OVERVIEW OF INSTITUTE OF MATERIALS SCIENCE (IMS)

Nguyen Xuan Phuc
& Le Van Hong

Outline

- Missions
- Organization chart
- Main areas of Activity
- Staff
- Facilities
- Achievements
- Current research topics

Institute of Materials Science

Vietnamese Academy of Science & Technology

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VIETNAMESE ACADEMY OF SCIENCE AND TECHNOLOGY (VAST)

- Institute of Mathematics
- Institute of Physics
- Institute of Chemistry
- Institute of Mechanics
- Institute of Geology
- **Institute of Materials Science**
- Institute of Biotechnology
- Institute of Information Technology
- Institute of Applied Mechanics
- Institute of Natural Product Chemistry
- Institute of Environmental Technology
- ……

IMS - HISTORY

- Established in: 1993

Laboratories from earlier institutes:

Institute of Physics (1969),

Institute of Materials Research (1979),

Institute of Tropical Technology (1977) &

Center of Mineral Processing (1992)

- A multi-disciplinary,

comprehensive S&T research institution

MISSIONS

- Basic research in materials science.
- R&D in materials engineering and technology
- Development and application of materials, and transfer of advanced technologies in materials science.
- Post-graduate education and training in materials science.
- Establishing international cooperation.

IMS DIRECTORS

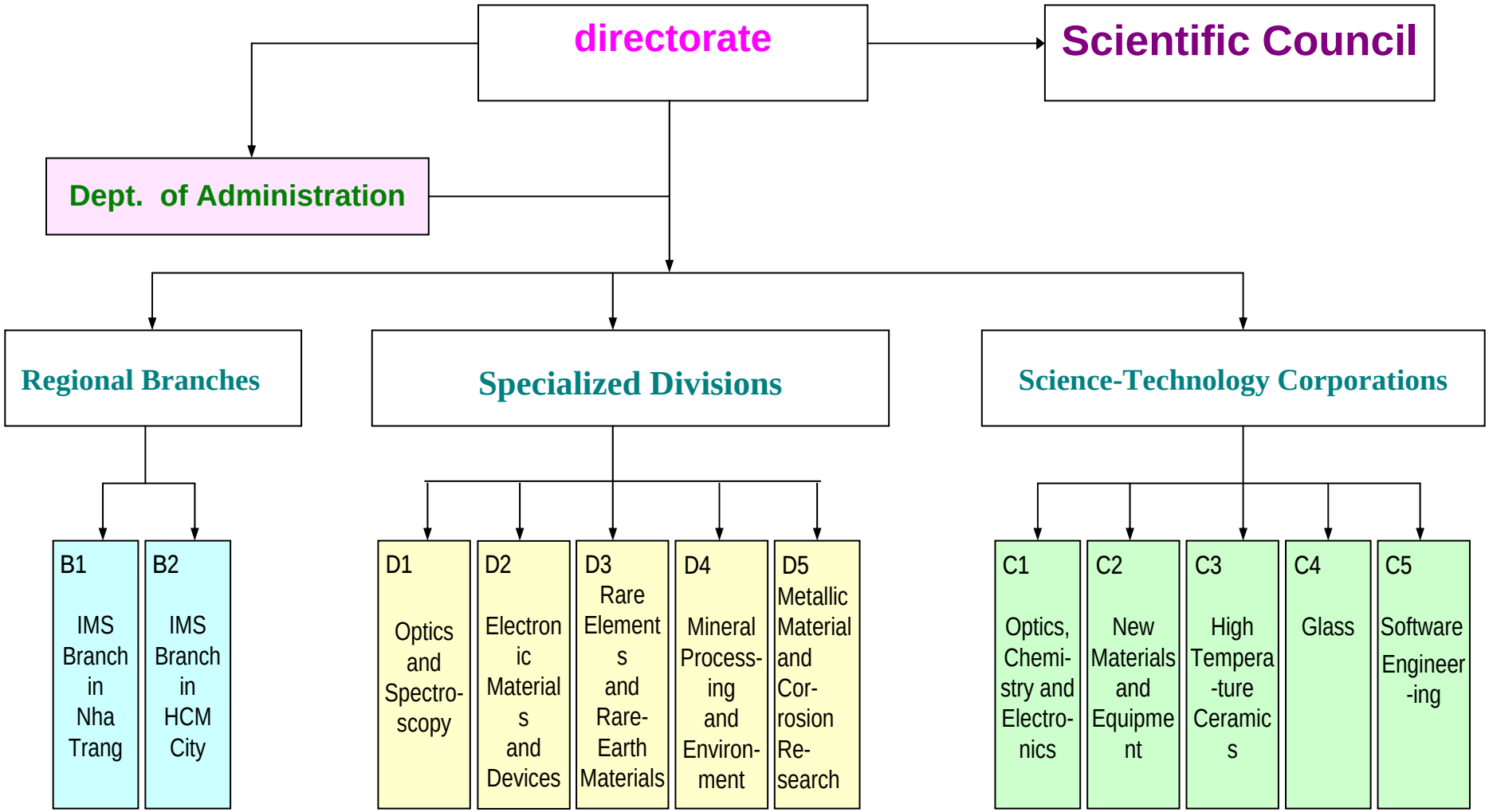
(SINCE ITS ESTABLISHMENT)

