Trends Researches on Material Science and Technology and Their Facilities in Indonesian Institute of Sciences (LIPI)

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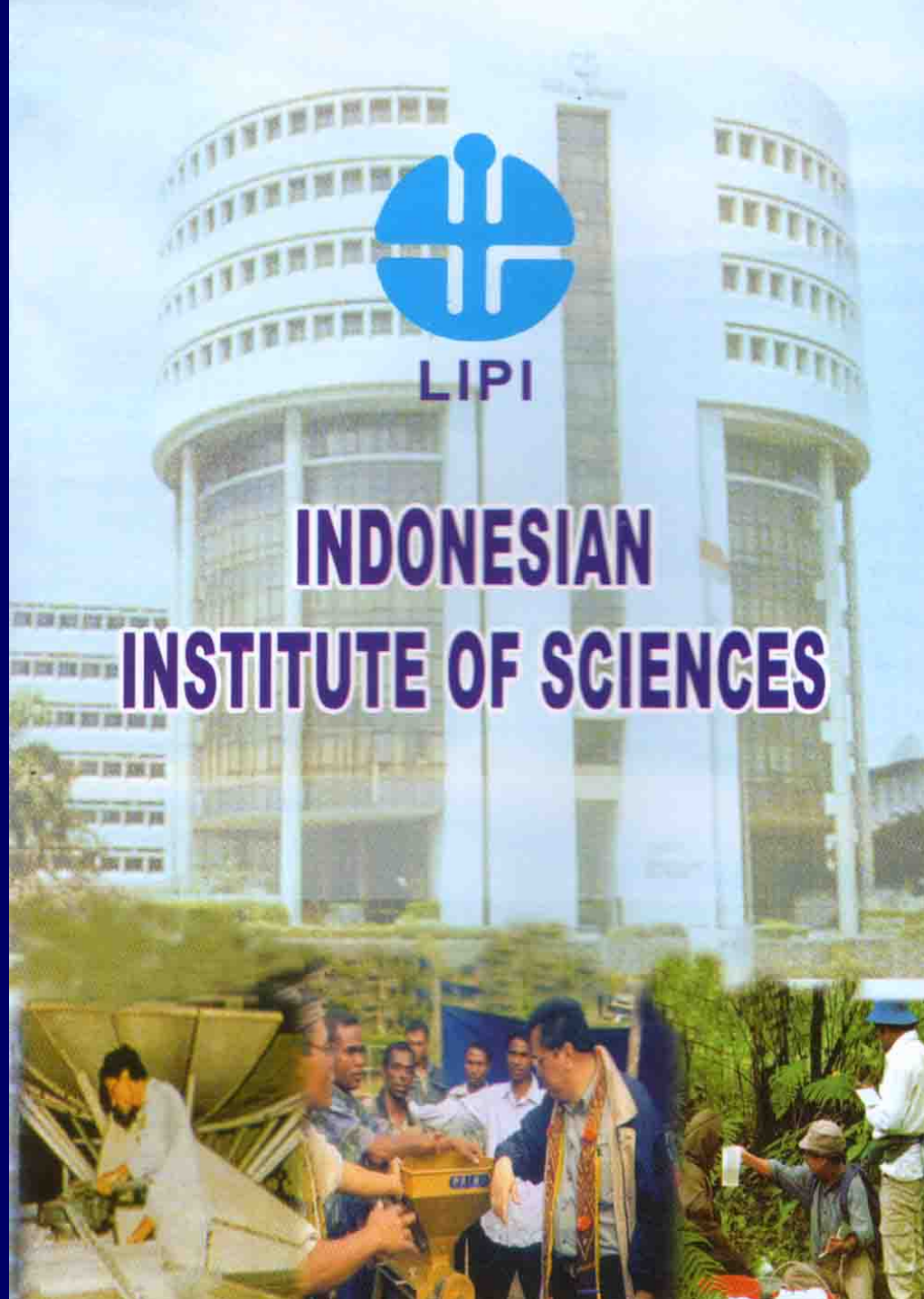
Indonesian Institute of Sciences



What is Indonesian Institute of Sciences (LIPI)?

LIPI is a non departmental governmental research institution. The Chairman of LIPI is directly responsible to the President of the Republic of Indonesia.

27 Research Institutes
20 Implementation Units

Peta Kegiatan Unit di LIPI

Activities Sites of LIPI'S Unit

Tasks

To assist the President in organizing research and development, to provide guidance and service to scientific and technological enterprises, and to conduct strategic and fundamental research in science and technology.

• Vision

The formation of a just, enlightened, creative, integrated, and dynamic society, supported by science and technology.

• Mission

-To master science and technology in continuing efforts of strengthening the national unity, and strengthening the competitiveness of the society.
-To participate in the endeavor to develop the nation through sustainable development.
-To promote ethnics of science.

