therefore a high percentage of the nanotechnology research is focused on industrial applications, for example:

- textiles – antimicrobial fabric, self-cleaning and water repellent fabric;
- cosmeceuticals – nano-emulsions, controlled release nano-capsules;
- food – e-nose sensors for quality control processes.

Since its inception, NANOTEC has provided more than 16,000 testing services to industries and researchers annually. Furthermore, nano safety initiatives are being developed in compliance with international standards and global networks via SAICM, OECD and UNITAR.

NANOTEC has identified 7 flagship programs which it considers are in response to both national and NSTDA priorities. The flagship programs are:



1. **Clean water**

Product target: Water filtration system providing clean and clear water in the areas contaminated with heavy metals and/or agriculture fertilizers. Capacity is 1,000 liter/day for usage in rural areas around the country.

2. **Control-released fertilizer**

Product target: Control-released fertilizer that responds to plant's life cycle
Plant target: Sugarcane, rice, and orchid

3. **Vector control system (mosquito)**

Product target: Insecticide-impregnated mosquito net and mosquito repellent lotion

4. **Nano Aroma**

Product target: Essential oil for aromatherapy with long lasting fragrances and effects

5. **Nano-Mark**


Product target: Nano Mark (with potential safety tag for nanoparticle-containing products)

6. **Smart Soil**

Product target: Carbonaceous soil or biochar from water hyacinth or biomass, to be used as soil conditioners

7. **Nano-biosensors**

Product target: UV indicator, heavy metal identification, and bacteria band for bacterial detection



In nanobiotechnology and the life sciences, NANOTEC is conducting research on nano-delivery systems, nanomolecular sensors, and nanocosmeceuticals. For delivery systems, NANOTEC is developing platforms for drug delivery based on nano-encapsulation and molecular complexation techniques for the controlled release and target delivery of bioactive compounds. Nano-carriers studies include core-shell nanoparticles, self-assembly nanoparticles, polymer conjugates, nanoemulsion and molecular inclusion complexes. In addition, novel targeting moieties such as peptides, magnetic, and antibodies are being explored.

In nanomolecular target discovery, the design and development of antibody fragments for targeting infectious diseases and cancer are being investigated. The emphasis is on therapeutic antibody-based nanomolecules and molecular diagnostic tests.





Publications

NANOTEC research publications in international journals stand at 57 publications per year. This is equivalent to one research publication per week, an extraordinary feat given the size of the research pool.

Business Development

The Business Development (BD) Unit is responsible for bridging the gap from Lab to Market for NANOTEC research output to potential private sector groups who will then proceed to do mass production for commercialization.

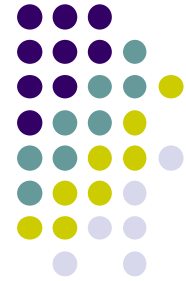
To effectively execute this responsibility, the BD unit work closely with the Technology Licensing Office (TLO) at NSTDA to manage and follow up on matters related to patent, licensing, and intellectual property. In addition, the unit also supports the day-to-day work of promoting contract research activities and testing services rendered by the Nano Characterization Lab (NCL).




Policy

In 2012, the Thai government approved the National Nanosafety and Ethics Policy Framework as the critical balance in the National Nanotechnology Policy Initiative to ensure sustainable development of nanotechnology. The policy directs attention to acquire and provide adequate information on the safety and risk of nanomaterials, technology and products. It is supplemented by voluntary labeling system for nano-products and the public engagement activities. Public participation in all stages from R&D to commercialization is the key success factor of this plan.

NANOTEC strives to become an international recognize agency whereby international standards are upheld to ensure that services rendered are reliable, safe and with good quality. In 2012 NANOTEC undertook a strenuous management system auditing process which resulted in NANOTEC receiving “3” certifications in one year. The 3 certifications are: ISO9001 on the design and execution of R&D operation, TIS 18000 for safety standards, and finally the ISO/IEC 17025 for competence of testing and calibration laboratories focusing on anti-bacteria and dynamic light scattering (DLS) properties.






Also in 2012 the government approved the National Science Technology and Innovation Policy which aim at nurturing more local scientists and promoting collaboration research projects between government and private sector groups. Thus, prompting the increase investment in science, technology and innovation to compete in the global market, especially with the approach of the single ASEAN market in 2015.

Collaboration & Networking

The mission of NANOTEC is accomplished by working closely with strategic partners both within and outside Thailand. The offices of the International Collaboration Section (ICO), Alliance Affairs Section (AAF), and the Research Support Division (RSUP) has establishes a number of formal and informal research collaborations with local and international partners.

The RSUP has established strong links with leading universities in Thailand in the form of Center of Excellence in Nanotechnology (COENs) which consist of more than 400 nanotechnology researchers, as well as with leading nanotechnology centres overseas. In 2012 NANOTEC and 8 universities signed the Center of Excellence (CoE) Agreement a 5 years counterpart funding approach between NANOTEC and the 8 universities.





The AAF works to coordinate and strengthen relationship with the NANOTEC's key stakeholder and strategic partners. The mission of this section is to connect/link, increase awareness and follow up key activities, which help supporting NANOTEC engagement with key partner and stakeholders.

It has established close working relationships with strategic partners in the governmental sector such as Ministry of Science and Technology (MOST), Ministry of Education, Thailand Board of Investment (BOI), Synchrotron Light Research Institute (Public Organization) and Thailand Center of Excellence for Life Sciences (TCELS) just to name a few. These relationships have assisted NANOTEC in expanding our collaboration efforts.

As for international collaboration, the ICO is active participant in regional and global activities. Several bilateral and multilateral partnerships have been successfully concluded ranging from joint research collaboration to researcher exchange activities. In so doing has helped establish NANOTEC as one of the key research agencies in the region.





Here are some sample collaborative partnerships:

- Asia Nano Forum (ANF)
- EU FP7 on Nanoscience, Nanomaterials and New Production Technology (NMP) - national contact point
- ASEAN Committee on Science and Technology (COST) and ASEAN Sub-Committee on Science and Technology Infrastructure and Resource Development (SCRID)

Collaborative partnerships

- National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Taiwan Textile Research Institute (TTRI), Taiwan
- Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V., Germany
- University of Queensland, Australia
- Laboratory of Materials-Biology Interactions EMPA Swiss Laboratories for Material Testing and Research, Switzerland
- National Institute for Materials Science (NIMS), Japan
- Korea Research Institute of Biosciences and Biotechnology, KRIBB
- University of West Virginia
- University of Texas (San Antonio)