Prof. Dr. Sc. NGUYEN VAN HIEU
Director: 1993 - 1997

Prof. Dr. PHAN HONG KHOI
Director: 1997 – 2002

Prof. Dr. Sc. NGUYEN XUAN PHUC
Director: since 2002

ORGANIZATION CHART



SPECIALIZED DIVISIONS

- **D1:** Division of Optics and Spectroscopy
- **D2:** Division of Electronic Materials and Devices
- **D3:** Division of Rare Elements and Rare-Earth Materials
- **D4:** Division of Mineral Processing and Environment
- **D5:** Division of Metallic Materials and Corrosion Research

MAIN AREAS OF ACTIVITY

1. Optical materials and technologies
2. Electronic materials and devices
3. Rare elements and rare earth materials
4. Polymers and composite materials
5. Metals and alloys
6. Mineral processing and environmental technologies
7. Materials and energy technology
8. Corrosion and corrosion prevention
9. Materials from marine resources
10. Inorganic materials

Optical materials & technologies

+ Materials for optoelectronics and photonics
+ Semiconductor lasers, physics and applications
+ Gas lasers and dye lasers
+ Fiber optics for optical communication and sensors
+ Photochemical materials
+ Gemology
+ Lighting techniques.

Electronic materials and devices

+ Electronic and optical properties of semiconducting materials and devices.
+ Magnetism and magnetic properties of rare-earth-containing materials
+ High temperature superconductivity and materials
+ Physics and technology of thin films
+ Sensor technology and applications
+ Methods for structural characterization of materials.

Rare elements and RE materials

+ Rare and precious metals
+ Rare earth containing magnet: materials & devices
+ Catalytic materials
+ Application of NdFeB materials.

Metals and corrosion

+ Friction metallic materials and machine details
+ Ferro-alloys with low-carbon content.
+ Atmospheric corrosion
+ Mechanism and kinetics of metal corrosion
+ Materials and methods for corrosion prevention.

Mineral processing and environmental technologies

+ Mineral processing technology
+ Environmental technologies
+ Materials and technologies for water & gas treatment.

STAFF

312 people, including:

Prof. Dr. Sc., 5

Assoc. Prof. 25

Dr. Sc., 9

PhD., 80

MSc., 19

Bachelors and engineers: 174

Technicians. 40

Facilities for thin film fabrication

- Edwards Auto 306 Sputtering System
- Microwave-Plasma Enhanced-Chemical Vapor Deposition (MWCVD)
- Laser Ablation System
- Electron Beam and Thermal Evaporation Systems for Depositions
- Dip coating & spin coating machines, etc.

Dip-coating system

Thermal Evaporation

Electron Beam Deposition

Sputtering system

Facilities for fabrication and processing of metallic materials

- Arc melting machine (in inert gas)
- Rapid quenching machine for fabrication of amorphous ribbons (in inert gas)
- High energy milling machines (SPEX & Fritch)
- Ultra-fine Jet Mill
- Automatic Forming Press Machines
- Gas & Plasma Cutting Machine,

etc.