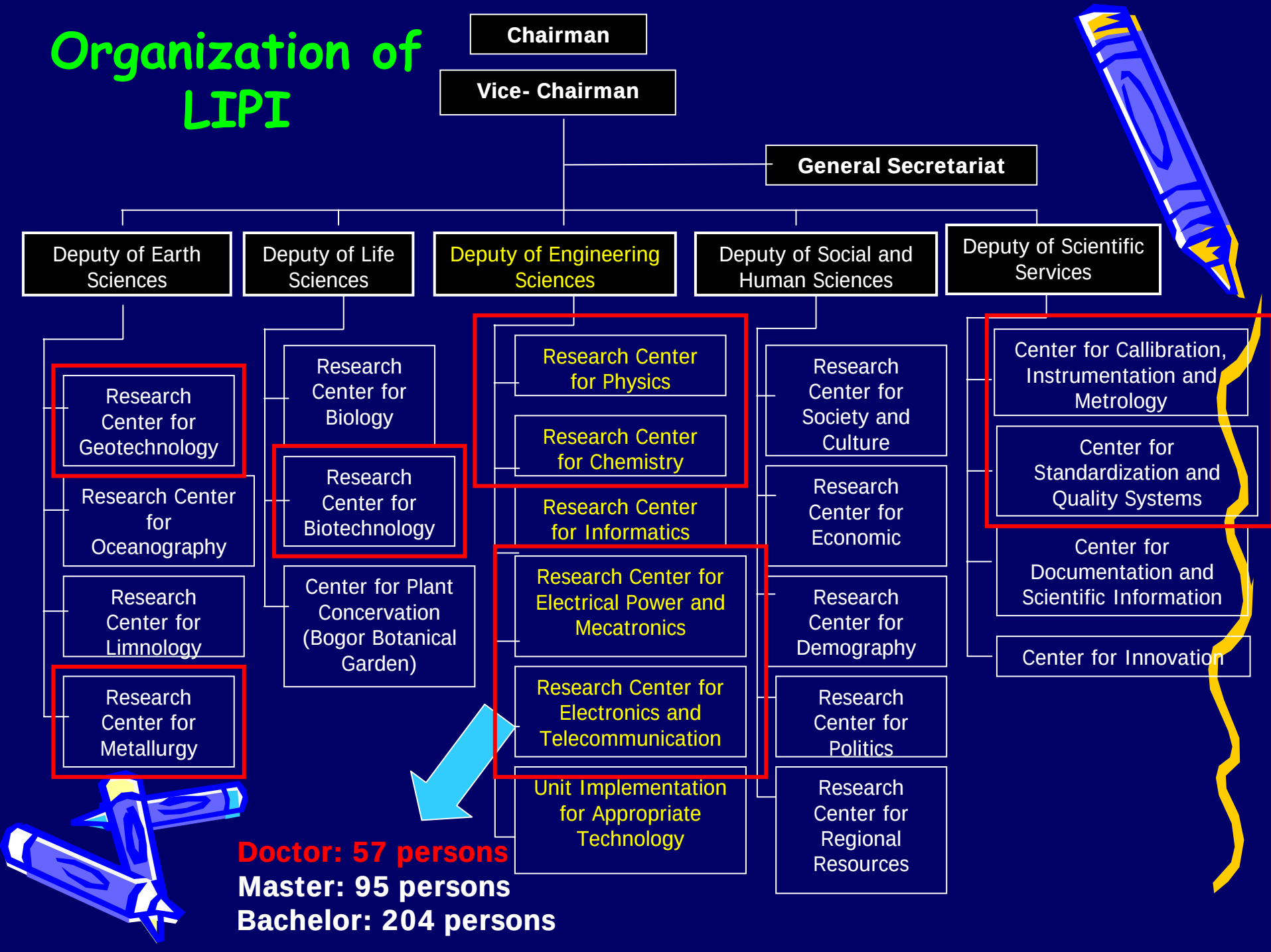
PUBLIC SCIENTIFIC SERVICES

- *Research, scientific information, material identification, consultation, analysis, survey, training.*
- *Product development, prototype and process.*
- *Publications (Journal, bulletins, newsletters, research reports, monograph, information booklets, procedings, etc), conferences and seminars, youth science competition, teachers' creativity, and other related activities in the efforts to produce science and technology.*
- *Supports to scientific professional associations and youth science clubs.*
- *Scientific authority, recomendation.*

Roles

- To do research and development on science and technology in Indonesia
- To become technological base for other research institutes and national industries.
- International contributions, such as collaboration researches, researcher exchanges, training, open facilities etc.

Organization of LIPI



Doctor: 57 persons

Master: 95 persons

Bachelor: 204 persons

Research and Development on Material Science and Technology in LIPI

- For energy supply
- For transportations
- For informatics and telecomunication
- For security and defence
- For foods and health
- For natural resouces based industry

International collaboration

- Hokkaido University (Material)
- Kagoshima University (Nano-structure materials) Jap
- Kin degradable composite) Japan
- Opt ument Optic) Japan
- JST nitasion/Biotoilet) Japan
- Uni Australia (MMES)
- Del rowave devices)
- Sal (Nano-chemistry)
- Etc

THE DIVERSITY OF UTILIZATION OF KAPOK FIBER

The Kapok tree is called Ceiba Pentandra is available abundant in Indonesia.

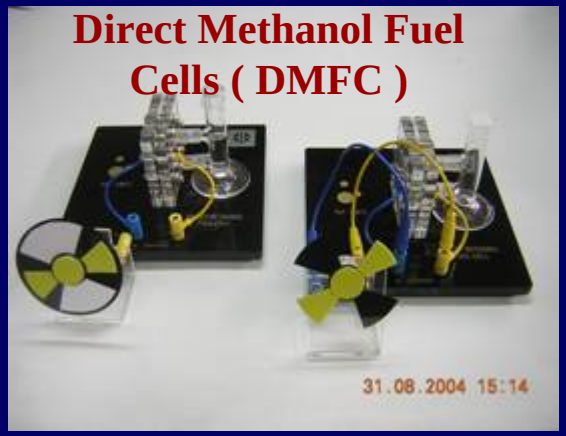
Figure (left) Helmet Shock Absorbing (SAH) made of Kapok fiber and (right) SAH made of Styrofoam

Test item	Test results (kilo gram force / kgf)		
	Styrofoam	Kapok-1	Kapok-2
Shock absorption force	243 - 257	189 - 217	175.6 – 206.4

