Korean Nanotechnology Networks and Funding

Zheong G. Khim

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President, Korean Nano Researchers Association

School of Physics,Seoul National University, Seoul Korea

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I. National Policy on Nanotechnology

General concensus on the emerging nanotechnology

- **21st century technology that can revolutionize human society with enormous impact**

Government is determined to support nano-tech R/D activity in Korea → Public sector should play leading role for the promotion of emerging technology

Planning the strategy for the development of nanotechnology R&D in Korea:

- **long term "plan (10 yrs) for promotion of Nanotechnology" was formulated in 2001**

Legistration of new law for Promotion of Nano-tech in 2002

- **the follow up "operation rules" for the development of Nanotechnology was legistrated in 2003 → Minister of MOST must formulate the detailed program that can facilitate the development of Nano-tech**

Areas of main concern

1. R&D investment for nanotechnology

- funding — total investment (for 10 year) 1,300 M$
  - government 860 M$, civilian 440 M$
- creation of new R&D programs

2. Infrastructure to support nanotechnology

- facility — national nano-fabrication center
  - advanced nano-fabrication center
- nano-information serviced network
  - centralized information distribution

3. Education and training program

- setting up new education system — nano-tech interdisciplenary education program
- cyber education — on line education
- meeting — conference, workshop, forum

4. International cooperation for technological innovation and exchange program

Objectives of Korea's nanotechnology Policy

Detailed target:

Nano-tech → *Creation of new job and enhancing competitiveness of the industry*

Fusion of IT, BT and NT → *to upgrade competitiveness of industry in current market*

Securing the basis to join G-5 in nano-tech by the year 2010

strengthening nano-tech R&D level upto 50% of leading country by 2006, 80% by 2010

II. Funding for nanotechnology

Investment plan for nano-tech in Korea

unit M$

	1st Phase (01-04)		2nd Phase (05-07)		3rd Phase (07-10)		Sum		
	Gov	Civil	Gov	Civil	Gov	Civil	Gov	Civil	Sum
R/D	203	44	232	137	232	206	667	387	1,045
ED/TRAINING	31	-	18	-	19	-	73	-	73
Infrastructure	64	28	28	11	23	10	116	49	164
Total	298	72	284	148	274	216	855	436	1,291

Strategy in government investment for nanotechnology

R&D : focussed investment to areas with comparative edge
development of core strategic technoly
consolidated technology based on NT
inducing more investment on NT from civilian sector
- 5 new frontier projects (~9M$ /team/yr), Nano-core tech program (10 selected technologies ~ 2M$ /team/yr), Nano-foundation program (20 selected subjects ~ 1 M$/yr/team)

Education and training program: establishing flexible, cooperative education system
- nano-science & technology interdisciplenary program, cooperative nano-tech program between university, industry and national lab
international exchange program

Supportive centers: establishing common fabrication centers and supportive nano-research networks

Investment from related Dept. in yr 02 & 03

(Unit : M$)

Dept / Year	Program	MOST	MOEH	MOCIE	MOIC	MOHW	MOE	MOD	MOA	OGPC	Total
2002	R & D	67	-	34	7	2	16	0.1	0.1	11	137
	Infrastructure	23	-	5	4	-	-	-	-	7	39
	Man Power	1	6	-	-	-	-	-	-	-	7
	Subtotal	91	6	39	11	2	16	0.1	0.1	18	183
2003	R & D	61	-	39	11	1	16	0.1	0.2	16	144
	Infrastructure	37	-	14	5	-	-	-	-	8	64
	Man Power	3	7	-	1	-	-	-	-	-	11
	Subtotal	101	7	53	17	1	16	0.1	0.2	24	219
Rate of Increase (%)	-	9.3	13.6	34.1	49.2	-40	-	-	100	26.0	17.7

MOST : Ministry Of Science & Technology / MOEH : Ministry Of Education and Human Resource
MOCIE : Ministry Of Commerce, Industry and Energy / MOIC : Ministry Of Information & Communication
MOHW : Ministry Of Health & Welfare / MOE : Ministry Of Environment
MOD : Ministry Of Defense / MOA : Ministry Of Agriculture
OGPC : Office for Government, Policy Coordination

R&D funding each program from related Dept.

Unit : M$

Dept	R & D Program	2002	2003
MOST	◊ Tera-class Nano Devices	9	9
	◊ Nanostructured Materials and Technology	8	6
	◊ Nanoscale Mechatronics and Manufacturing	9	7
	◊ Core nanotechnoloty development	19	17
	◊ Photonic technology, next generation	1	1
	◊ Nano-information network	-	1
	◊ IMT program for nanotechnology	3	3
	◊ NT basic research program	19	20
	◊ National nano-fab center	22	22
	◊ Advanced nano-fab center	-	9
	◊ Ultra short pulse phontonic technology	-	3
	◊ Next ganeration NMR facility	2	3
	◊ NT education and training program	1	3
	Subtotal	93	104
MOEH	◊ Brain-Korea 21 (nano-tech part)	6	7