Arc melting machine


Arc melting machine


Vacuum sintering furnace


Melt spinning system

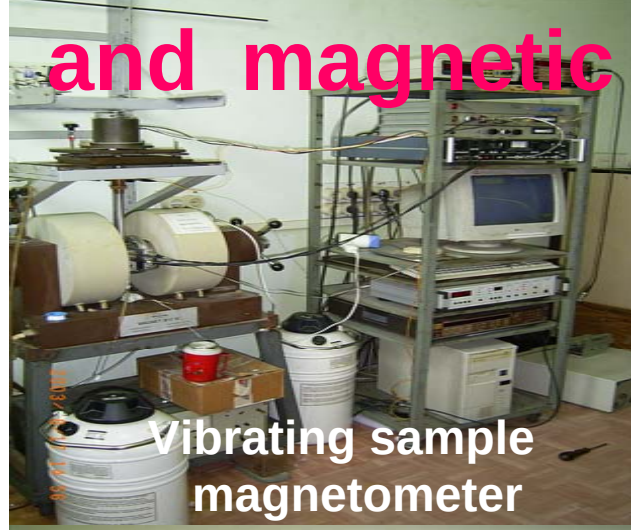

Frequency furnace

Facilities for structural characterization

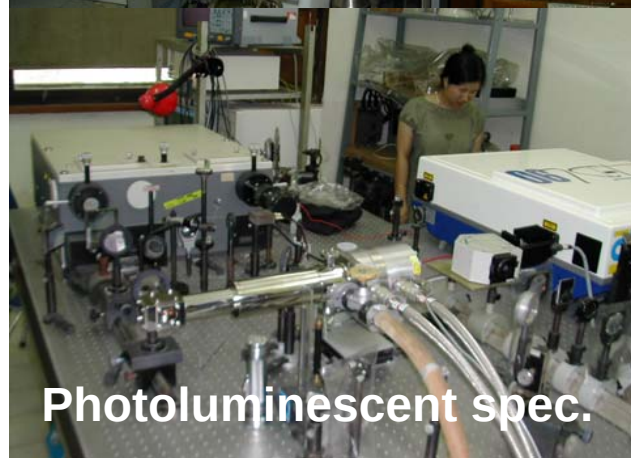
- Equipment for Surface Profile and Step-High Measurement
- X-Ray Diffractometer - D5000 SIEMENS
- Scanning Electron Microscope FE-SEM S4800
- Transmission Electron Microscope - EM125
- Micro Raman Spectrometer – LABRAM, etc.

Facilities for optical, electrical and magnetic properties

- Prism Coupler System for Measuring Refractive Index, Thickness and Waveguide Loss
- Absorption, Transmission and Photoluminescence Measurement Systems
- High Performance Spectrum Analyzer
- Optical Time Domain Reflectometer
- Fast Digitizing and Storage Oscilloscopes
- Semiconductor Parameter Analyzer
- Equipment for characterization of thermal conductivity
- PPMS Quantum Design
- VSM, AC susceptibility, Magneto-resistance
- BH graph


Vibrating sample magnetometer


Electrical measurement


Photoluminescent spec.

Scientific reports in international journals

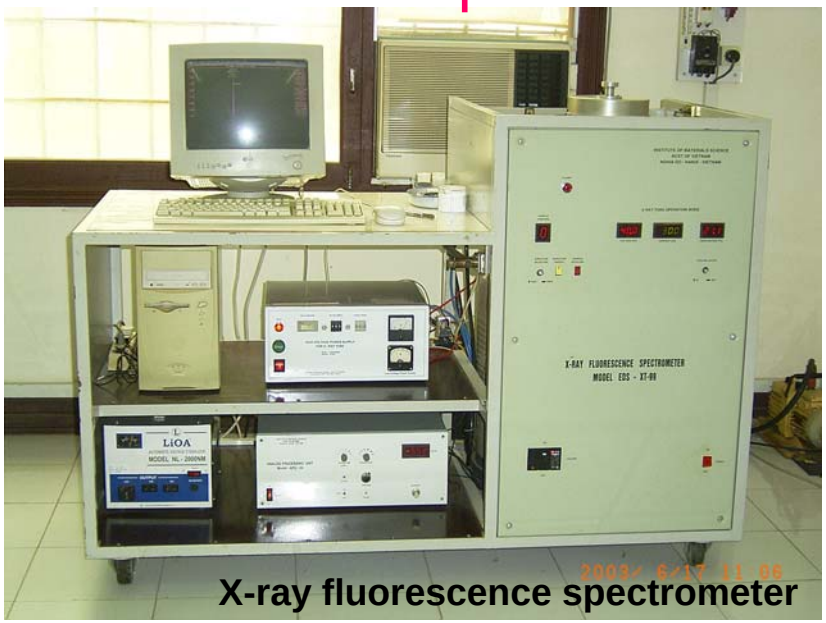
- Physical Rev. B
- Applied Physics
- Applied Physics Lett.
- J. Raman Spectroscopy
- J. Luminescency
- Journal of Mag. Mag. Mat.
- Physica B, Physica C,
- Journal de Physics
- Solid Thin Film
- Modern Physics
- J. Intergrated Ferroelectrics
- Phys. Chem. Lett.
- J. Europ. Ceramic Soc.
- J. Electrochemical Soc.
- Sensors & Actuators ….