Electrical/ Hybrid Cars

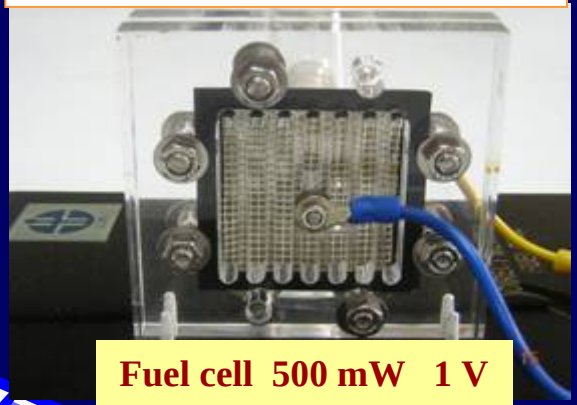
Fuel Cell

Tool kits



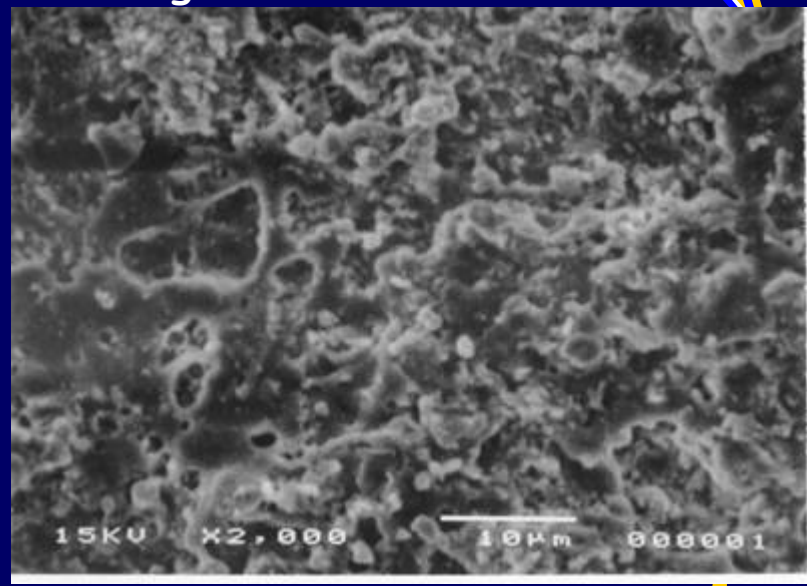
By cycle with Fuel Cell

STACK DMFC



Detonation Gun (D-Gun) for coating metal

Coating of Al2O3 in steel surface

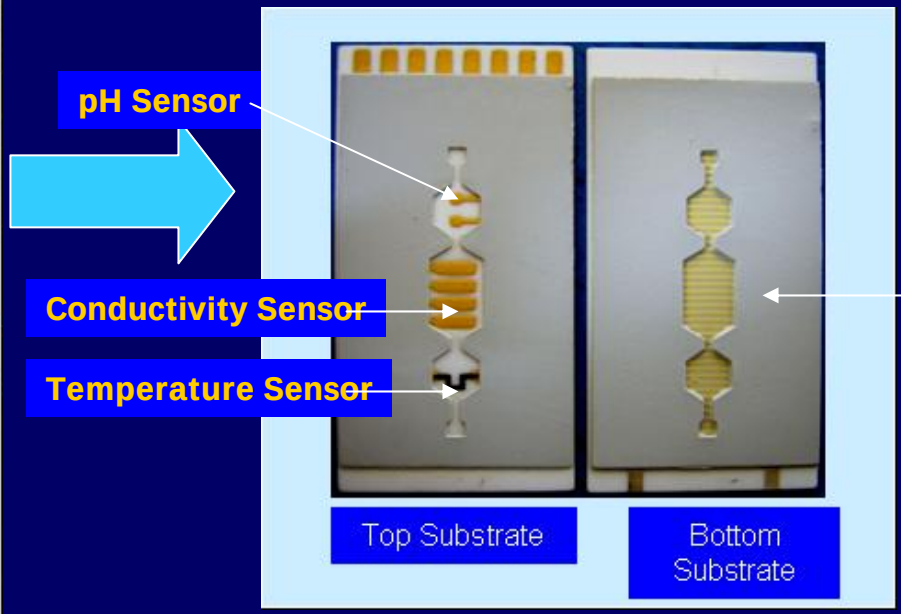


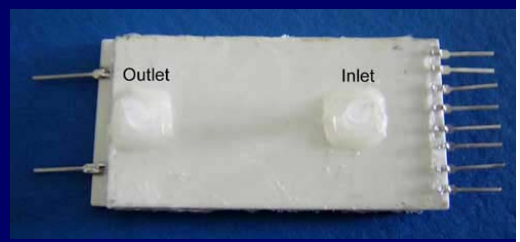
Research and Development on Material Science and Technology in LIPI

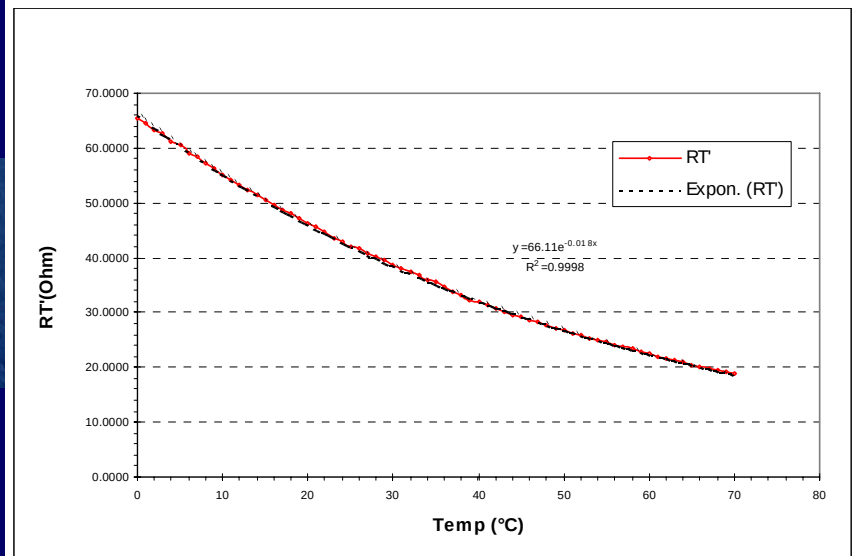
Integrated Thick Film Flow Cell

- **Consist of Conductivity Sensor, Temperature Sensor, pH Sensor and Heater**

FLOW CELL





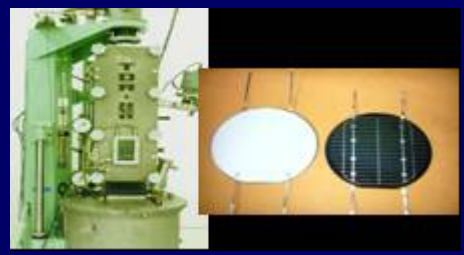


SOLAR CELL

Crystal growing (PPF-LIPI)

