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
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
• ……..
• 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
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.
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.
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 & Fritsch)
- Ultra-fine Jet Mill
- Automatic Forming Press Machines
- Gas & Plasma Cutting Machine, etc.
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
Scientific reports in international journals

- Physical Rev. B
- Applied Physics
- J. Raman Spectroscopy
- J. Luminescency
- 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

Growing systems

Homemade Thermal CVD for growth CNTs (Installed 2002)

MW CVD, AX 5200 1.5 kW (Installed 2003)
- Diamond thin film; Nano Diamond, DLC; Aligned CNTs

Different configurations of the Carbon nanomaterials formed by the thermal CVD

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

NPs clustering
PhD education

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

Training workshop

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