

# **Nanotechnology: Risk Assessment & Safety Compliance in THAILAND**

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# ABOUT US....



**THAILAND**



**PATHUMTHANI PROVINCE**



**CENTRAL OFFICE**



**INNOVATION CLUSTER BUILDING**

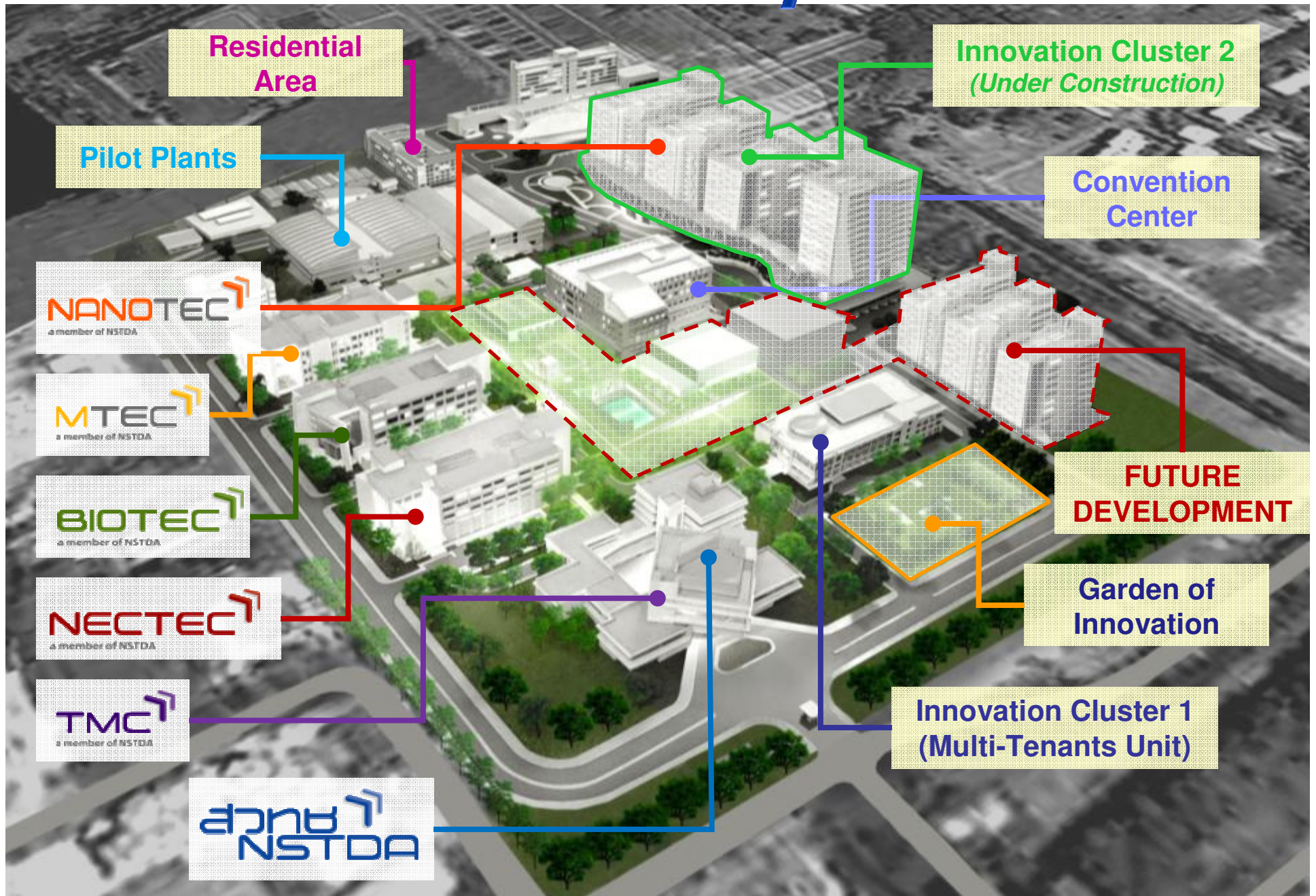


**SIRINDHORN SCIENCE HOME**





# S&T Community in TSP



# NANOTEC ROLES

## POLICY DEVELOPMENT

POLICY