Wafer production (PPF-LIPI)

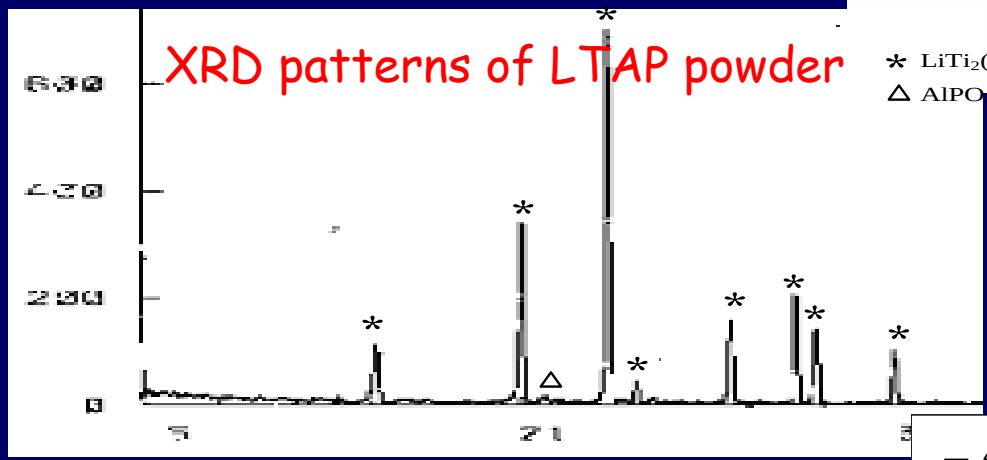
Solar cell fabrication (P2ET-LIPI)

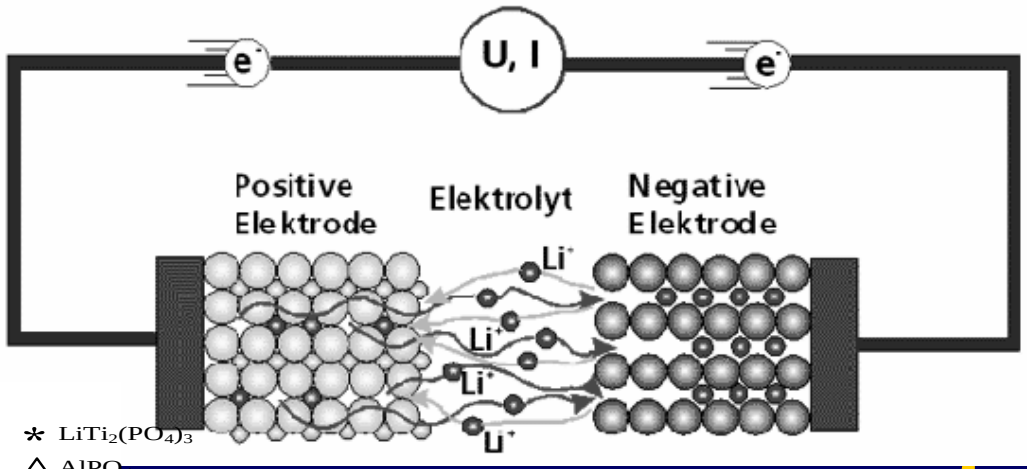


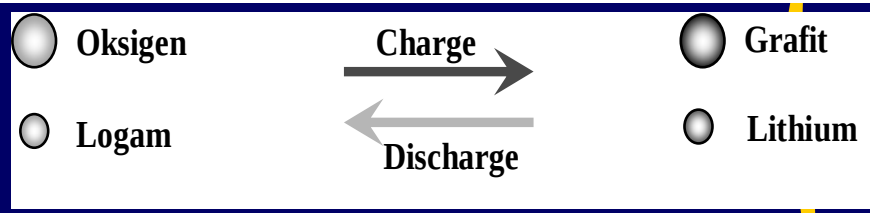
Panel of Solar Cell fabrication (P.T. LEN)

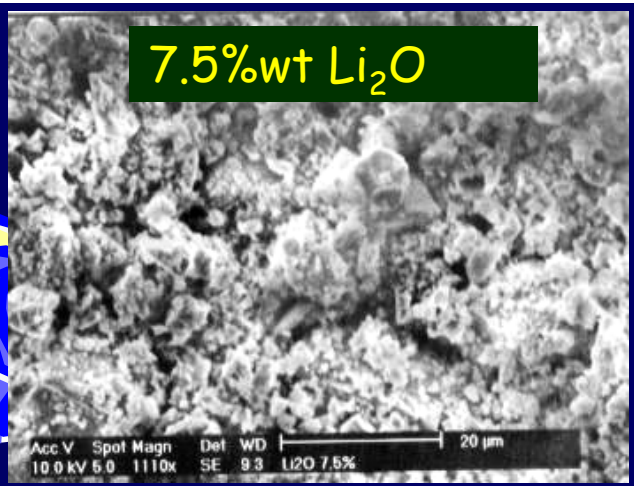
Research and Development on Material Science and Technology in LIPI

