

IPPS (SWEDEN) PHYSICS SUPPORT TO VAST (VIETNAM): AN EXAMPLE OF FRUITFUL COLLABORATION BETWEEN A DEVELOPED EUROPIAN COUNTRY AND A DEVELOPING ASIAN COUNTRY



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I. Problem: How to conduct fruitfully a collaboration between a developed and a developing country in experimental physics?

II. Collaborating institutions: IPPS and VAST

A side: IPPS as a project donor:

**International Programme in the Physical Sciences (IPPS)
Supported research areas**

The IPPS focuses its activities on providing assistance to create viable and independent research teams of an international standard. In the countries with which IPPS has co-operation, physics is very weak and in a stage of capacity building. Therefore, most of the Research groups supported by the IPPS are located at university departments. This means that in the project support given, the IPPS also assists the departments in creating or strengthening their MSc and/or PhD programmes. IPPS also has attached groups, which means groups not receiving regular support but who can apply for grants for minor expenses of urgent needs.

All research to be supported are proposed by the groups in the respective countries and should be in line with the plans of the department/institution/faculty/university.

B side: VAST as a project acceptor:

Vietnam Academy of Science and Technology (VAST) is the scientific institution under the direct management of the Government with the function to conduct the research and implementation of the natural sciences and technology in the key directions of the State.

The missions of VAST are to organize and implement the natural science and technology research activities according to the key directions fixed by the State, to create and implement the advanced technologies. The objectives of which are to better serve the country's policy in science and technology development for the most benefit of the society in general and of science & technology in particular.

Physics are done in the following institutes of VAST:

- Institute of Physics
- Institute of Materials Science (IMS)
- Institute of Geophysics
- Institute of Space Technology
- HCMC Institute of Physics
- Institute of Applied Materials Science
- Nha Trang Institute of Technology Research and Application
- Institute of Applied Physics and Scientific Instruments

III. Role of a long term research project: a skeleton of the collaboration

- Project title: **Rare Earth Metal**
- Project length: **2+1/2 phase = 10 year from 1991-2001**
- Total project budget: **1,1 USD, (including training sandwich PhD)**
- Budget source: **SAREC/Sida (Sweden),**
- Swedish budget manager: **IPPS**
- Swedish physics laboratory: **Angstrom Laboratory of Uppsala University**
- Vietnam budget manager: **Vietnam Academy of Science and Technology,**
- Vietnam physics laboratory: **Magnetic Materials Laboratory of Institute of Materials Science, (IMS of VAST)**

IV. Recipient Labo: Status (then and now) of (IMS) Laboratory of Magnetic Materials Physics :

a) Facility: (installed in) and beneficial for:

1. Arc melting (1996): 3 PhD & 5 MSc thesis, 5 SCI papers, 2. Ball milling (2001): 2 PhD & 3 MSc thesis, 4 SCI papers, 3. HiT (1600oC) furnace (2000): 2 PhD & 3 MSc thesis, 5 SCI papers, 4. Sputtering (2001): 1 PhD & 3 MSc thesis, 3 SCI papers, 5. Vibrating Sample Magnetometer (VSM) (1991): 7 PhD & 10 MSc thesis, 15 SCI papers, 6. Closed Cycle Refrigerator (1994): 4 PhD & 8 MSc thesis, 12 SCI papers, 7. Hi Field Pulsed Magnetometer (1998): 2 PhD & 5 MSc thesis, 4 SCI papers, 8. Rapid quenching* (2001), 9. PPMS* (2006), 10. XRD* (1993), 11. FE-SEM* (2005)- 12. Pulsed Laser Ablation (2004)- *) Non-IPPS

b) Education:

- Sandwich PhD theses: 3 (Vu Van Hong, Dao Nguyen Hoai Nam and Le Viet Bau)
- Other theses completed with benefit of project research facilities: + 8 PhD and 20 MSc.

c) Publication:

- + Swedish-Vietnamese co-author: 20 SCI papers,
- + Other papers with benefit of project equipment: 30 SCI papers.

d) Significant research results:

Research fields of the Laboratory: Physics and materials aspects of various magnetic materials such as: Magnetoresistive ceramics, Spintronic materials, Bulk amorphous materials, and Magnetic nanoparticle.