National Nanotech Policy  
Nanotechnology Roadmap  
NanoSafety Plan



## NATIONAL CENTRAL LAB

Synchrotron beamline  
Computation Consortium  
Scholarship Students

## RESEARCH & DEVELOPMENT

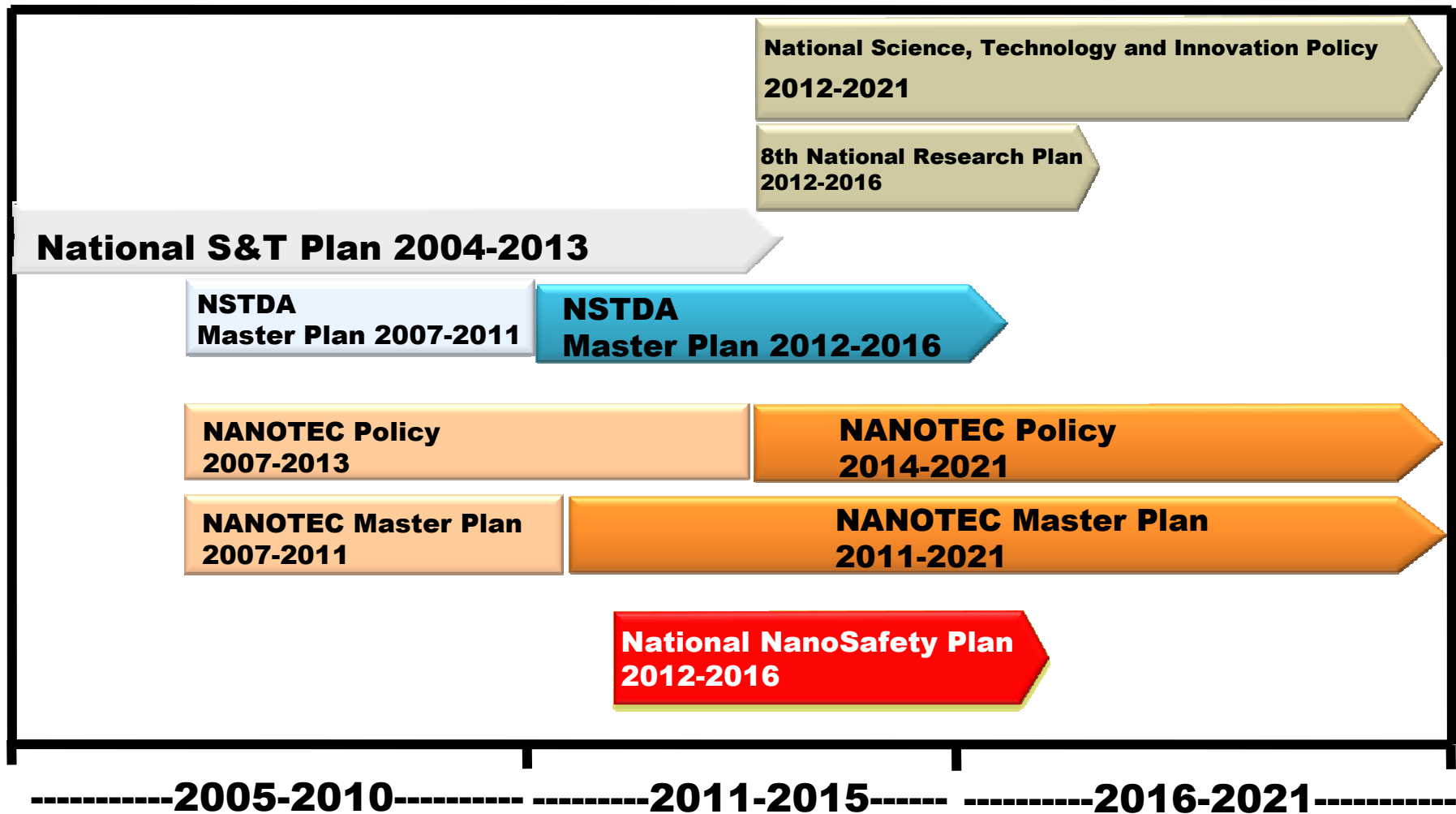
In-house Labs (12 R&D teams)  
CoE (8 universities)  
Funding