RECENT ACHIEVEMENTS
Toxic gas Sensors & Devices

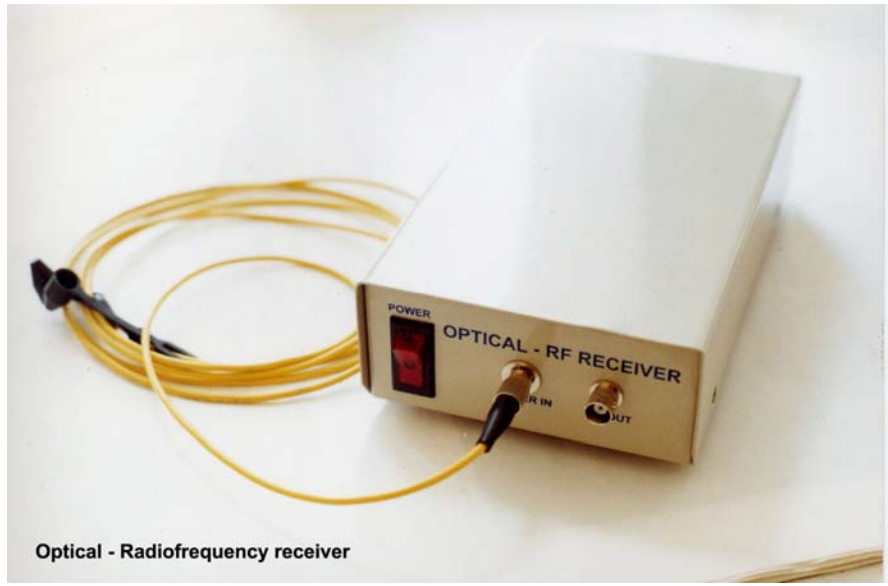
Dissolved Oxygen digital meters

Toxic gas sensor

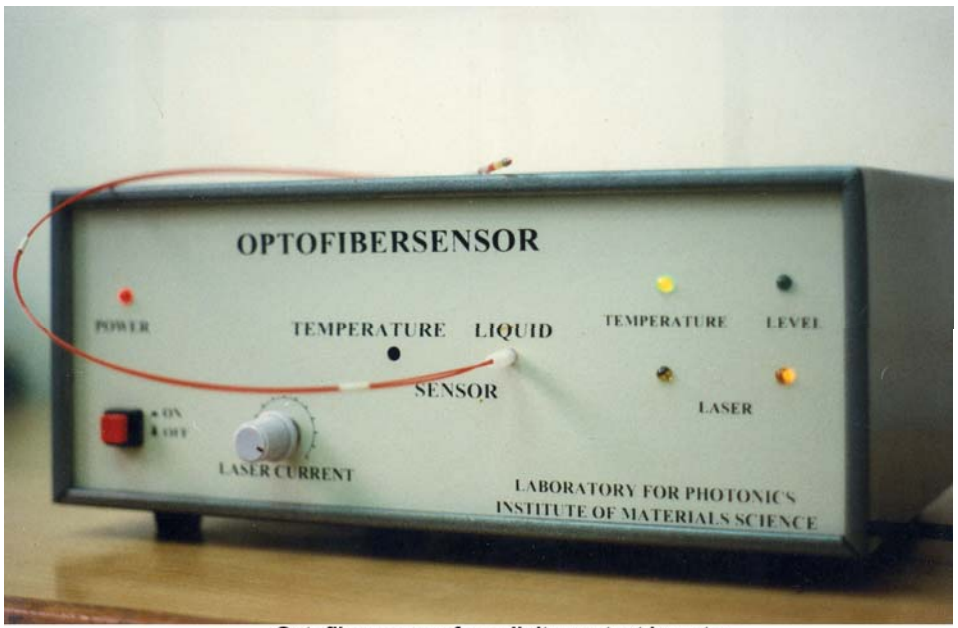
Optoelectronic devices



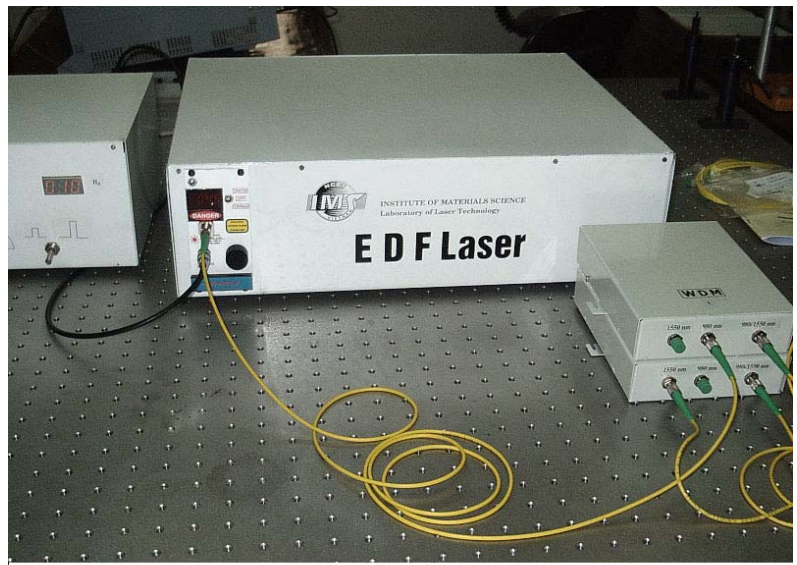