Unit : M$

Dept	R & D Program	2002	2003
MOCIE	◊ NT R&D program (7 projects)	14	11
	◊ Nanotechnology center	-	9
	◊ Core nano-material and parts	20	28
	◊ NT industrialization center	3	3
	◊ Nanoparticle TIC	1	1
	◊ Metallic material TIC	1	1
	◊ Nano-machining TIC	1	1
	Subtotal	40	54
MOIC	◊ IT-NT fusion technology	7	11
	◊ National Grid	4	5
	◊ IT research association	-	0.1
	◊ IT R&D network	-	0.02
	◊ University IT research center	-	1
	Subtotal	11	16
MOHW	◊ Nano health diagnosis	2	1
MOE	◊ Eco-technopia 21	16	16
MOD	◊ Application of Nano-particle	0.1	0.1
MOA	◊ Nano-bio technology for agriculture	0.1	0.2
OGPC	◊ National Laboratory	19	24
Total		187	220

This year's accomplishments

R&D:

nano-tech National Technology Road Map
creation of two new Frontier projecs (nano-materials, NEMS)
creation of core nano-tech projects and nano-tech industrialization projects

Infrastructure:

formation of national fabrication centers
establishing *3 NT industrialization centers,* several regional Technology Innovation Center (TIC) and nano-information center
nano researchers association, nano industry research association
10 nano-tech interdisciplenary education programs

Supportive measures:

legistration; followup guideline rules for Promotion of Nano-tech
international agreement: "Nano-tech forum" between Korea and US, Korea and Canada, Korea and UK etc

Example of this year's R&D results

Nano-device:

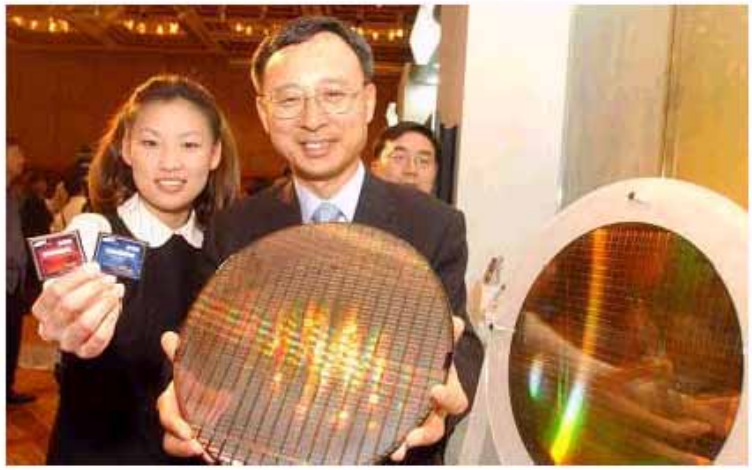
metallic CNT to semiconducting nano device transforming tech
development of FED using CNT by Samsung and LG (CNT-FED will be commercialized by SS)

Nano-materials:

nano-ceramic slurry for CMP
nano-size conducting polymer

Nano-process:

development of digital nano-actuator for bio muscle
70 nm process for memory chip



Samsung semiconductor branch CEO, Dr. C.G. Hwang, is showing 4 Giga NAND Flash Memory (70 nm) with cell size 0.025 μm^2

III. Nanotechnology networks in Korea

Existing nano-tech networks: early stage

R/D networks; *2 official and several spontaneously formed networks*

- *Korean Nanotechnology Researchers Association (by MOST)*
- *Nanotech research Association (by MOCIE)*

- *Frontier project association*
- *Center for industrialization of NT*
- *Technology Innovation Center*

Infrastructure networks;

- *Nano-fabrication center (MOST)*
  combined fab center, specific fab center
- *Nanotechnology information center (KISTI)*

Purpose of NT networks in Korea

- *to share and to exchange information on common interest area ➔ increse productivity of R&D activity*
- *campaign of publicity for NT and Nt policy planning*
- *promotion of international cooperation on NT through organization of international conference, forum etc*
- *setting up educational program for high quality NT manpower*

Function of NT networks in Korea

Scientific mission: *information sharing*

- *organization of domestic or international NT conference, workshop or forum*
- *cyber conference*

Educational program*: training high quality manpower*

- *special summer/winter lecture courses for graduate student*
- *supporting association of interdisciplenary program*
- *cyber education*

Information survice*: www.nanonet.info*

- *publication of Nano Weekly*
- *on-line service of Nano Weekly*

International collaboration: *in a primitive stage*

- *international cooperation for technological innovation and exchange of manpower*

Activity of NT networks in Korea

Conference: domestic; numerous NT conference organized by KNRA by several Frontier projects etc

Nano-Korea 2003 exhibition and symposium

exhibition organized by NTRA

symposium organized by KNRA

(~50 invited talks including 5 foreign speakers)

(~100 posters, exhibition by ~50 NT related companies, total participants ~ 1000)

We are planning international exhibition and symposium

NANO-KOREA 2004

Korea needs cooperation from international organization in planning and organization of international meeting exchanging and training human resouces