## TECHNOLOGY TRANSFER

Contract research  
Joint research  
Consultation / Training

# Thailand Major S&T Strategic Plan





# Commercialized Nano-products

R&D

--- Characterization

PRODUCTION --- Inspection / Validation / Monitoring



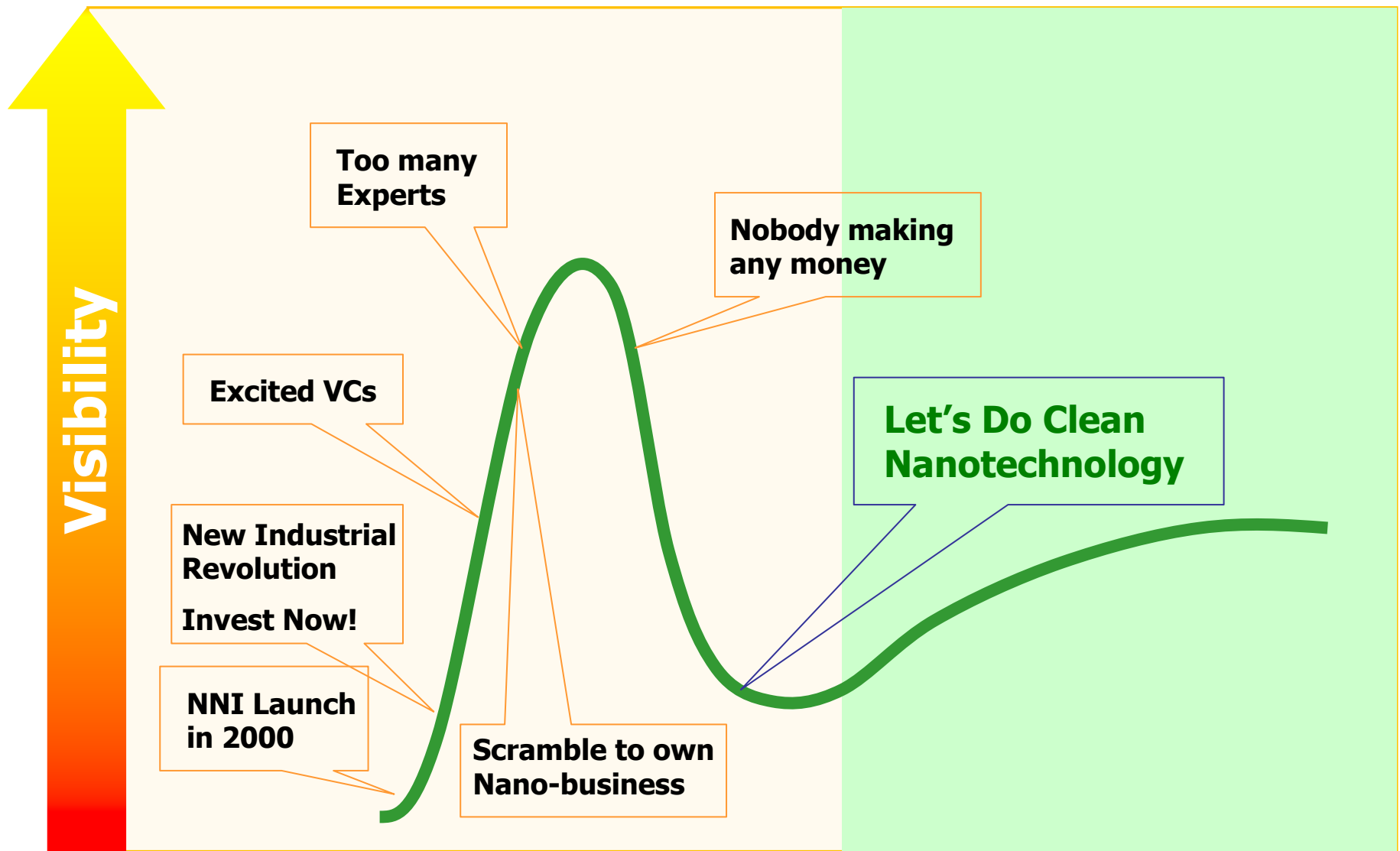
## COMMERCIALIZED PRODUCTS

- REAL or FAKE ?
- REAL with QUALITY ?
- REAL with SAFETY ?