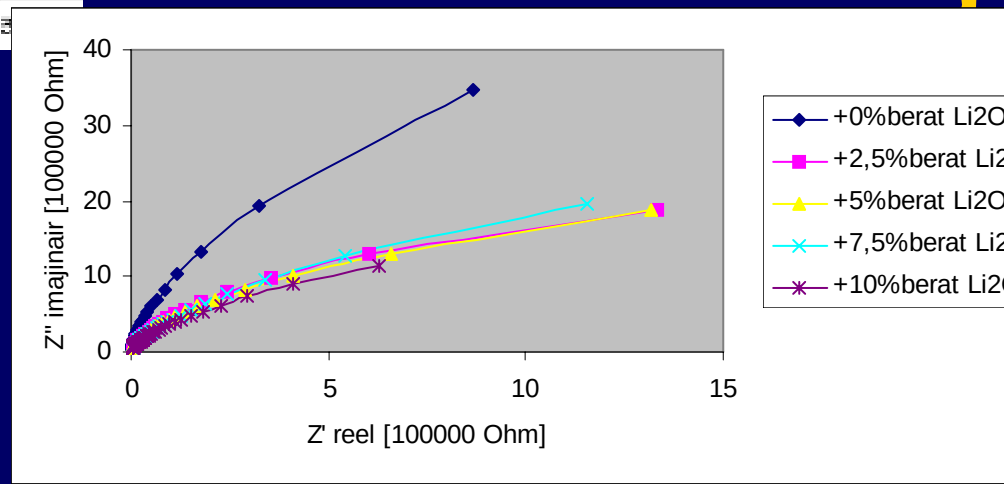
Study of Li2O Addition at Electrolyte Composite LTAP (Lithium Titanium Aluminum Phosphate)





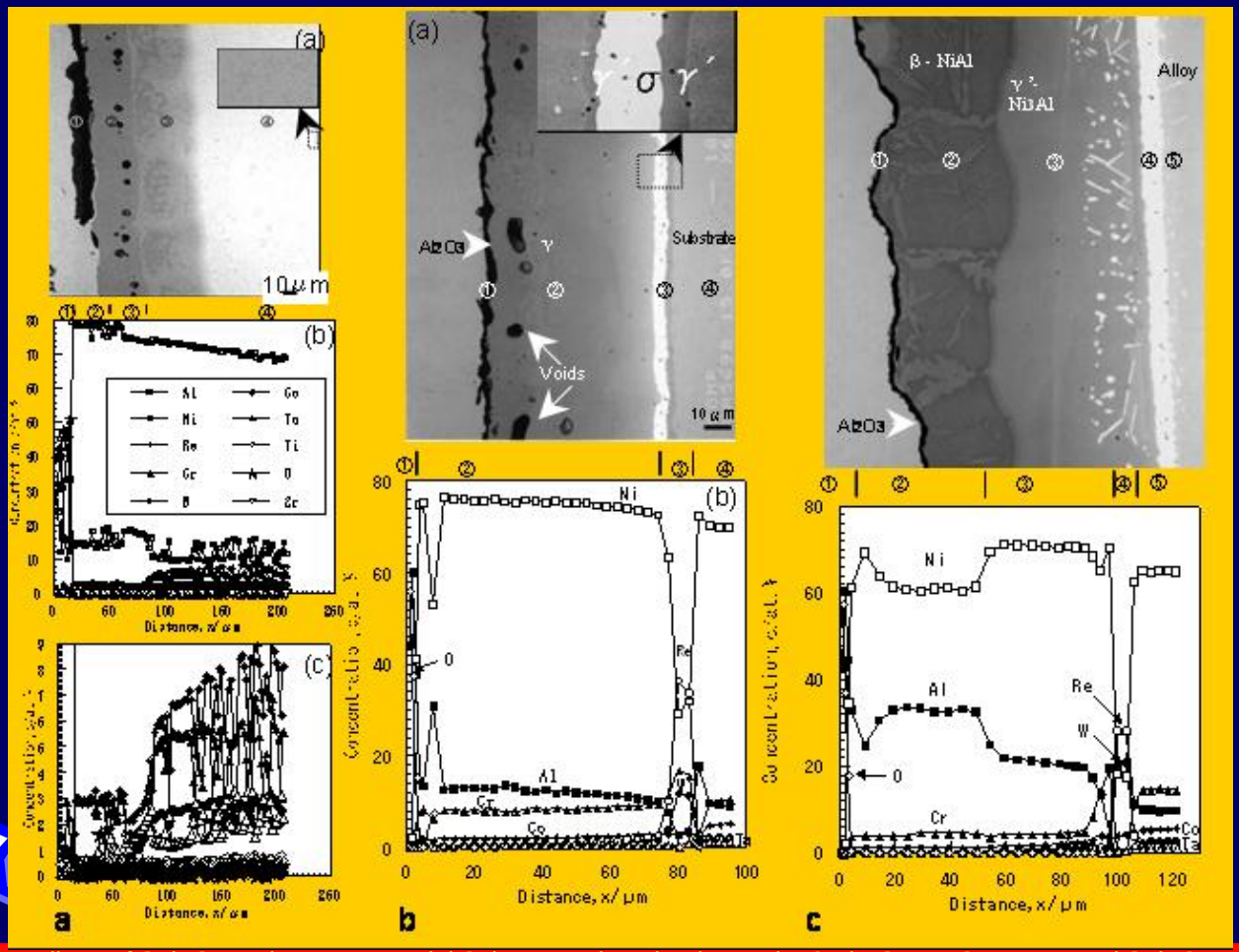






Development of Rebased Alloy as Diffusion Barrier on Ni Based Superalloy

Cross-sectional microstructure and concentration profiles of TMS-82+ superalloy treated by Ni(Zr) composite electroplating and Al-pack cementation for 5h, followed by oxidation at 1423K in air for 100h. ① (Ni,Al) oxide scale; ② γ;③ γ+γ';④ Substrate. (b) for the substrate after ReNi/NiW/Ni electroplating, Cr-pack cementation, Ni(Zr) composite electroplating and Al-pack cementation for 1h and (c) for 5 h, followed by oxidation at 1423K in air for 100h. ① α-Al_2O_3; ② β-NiAl; ③ γ'-Ni_3Al; ④ diffusion barrier; ⑤ Substrate.