X-ray fluorescence spectrometer model EDS-XT99



Optical - Radiofrequency receiver

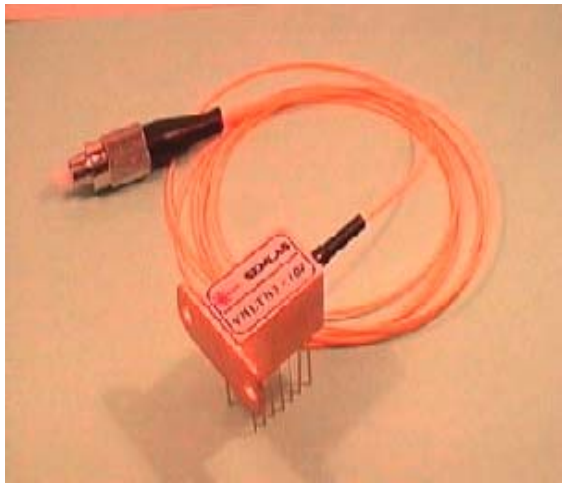


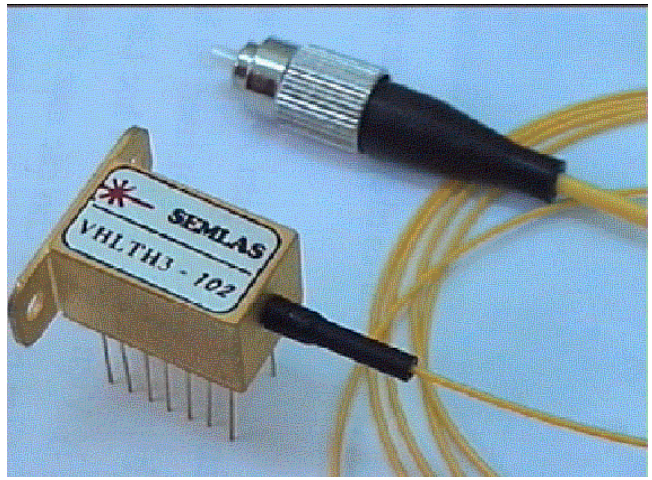
Optofiber sensor for salinity content in water