TOXICOLOGY

# Social Visibility on Nanotechnology



# NATIONAL NANOSAFETY PLAN

2012 - 2016

SAFE-NANO FOR  
THAILAND'S SUSTAINABLE  
DEVELOPMENT

AIM

HEALTH, ENVIRONMENT SAFETY & SOCIAL SECURITY

KPI 1

EFFECTIVE MANAGEMENT SYSTEM

KPI 3

PUBLIC KNOWLEDGE & AWARENESS

KPI 2

PRODUCT LABELING

**S1:** KNOWLEDGE MANAGEMENT

**S3:** PUBLIC ENGAGEMENT

**S2:** REINFORCEMENT & ENFORCEMENT

STRATEGY

ENGINEERING

M

M

M

M

M

ENFORCEMENT

ECONOMY & FINANCE

EMPOWERMENT

EDUCATION



GOVERNMENT MINISTRIES & ASSOCIATIONS



# STRATEGY 1: ESTABLISHMENT OF KNOWLEDGE MANAGEMENT

2012

2013

2014

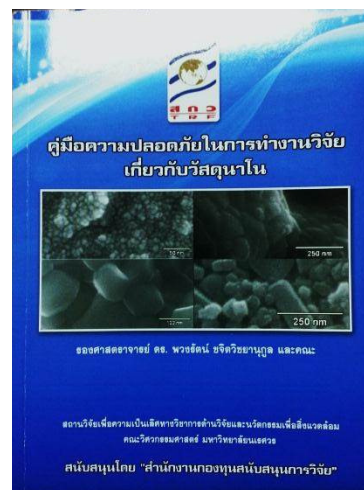
2015

2016



**NANOSAFETY DATABASES**

**KNOWLEDGE MANAGEMENT & IMPLEMENTATION**

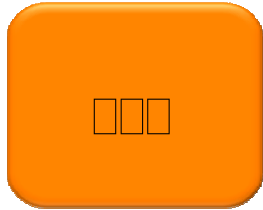


**SAFETY MANUAL  
FOR  
NANOMATERIAL  
BASED RESEARCH  
WORK**



**SAFETY MANUAL  
FOR  
NANOMATERIAL  
BASED INDUSTRY**

# STRATEGY 2: MEASURES REINFORCEMENT & ENFORCEMENT



2012

2013

2014

2015

2016

**HAVING AGENCIES AND WARNING SYSTEMS FOR PRODUCT NANOSAFETY**

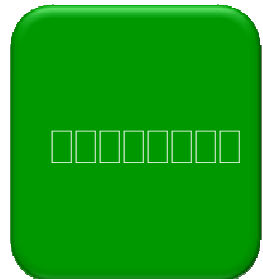
**TESTING LAB AVAILABLE FOR NANOPRODUCTS**

**LABELING WITH SCIENTIFIC EVIDENCE**

**HAVING NANOSAFETY AND ETHICS MEASURES**

**HAVING MECHANISMS TO  
SUPPORT/MONITOR/ENFORCE THE MEASURES**

**HAVING CONTROLS ON PRODUCTS ADVERTISEMENT**



## INSTRUMENTS: PHYSICAL & PHYSICAL IMAGING

**HR-TEM**



**AFM**



**SEM-EDX/WDX**

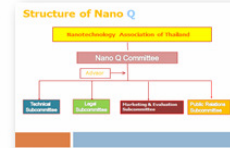
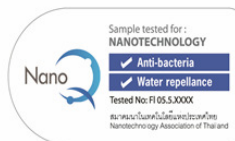


**AFM / RAMAN SPECTROMETER**



## Nano Q

- Nano Q is a certified quality mark for nano products which are certified by Nanotechnology Association of Thailand.
- Motivation to Have Nano Q
  - Increase Public Trust: Facilitate healthy development of nanotechnology
  - Protect Consumer: Avoid waste money
  - Protect Good Companies: Eliminate unfair competitions
  - Facilitate Trade: Stimulate economic growth



