Overview on Nanotechnology in Korea : Policy and Current Status

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5

Infrastructure & Organizations

International Cooperation



- In December 2006, NSTC
 - i) reviewed the outcomes of the NT Development Plan for the first 5 years of the Phase-1 Plan,
 - ii) approved the newly revised Phase-2 Plan for NT development for next 10 years.

Milestones in Korea Nanotechnology Policy



- 1st phase KNI : 2001-2005
- 2nd phase KNI: 2006-2010

Goal of KNI

Securing Technological Competitiveness to Join firmly the Global Top Three NT Nations by 2015





Overview of KNI



Results of 1st Phase of KNI(2001~2005)



Korea NT Annual 2005, KISTI

Current Status of 2nd phase KNI (2006~2010)



Korea NT Annual 2007, KISTI

Government Funding during 1st Phase of KNI(2001~2005)



M.C. Roco, Journal of Nanoparticle Research, 2005, MOST Action Plan for NT, 2002-2005

2 Government Funding on NT (2007~2008)

(unit : US M\$, %)

Ministry/Administration	2007	2008	+/-(%)
M. of Education, Science & Technology (MEST)	120	107	(-) 10.8
M. of Knowledge and Economy (MKE)	96	92	(-) 4.2
M. for Food, Agriculture, Forestry and Fisheries	2	2	-
M. of Welfare and Family Affairs	2	2	-
M. of Environment	4	5	(+) 25
Defense Acquisition Program A.	1	2	(+) 100
Korea Food & Drug A.	1	4	(+) 300
National Lab.	56	56	-
total	282	270	(-) 4.3

MEST funding on NT : R&D

(unit : US M\$, %)

Selected R & D Programs	2007	2008
Terabit-class Nano Devices (Frontier)	9	9
Nanostructured Materials Technology (Frontier)	9	9
Nanoscale Mechatronics and Manufacturing (Frontier)	10	9
Nano R&D Program	7	8
Basic Research Program (NT field)	43	43
total	78	78

(unit : US M\$, %)

Selected R & D Programs	2007	2008
NT-based Core Technology Development	29	28
Basic research for Nano semiconductor Instrument development	12	12
IT-NT Convergence Basic Program	15	19
Innovation Centers for Regional Industries	8	6
Infrastructure for IT Converging Tech.	5	4
total	69	69

Based on KNI, the Korean government had launched several different levels of research projects nationwide. Among them, the following three are major nanotechnology-related projects consolidated under the '21C Frontier R&D Programs.'

Research Centers	Homepage
Center for Tera-level Nanodevices, Dr. Jo-Won Lee	http://www.nanotech.re.kr
Center for Nanostructured Materials, Dr. Sang-Hee Lee	http://cnmt.kist.re.kr
Center for Nanoscale Mechatronics, Dr. Sang-Rok Lee	http://www.nanomecca.re.kr

Nano R&D Program for Small Team

Characteristics

	Period	Government Funding (USD million)	Number of researchers	Approaches
individual research	3	0.1	1	bottom-up
small team research	6(3+3)	0.3~0.6	2~3	top-down

Purpose

- individual research : support creative basic research
- small team research : support core original research that require strategic incubation for national interests.

Nano R&D Program for Small Team

☐ Areas

- Nano Materials/Environment/Energy
- Nano Semiconductors/Electronics
- Nano Bio/Medicine
- Nano Process/Equipment/Measurement/Metrology

☐ Status

Fiscal	Government	Number of projects supported			
Year (USD million)		continued	new	total	
2007	7	36	16	52	
2008	8.3	27	32	59	

Infrastructure for Nanotechnology

Infra	Ministry	Facilities	2007	2008
			(US M\$)	(US M\$)
	MEST	National Nano Fab Center (NNFC)	9	5
		Korea Advanced Nano fab Center (KANC)	6	-
Fab centers	MKE	National Center for Nanomaterials Technology (NCNT)		
		National Nanotechnology Integration Center (NNIC)	17	16
		Gwangju Nanotechnology Integration Center (GNIC)		
Informati- on Service	MEST	Nano-information Center(KISTI)	0.8	0.8
Network	MEST	Korea Nanotechnology Research Society (KoNTRS)	0.8	0.8
	MKE	Nanotechnology Researchers Association (NTRA)	0.7	0.7
		total	34.3	23.3

Location of Nano Fab. Centers



Nano Fab. Centers (by MEST)



Korea Advanced Nanofab Center(KANC)

- NT Field : Compound electronics
- Clean Room : 3,368 m²
- Facility : 4~6 inch electronic device line
- **Region :** Suwon (service since May 2006)



National Nano Fab Center(NNFC)

- NT Field : Silicon-based
- Clean Room : 2,370 m²
- Facility : 8 inch CMOS package line
- Region : Daejeon (service since March 2005)

Nano Fab. Centers (by MKE)



National Nanotech. Integration Center(NNIC)

- NT Field : Nano process & equipment
- Clean Room : 2,346 m²
- Facility : module process-oriented equipment
- Region : Jeonju (Oct. 2008, scheduled)



Gwangju Nanotech. Integration Center(GNIC)

- NT Fields : Nano Process & equipment
- Clean Room : 1,195 m²
- Facility : module process-oriented equipment
- Region : Gwangiu (service since Oct. 2007)

Nano Fab. Centers (by MKE)



National Center for Nanomaterials Tech.(NCNT)

- NT Field : Semiconductor/display nano materials
- Clean Room : 2,370 m²
- Facility : 8 inch Silicon
- Region : Pohang (service since May 2007)

Three major organizations are active in securing national competitive edge by facilitating the creation of new industry and the industrialization through the development of the fundamental technology in the area of NT and gradual/systematical construction of the cooperation system among academy, research institute and government.