Ni-base super alloys for blades and vanes along with multi-layer thermal barrier coatings in gas turbines.

Collaboration with Hokkaido University

- One-step CO_2 Supercritical Extraction for Manufacturing Nanostructured Mesoporous Sulfated Titania Aeroge

Table 1. Specific surface area, cumulative pore volume, and average pore diameter of the titania gels after calcination at various temperatures.[a]

	As-extracted gels	500° C	600° C	700° C	800° C
TiO_2-SO_4 Aerogel					
Surface area (m^2g^{-1})	469	175	117	65	7
Pore volume (cm^3g^{-1})	1.80	0.94	0.74	0.40	0.07
Average pore diameter (nm)	11.9	19.1	24	21	39.7
TiO2 Aerogel					
Surface area (m2g-1)	195	90	58	19	5
Pore volume (cm3g-1)	0.55	0.49	0.35	0.16	0.05
Average pore diameter (nm)	12.8	18.7	20.0	36.5	51.6

a. The accuracy of N_2 adsorption measurements was 0.1%, and the reproducibility of these values for each sample was within 10%.

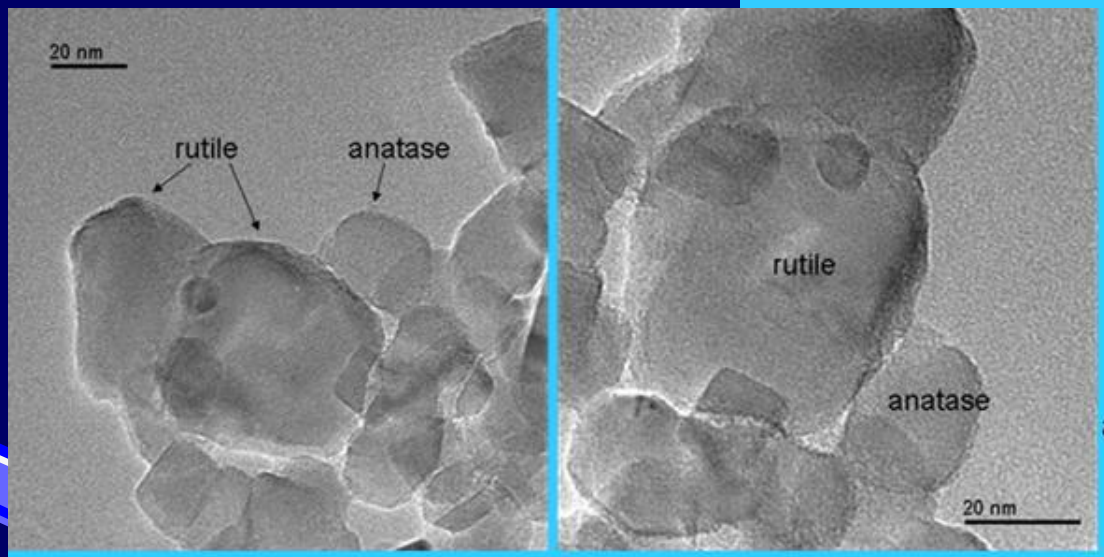
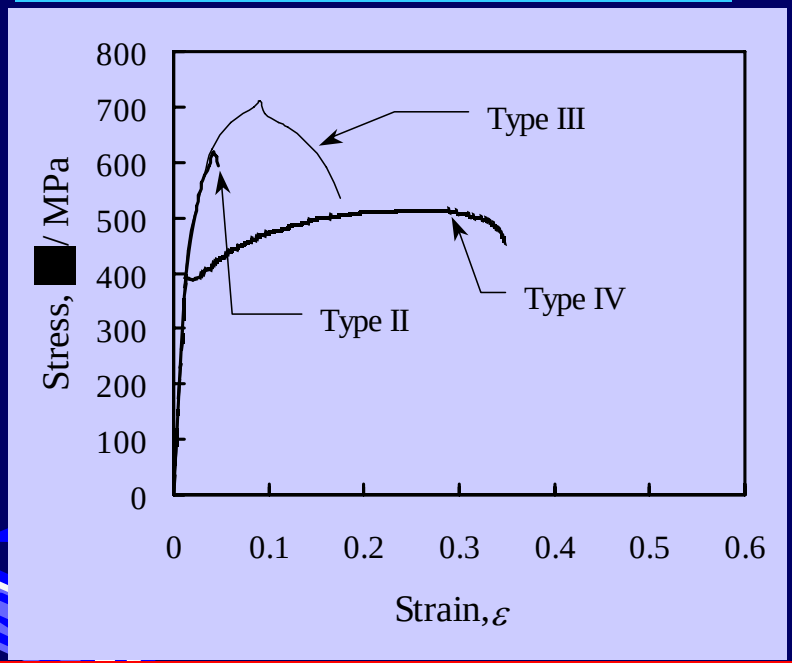
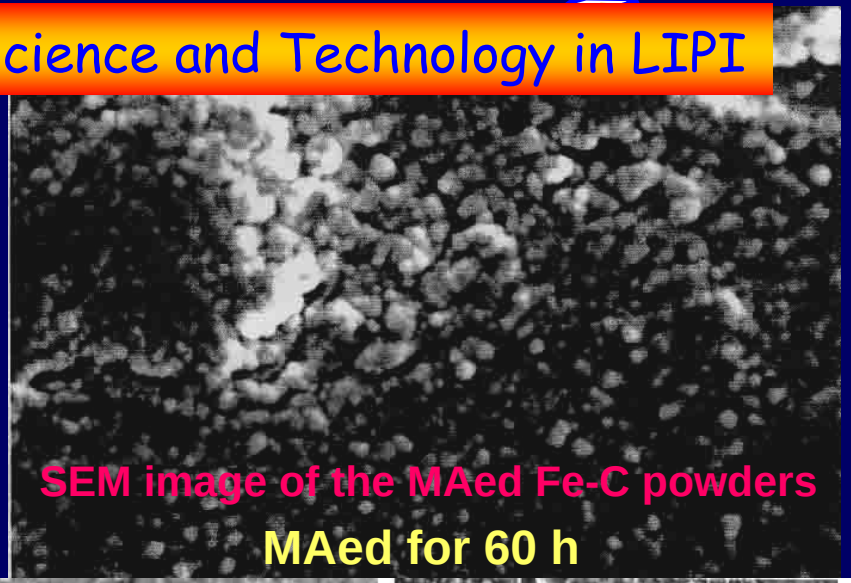