## STRATEGY 3: PUBLIC ENGAGEMENT

2012

2013

2014

2015

2016

KPI

**PUBLIC & CONSUMER NETWORK**

**ACCESSABILITY TO INFORMATION FROM PUBLIC**

**MATERIALS FOR EDUCATION SYSTEM**

ACTIVITY



**BOOK      MODEL      & WORKSHOP**



# CURRENT STATUS

## MATERIAL ANALYSIS METHOD



### INSTRUMENTS: PHYSICAL & PHYSICAL IMAGING

#### HR-TEM



#### AFM



#### SEM-EDX/WDX



#### AFM / RAMAN SPECTROMETER

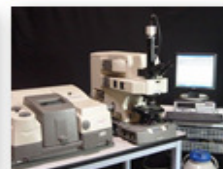


### INSTRUMENTS

#### DLS



#### FTIR



#### GC-HPLC-MS



#### XRD



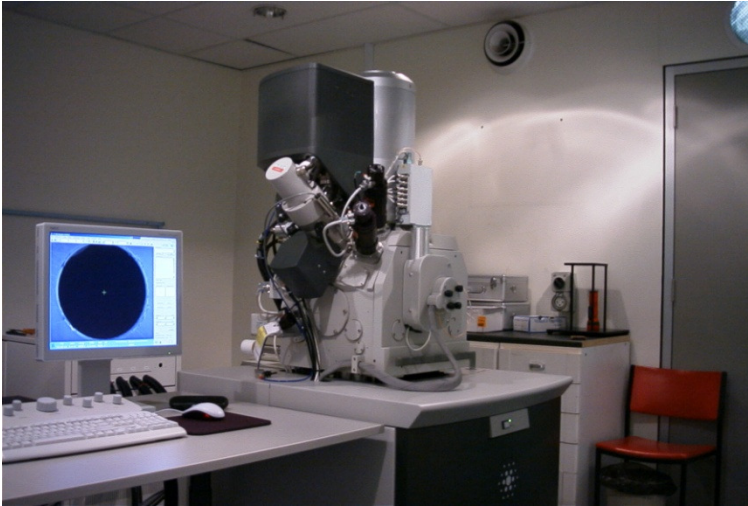
#### CONTACT ANGLE



#### DSC-TGA



# NANOTEC Testing Service Lab Equipment



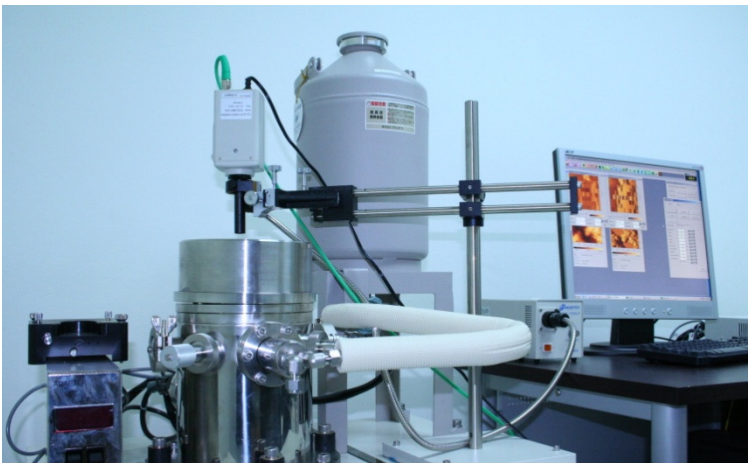
Scanning Electron Microscope



Scanning Tunneling Microscope



High Pressure Homogenizer



Atomic Force Microscope



Antibacterial test



Transmission Electron Microscope



Nanosizer

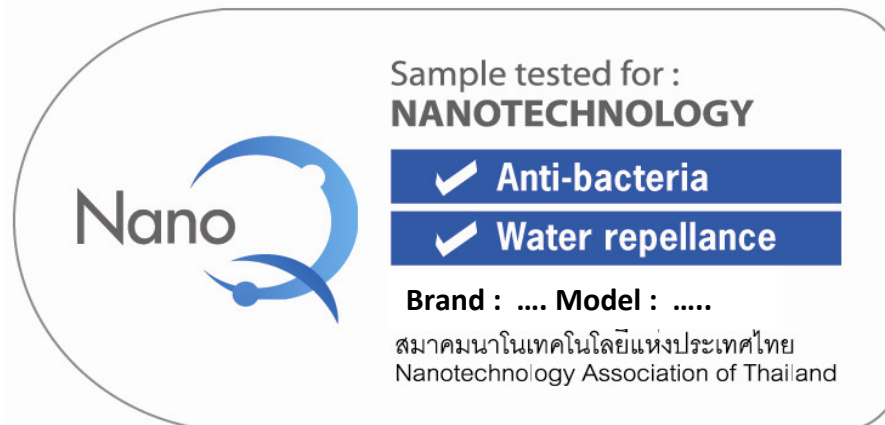
# Nano-measurement & Nano-characterization Service Lab

- Capabilities
  - Physical & chemical testing: particle size and nano-particle distribution analysis (nanosizer/ Dynamic light scattering)
  - Structural surface analysis (AFM/STM/ E-SEM)
  - Biological testing: MTT toxicity assay, anti-bacterial testing (AATCC standard)
  - Nanoparticle preparations in powder and emulsion form.