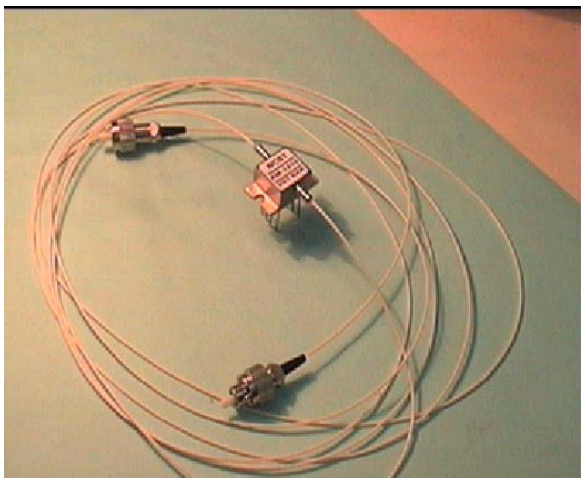
Er-doped fiber Laser system

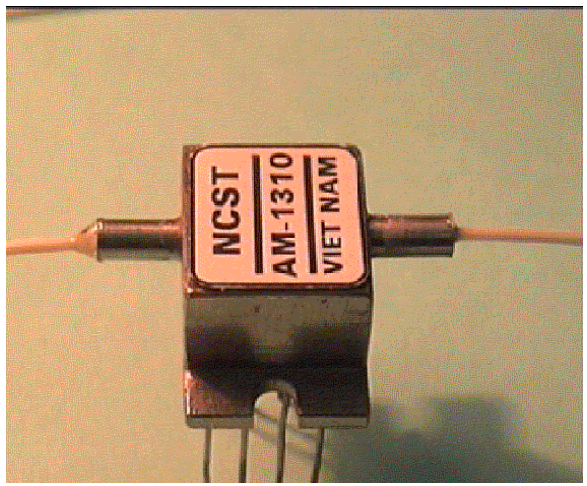
Optoelectronic devices

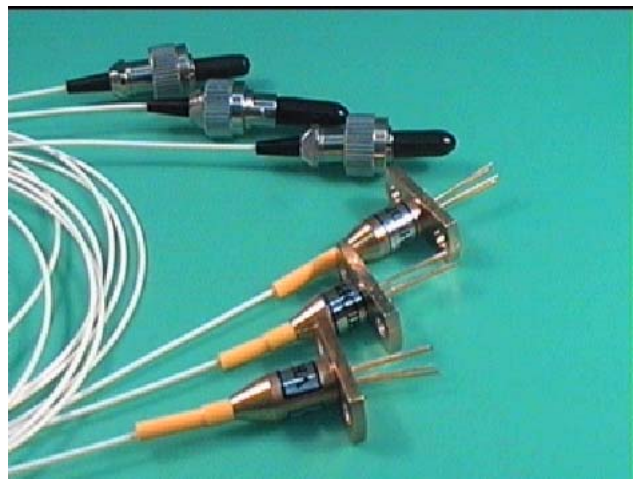




Single-mode optical complex laser module, model VHLD13







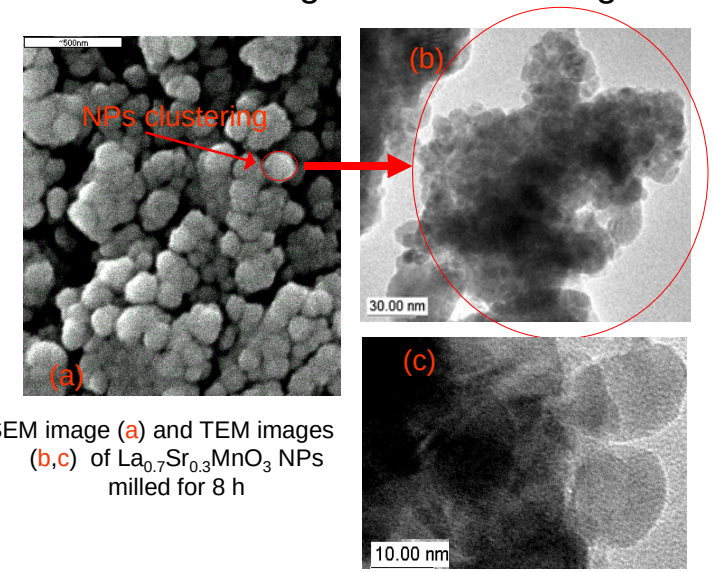
Optical Amplifier Laser Module model AM1310

