Chapter 1. Background and objectives

The materials research in Tohoku University has more than 90-year history, and has produced and developed a lot of studies to date. New materials born in Tohoku University include, for example, different kinds of magnetic materials, amorphous metals, nanoparticle-dispersed materials, quasi-crystals, superconducting materials, functionally gradient materials, high-performance thin films, intermetallic compounds, ceramics, monocrystalline functional materials, ultrafine particles, etc. Furthermore, in the material fabrication and development, not only the discovery of novel properties caused by artificially produced new structure, but also the material processings such as highly purifying, nano-structuring, highly precise control of morphology and highly precise molding has led the world. The objective of this program, based on the background mentioned above, is the formation of a center where novel exploratory researches are promoted and top-class researches are continuously realized. This is achieved by finding young researchers full of vitality to challenge unexplored fields in materials science, and by providing them with an excellent environment where they can independently perform original studies with support from outstanding established researchers.

Chapter 2. Organization

In order to show a large potential on materials research in Tohoku University as much as possible, this program is organized with 22 outstanding researchers as promotion members, belonging to four departments in the Graduate School of Engineering (Materials Science, Materials Processing, Metallurgy, and Applied Physics), one department in the Graduate School of Science (Physics), two research institutes (Institute for Materials Research and Institute of Multidisciplinary Research for Advanced Materials) and one center (New Industry Creation Hatchery Center). The list of the promotion members is shown in Table 1.

Table 1　List of promotion members

Name	Affiliation	Role/research subject in the program
Program Leader Akihisa INOUE	Institute for Materials Research	General leader
Program Substitute Leader Yohio WASEDA	Institute of Multidisciplinary Research for Advance Materials	Substitute leader
Masuo OKADA	Dept. of Materials Science, Faculty of Engineering	Substitute leader
Terunobu MIYAZAKI	Dept. of Applied Physics, Faculty of Engineering	Fabrication of thin film structures
Koichiro INOMATA	Dept. of Materials Science, Faculty of Engineering	Fabrication of thin film structures
Koki TAKANASHI	Institute for Materials Research	Fabrication of thin film structures
Kazuo NAKAJIMA	Institute for Materials Research	Fabrication of thin film structures
Akira KAWASAKI	Dept. of Materials Processing, Faculty of Engineering	Fabrication of nano-hybrid materials
Hiroyuki KOKAWA	Dept. of Materials Processing, Faculty of Engineering	Fabrication of nano-hybrid materials
Takashi GOTO	Institute for Materials Research	Fabrication of nano-hybrid materials
Naoki TOYOTA	Dept. of Physics, Faculty of Science	Fabrication of low-dimensional materials
Yoshihiro IWASA	Institute for Materials Research	Fabrication of low-dimensional materials
Minoru ISSHIKI	Institute of Multidisciplinary Research for Advance Materials	Highly purifying materials
Kiyohito ISHIDA	New Industry Creation Hatchery Center	Database
Yoshiyuki KAWAZOE	Institute for Materials Research	Simulation
Sadamichi MAEKAWA	Institute for Materials Research	Theory of material properties
Norio KOBAYASHI	Institute for Materials Research	Fundamental properties of materials
Yoji KOIKE	Dept. of Applied Physics, Faculty of Engineering	Fundamental properties of materials
Mitsutaka HINO	Dept. of Metallurgy, Faculty of Engineering	Fundamental properties of materials
Toshio SAKURAI	Institute for Materials Research	Local probe characterization technique
Daisuke SHINDO	Institute of Multidisciplinary Research for Advance Materials	Nano-structural characterization
Eiichiro MATSUBARA	Institute for Materials Research	Nano-structural characterization

Chapter 3. Activities

Utilizing infrastructures and equipments established in FY2002~2003, the promotion members continued to support COE fellows (eleven post-docs) and prominent young researchers (fourteen post-docs and students) in FY2004.　They also collaborated with each other, conducted fundamental and applied research on special structured materials, and educated many young researchers who would lead the next generation.　Detailed activities are shown below:

(1) Promotion of research activities of COE fellows

Applications for novel exploratory researches on material fabrication, processing, properties and characterization were submitted by a lot of young researchers in the world. Among them, eleven persons were selected to be post-doctoral fellows (COE fellows), and have performed research work.

(2) Grant system on cooperative projects for young researchers

Applications for novel exploratory researches were submitted by doctor-course students and post-doctoral fellows below 34 years old in the faculties and institutes of Tohoku University related to this program. A grant between 800 and 1,500 thousand JPY was given to selected 14 persons.

(3) Seminars

The following seminars and symposia (Table 2) were organized or sponsored by this program in FY2004:

Table 2 Seminars and symposia organized or sponsored by this program in FY2004.

Dates	Seminars/symposia	Participants/visitors
6.10-12, 2004	University of Cambridge (Cambridge, UK) Tohoku-Cambridge Forum	A few tens participants including 5 promotion members
8.18-20, 2004	Kyoto University (Kyoto, Japan) 21COE "New Materials Science" Kyoto Univ.-Tohoku Univ.-KAIST Joint Symposium	100 participants including 2 staffs and 18 students of Tohoku University
8.22-27, 2004	Sendai International Center (Sendai, Japan) 11th International Symposium on Metastable, Mechanically Alloyed and Nanocrystalline Materials (ISMANAM2004)	210 participants (21 countries)
2.1-27, 2005	Tohoku Electric Power Co., Green Plaza (Sendai, Japan) Exhibitions of materials research in Tohoku (Tohoku University Museum)	More than 1,000 visitors
3.3-5, 2005	Iwanumaya Hotel (Sendai, Japan) Materials Science School for Young Scientists Cosponsored by IFCAM	58 Participants 50 from Tohoku University 8 from outside

(4) Summary of publications and presentations

Publications and presentations by promotion members are summarized below:

・483 original papers

(Nat. Mater., Phys. Rev. Lett., Appl. Phys. Lett., Phys. Rev. B, J. Appl. Phys., Scripta Mater., Mater. Trans., J. Phys. Soc. Jpn., Jpn. J. Appl. Phys., etc.)

・285presentations in domestic and international conferences

・47 patents

・13 prizes

・20 reports on newspapers or TV