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  - Protect Good Companies : Eliminate unfair competitions between good and bad products
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# Structure of Nano Q



Executive Committee of Nanotechnology Association of Thailand

Nano Q Committee

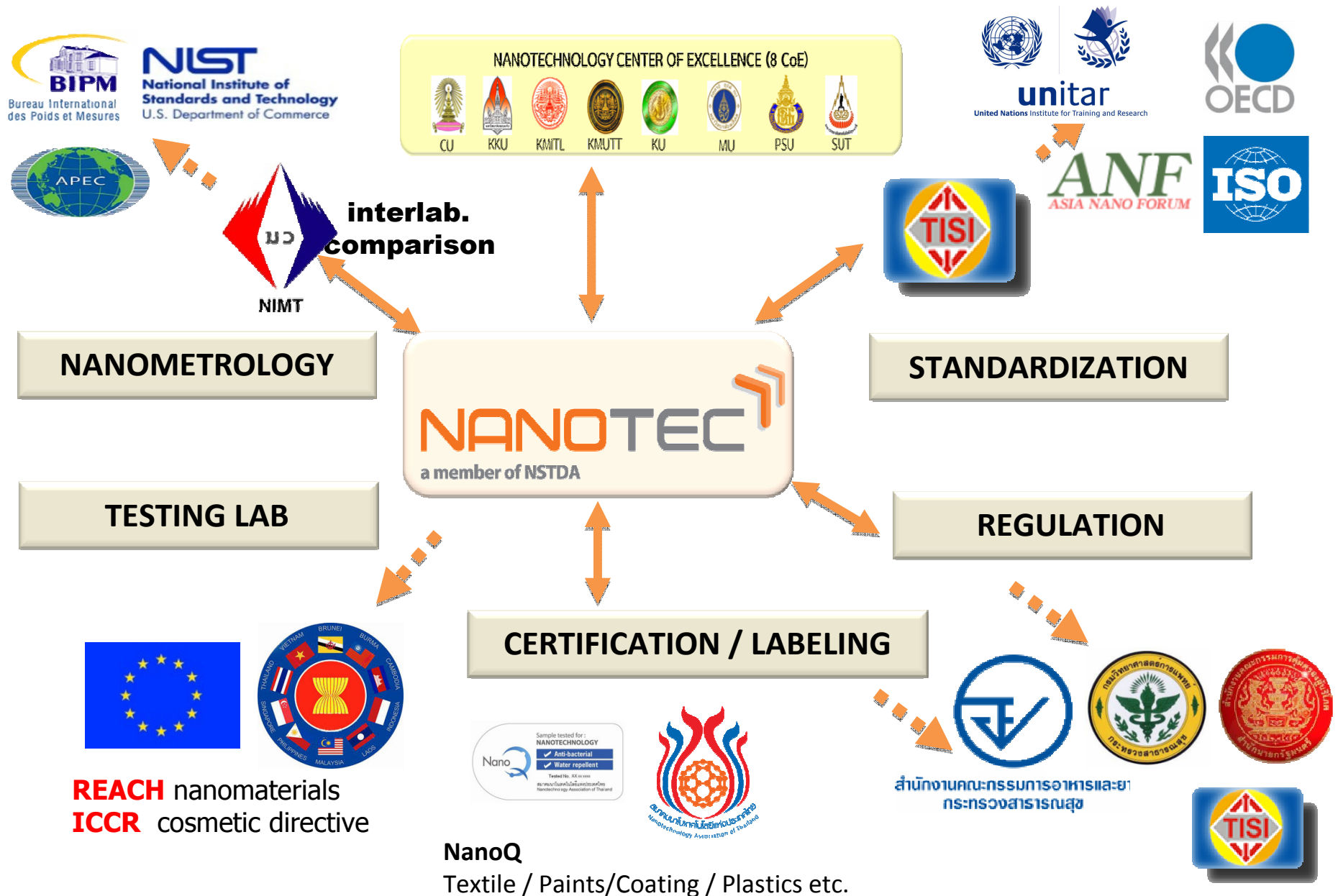
Advisor

Technical Subcommittee

Legal Subcommittee

Public Relations Subcommittee

# Nano-EHS activities in Thailand





# Thank you for your attentions