Single-mode laser modules

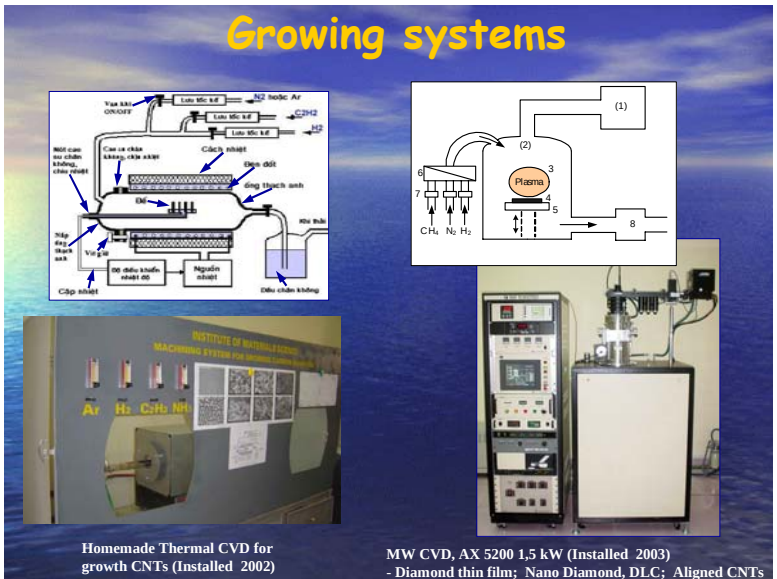
Current research topics

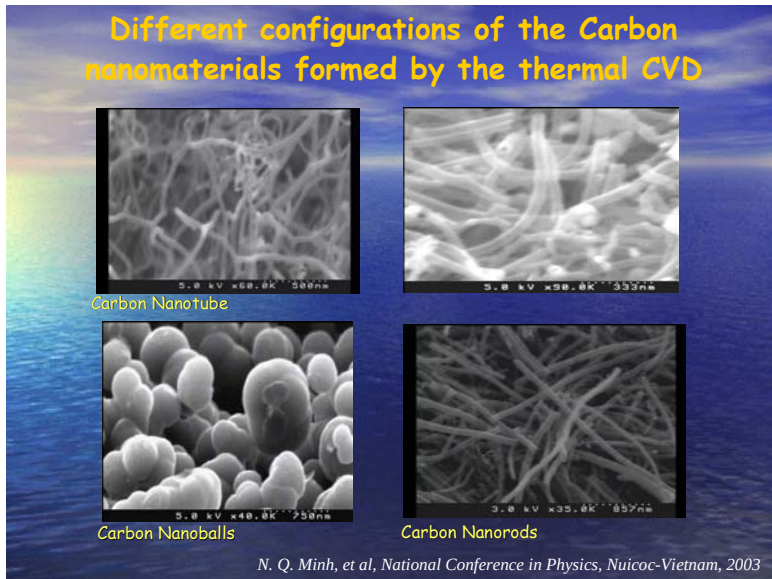
- Carbon nanotube materials
- Multilayer magnetic materials
- Nanoparticle materials
- Photonic materials
- Optoelectronic materials
- Sensor materials and devices
- Nanoparticle catalytic materials

NPs clustering : self and/or magnetic.



SEM image (a) and TEM images (b,c) of $La_{0.7}Sr_{0.3}MnO_3$ NPs milled for 8 h





- Annually enrollment: 5 – 10 students
- Promoting theses: 20 students

Training workshop

PhD education

- **Joint Postgraduate Program: IMS+COLTECH – Osaka University**
- **Cooperation with several universities in education.**

International Workshop on Functional Materials

- Site: Ha Long, Beach City of World Heritage Halong Bay (150 km east from Hanoi, Vietnam)
- Time: November 2006
- An Activity of SE Asia Materials Network
- Sponsors (expected): ICMR, VEF, ICTP, UNESCO, VAST ASEAN COST ….

THANK YOU FOR YOUR ATTENTION