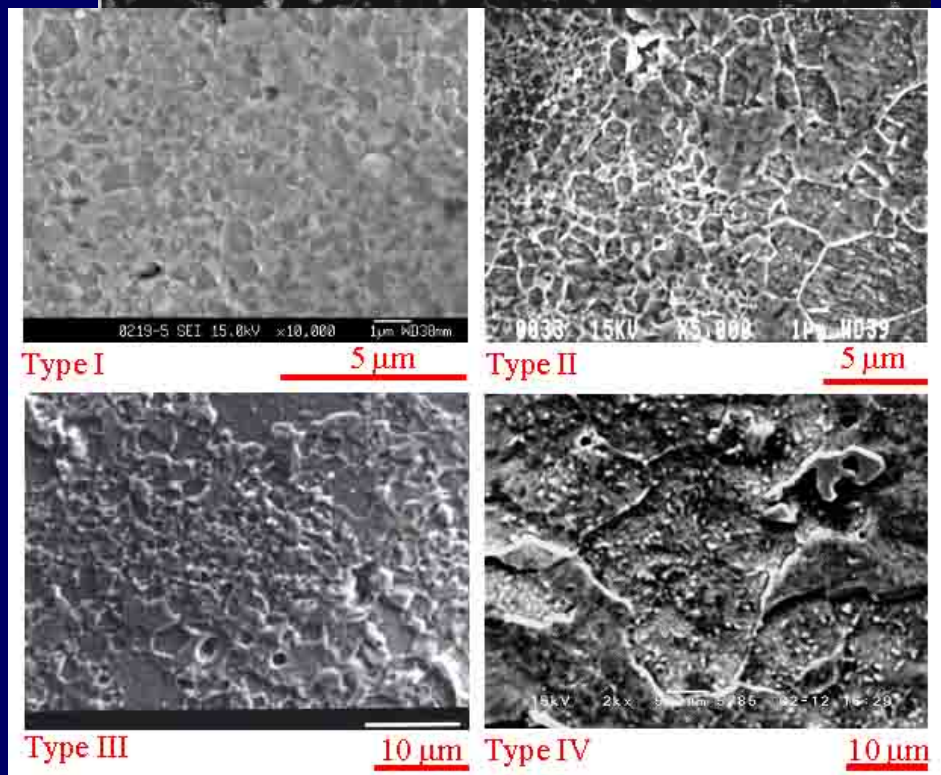
Figure 14. TEM image of the sulfated anatase and rutile structure aerogel after calcination at 750°C

Fine grained carbon steel prepared by MA-PM (Mechanical Alloying and Powder Metallurgy

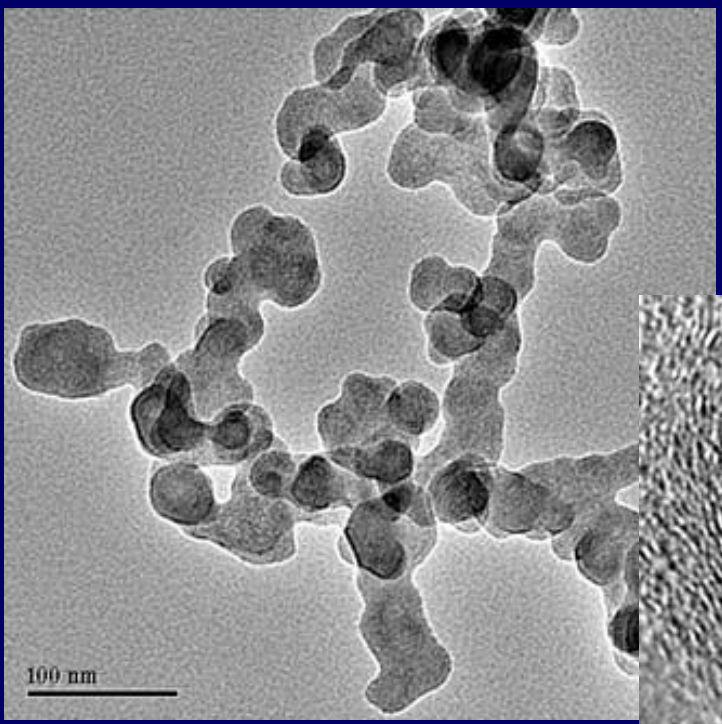
Type	Vickers hardness (HV)	Mean grain size (μm)
I	187	0.477
II	235	0.712
III	217	2.30
IV	182	17.4