Especially regarding magnetoresistive materials, collaboration resulted in the following physical phenomena:

- + Glassy Magnetism of Manganites and Cobaltites
- + Temperature Memory Effects of Electrical Resistance in $\text{La}_{0.7}\text{Sr}_{0.3}\text{Mn}_{0.925}\text{Ti}_{0.075}\text{O}_3$
- + Selective Dilution for Detection of Interactions in $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ and $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$
- + No Double Exchange Between Co and Mn
- + Room temperature Magnetocaloric Effect in $\text{La}_{0.7}\text{Sr}_{0.3}\text{Mn}_{1-x}\text{MxO}_3$ ($M=\text{Al}$ or Ti)

e) Publication:

1. D.N.H.Nam et al. J. Mag. Mag., Mat. 177-181(1998) 1135-1136.
2. D.N.H.Nam et al., Phys. Rev. B, Vol.59, No 6, (1999) 4189-4194.
3. D.N.H.Nam et al Phys. Rev. B, Vol. 62 (2000) 1027-1032.
4. D.N.H.Nam et al. Phys.Rev.B, Vol. 62 (2000) 8989-8995.
5. R.Mathieu et al. Phys. Rev. B, Vol. 63 (2001) 1744051-1744056.
6. D.N.H.Nam et al. J. Mag. Mag. Mat226-230 (2001) 1335-1337.
7. D.N.H.Nam et al. J. Mag. Mag. Mat., 226-230 (2001) 1340-1342.
8. M. Tseggai et al. Journal of Solid State Chemistry 178 (2005) 1203-1211,
9. L.V. Bau et al. J. Mag. Mag. Mat (2005).
10. D.N.H.Nam et al. Phys. Rev. B 73, 184430 (2006).
11. N.V.Dai et al. Phys. Rev. B, (2008) accepted 03/2008., Code: LM11637BJ.
12. D.N.H. Nam et al. J. Applied Physics, 103 (2008) 043905.
13. DNH Nam, et al. Phys. Rev. B, Accepted May 17, 2008.
14. DNH Nam et al. Phys. Rev. B, code LN 11513B
15. L.V. Bau et al. J. Mag. Mag. Mat., (2010)

VSM
1991



PPMS 2006

Arch
melting
1996



FE-SEM 2005

V. Discussion and conclusion remarks:

- How to choose in capacity building:

Equipment but what?

Machine for sample fabrication + 1 (research interested) physical property characterization.

Better choice: not commercially ready made, but composing of component equipments of advanced electronics.

Expert education but when?

Sandwich education of PhD

The student must master the support research equipment, as a part of the his/her thesis content.

- Knowledge required for the recipient to master:

First phase: A side to B side: 'Tell me what is it, I will tell you why it is so'

Next phase: A side to B side: 'Tell what is it, we'll see why',

- Collaboration to continue: what here and where else: B side (VAST) contributions also to South-South collaborations

Scientific Workshop in Bangladesh



Training Workshop in Laos



International Conference on
Magnetism and Advanced Materials (ICMAM-2010)
03-07 March 2010, Dhaka, Bangladesh
Organized by: Department of Physics, Bangladesh University of Engineering and
Technology (BUET), Dhaka-1000, Bangladesh
and
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1. ISP Report, International Programme in the Physical Sciences, Project Catalogue 2002, Uppsala University, Tabergstryken AB, 2004.
2. ISP Report, Annual Report for International Science Programme, Universitetstryckeret, Uppsala 2009
3. Vietnam Academy of Science and Technology, Annual Report 2008, Hanoi-March 2009.6