Organization	Homepage
Nanotechnology Information Center, KISTI	http://www.nanonet.info
Korea Nanotechnology Research Society (KoNTRS)	http://www.kontrs.or.kr
Nanotechnology Researchers Association (NTRA)	http://www.nanokorea.net



Nanotech-Related Research Institutes

Organization	NT fields	Homepage
Korea Basic Science Institute (KBSI)	Nano analysis/measurement	http://www.kbsi.re.kr
Advanced Photonics Research Institute (APRI)	Apply Femto TW-class laser to nanostructured materials	http://apri.gist.ac.kr
Pohang Sync. Radiation Laboratory	Nanostructured materials analysis	http://pls.postech.ac.kr
Microsystem Research Center, KIST	MEMS, Comp. semiconductor nanodevices	http://www.micro-nano.re.kr
Semiconductor Laboratory, ETRI	Si & Nano Comp. semiconductor devices	http://www.etri.re.kr
Vacuum Center, KRISS	Assessment/measurement of vacuum equip. for nano process	http://www.vacuum.or.kr
Korea Photonics Technology Institute (KoPTI)	Compound semiconductors, LD/PD, LED, nano photonics	http://www.kopti.re.kr
Inter-university Semiconductor Research Center (ISRC), SNU	Si nano devices, Compound semiconductors, photoelectric devices	http://isrc.snu.ac.kr
Nano Practical Application Center (NPAC)	Nano devices, parts, textiles	http://www.npac.or.kr

Nanotechnology-related companies :

- 78 (including 33 venture companies) in 2001
- 274 (including 145 venture companies) in 2007

Year	2001	2004	2005	2006	2007
large	45	18	32	32	37
small & medium		28	56	79	92
venture	33	78	126	125	145
total	78	124	214	236	274

4 Distribution of NT Companies by Field



reference: www.k-nano.net www.nanonet.info

Korea NT Annual 2007, KISTI



274 commercializations since 2004
119 in 2004, 81 in 2005 and 74 in 2006

• 74 cases of 2006 by technological field are as follows :



- ➢ Nano Devices : 24 (32%)
- Nano Materials : 15 (19%)
- Nano Fundamentals :11 (14%)
 - (Nano Measurement, Tools,
 - Processing)
- Environmental & Energy : 10 (13%)
- Nano Medicals & Health : 9 (12%)
- Nano Bio : 8 (10%)

5 International Cooperation in NT Area

Materials Area

- Advanced Nanometer Films Technology
- Development of the application and manufacturing technology for fuctional anoparticles
- Magnetostrictive Sensors and Actuators
- Quantum Coherent in Nanostructured System
- Nano Al2O3, ZrO2 ceramic power
- Synthesis and applications of nanostructured silicas for elastomeric materials

Chemistry Area

- Manufacture of nanocomposite aerogels and their applications
- Development of High Functional Materials by Means of Mechanochemical Treatment
- Development of a sustainable technology for metal chemistry and electroplating
- Study on crystallization using emulsions
- Synthesis and efficiency study of new porphyrin based photosensitizers for photodynamic therapy
- Study and application of nano-phosphor materials doped with rare earth ions
- Generation of new chlorin photosensitizers and efficiency screening for Photodynamic therapy

5 International Cooperation in NT Area

Public-Welfare Area

 Development of carbon and micro porous absorbent for removal of environmental contaminants

Information Industry Area

 Integration of CNT Cathode and Low Voltage Phosphor Anode for High Luminescence and Large Area of Plane Light Source Unit

🛛 Basis Area

 Research on quantum effects and peqularities of physical proproperties of nanosized structures

Global Joint R&D Programs

 MEST and KICOS(Korea foundation for International cooperation of S & T) have reorganized the existing small-sized bilateral or multilateral cooperative R&D programs into a new international R&D program called the Global Research Laboratory (GRL) program in 2006.

• 12 projects are currently supported under the GRL program (7 projects selected in 2006 and another 5 projects in the first half of 2007) and around 5 new projects will be selected in the second half of this year in the BT, NT and ET areas.

 Notably, 5 projects out of the total 12 projects are in the NT area, and the overseas partners are US universities (3 projects) and European institutions. The total budget of 2007 in NT area is 2.4 US M\$. The projects are as follows:

Project title	Korean Lab
Design and development of innovative nanomaterials and futuristic electronic /optical nanodevices	POSTECH
New Architecture for Innovative Polymer-Based Electronic Devices Using a Solution- Processed Titanium Oxide Functional Layer	GIST
Development of innovative nanophotonics devices	KIST
Development of Design and Patterning Technologies of Inorganic-Organic Hybrid Materials Tailor-designed for the Nano Electronics Applications	Hanyang Univ.
Design of Novel Hybrid Nanocomposites with Enhanced Strength and Plasticity	Yonsei Univ.

International Nano Events

NanoKorea Exhibition & Symposium



- Largest Domestic Exhibition & Symposium of Nanotech
- NanoKorea started from Aug. 2003
- Organizers : NTRA, KoNTRS, KISTI

Korea-US NanoForum



- Held annually since Oct. 2003
- 5th Forum : Apr. 17-19, Jeju, Korea
- Sponsors : MEST, NSF(US)
- Organizers : KISTI, KoNTRS,

Carnegie Mellon University