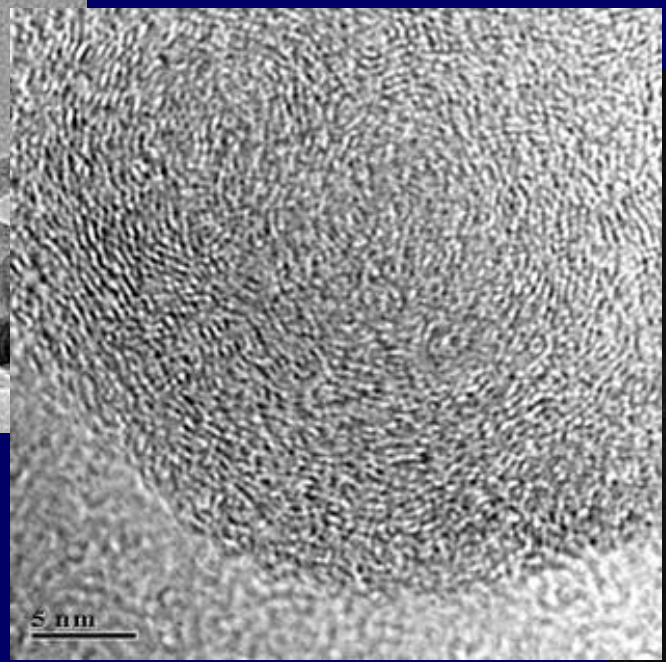


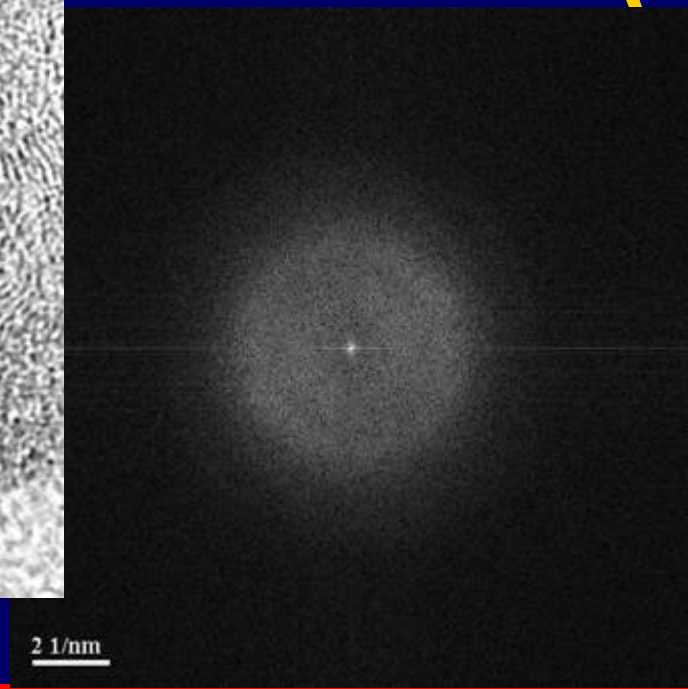


- Thermal Evolution of Amorphous Nanoparticles from Bentonite and Their Crystallization Behavior



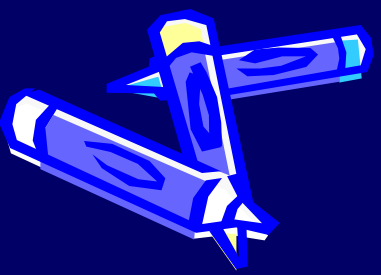
Only amorphous phase was observed on the K1-PSD after calcination at 700°C. Pictures are taken using SEM and TEM (bright and dark field).





Research Facilities in LIPI

- SEM, EPMA and Optical Microscope
- NMR (nuclear magnetic resonancy)
- TEM
- Tensile test and hardness measurenments
- TG-DTA
- XRD
- XRF
- AAS
- Optical Spectrum Analyzer
- Silicon Crystal Growing
- Liquid Phase epitaxy
- Laser trimer
- Various ball mill
- RF Sputtering and Evaporation sputtering
- Mo CVD
- Diffusion furnace, laser direct write system, photo litrography
- Etc



Introduction to

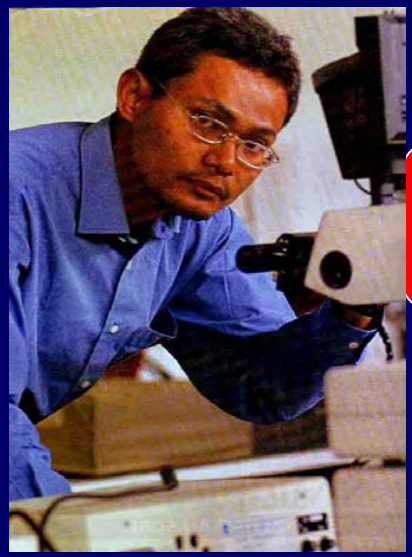
Indonesian Society for Nanotechnology

Many Indonesian young scientists came from aboard in nanotechnology fields but had limited facilities, staffs and budgets.

www.nanotech.lipi.go.id

It was established in April 2005 and Composed of more than 100 young researchers from many national research institutions (government institutions, universities, private sectors) in interdisciplinary of nanotechnology.

Organization



Chairman
Dr. N.T. Rochman

General Secretary
Dr. Anto T. R.

Nano-Material
Dr. Setio P.

Nano-Chemistry
Dr. Eniya

Nano-Electronic & Device
Dr. Khoirulrijal

Nano-Biotechnology
Dr. Arief B.W

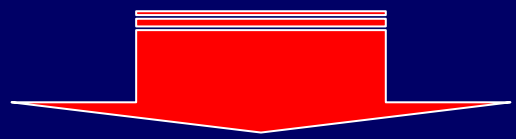
Nano-Scince & Education
Dr. Budi K.

Tasks

- To provide a forum and networking for communication and idea exchange in the field of nanotechnology
  →Organizing workshop on nanotechnology 3 x/ year, journal online, miling list etc.
- To provide information center for nanotechnology : **www.nanotech.lipi.go.id**
- To support a material to government for making a road map of nanotechnology in Indonesia
- To help creating nano-science and technology based industries
- To become a coordinetor for collaboration research between research institution and private industries.
- To do international contribution through international collaboration research, training of the staff, expert exchange program, organizing international seminar etc.

Summary

- LIPI and Indonesian Society for Nanotechnology concern in developing material science and technology
- we have capable human resources and some research facilities
- We are ready to international contribution such as research collaboration, researcher exchanges, training, open facilities etc.



How to solve the finance for collaboration research?

Thank you for

The Organizing Committee