

Activities of the Micromachine Center in FY 2007

Overview

The Micromachine Center (MMC) actively promotes technical development projects commissioned by the national government and the New Energy and Industrial Technology Development Organization (NEDO) in an effort to establish the core technologies in the micromachine, Micro Electro Mechanical Systems (MEMS) and other micro/nano fields. At the same time, in order to promote widespread use and industrialization of these core technologies, the Center also aggressively pursues activities to improve the environment for micro/nano technologies. The Center's activities include policy proposal activities, industry interchange / stimulation projects, research projects, standardization promotion projects and dissemination and publicity projects designed to promote industrial development in micro/nano fields and contribute to the international community.

In FY 2007, the Micromachine Center conducted the following activities.

1. National / NEDO projects

In FY 2007, the Micromachine Center vigorously promoted the Highly Integrated and Complex MEMS Manufacturing Technology Development Project, a three-year project initiated in FY 2006. The Center also actively promoted the dissemination of MemsOne, the research and development achievement of the MEMS Design and Analysis Support System Development Project (commissioned by the national government and NEDO) that concluded in March 2007.

(1) Highly Integrated and Complex MEMS Manufacturing Technology Development Project (Project commissioned by NEDO)

In FY 2007, as in the previous fiscal year, active development efforts continued to focus on gathering, organizing and building a database of knowledge data in three areas:

- ① Combination of MEMS / nanofunctions
- ② Integrated formation of MEMS / semiconductors
- ③ High integration of MEMS with other MEMS

A new project to research and develop a fine MEMS integrated design platform was also initiated in FY 2007 as a single-year FY 2007 special financial resource for project promotion. A web browsing system was also created by organizing information relating to research and development issues 1 - 3 as well as information peripherally related to these issues involving an equivalent circuit model as a design platform suitable for highly integrated and complex MEMS devices.

(2) Promotion of MemsONE dissemination

MemsONE was the research and development achievement of the MEMS Design and Analysis Support System Development Project, a project commissioned by the national government and NEDO that concluded in March 2007. The Center worked with the MEMS Industry Forum to energetically promote the dissemination of MemsONE.

(3) MemsONE Achievements Dissemination Project (commissioned by NEDO)

The Center initiated a MemsONE achievements dissemination project (commissioned by NEDO) to disseminate MemsONE in order to achieve the project's stated objective of promoting the expansion of the MEMS industry base and the development of new MEMS products.

More than 450 licenses for the beta version have been issued, and the training course was attended by more than 150 persons. These activities made a major contribution to establishing an infrastructure for dissemination.

2. MEMS Industry Forum projects (policy proposal and industry interchange / stimulation projects)

In order to support the further development of the MEMS

industry, the MEMS Industry Forum was established in April 2006 as a Special Projects Committee with a membership made up primarily of companies involved in the MEMS industry. The MEMS Industry Forum also works to establish ties with academies, local centers, overseas institutions and the like as affiliates. The Forum makes policy proposals to relevant institutions and promotes a variety of activities aimed at industry interchange and stimulation.

(1) Policy recommendation activities

On November 8, 2007, members of the MEMS Industry Forum Promotion Committee and representatives from the government and related agencies exchanged views on MEMS. In addition, a MEMS Forum was held at the Micro-Nano 2007 general exhibition in July 2007. Various issues were raised with regard to design (MemsONE), manufacturing (MEMS Foundry) and MEMS personnel training, with the aim of strengthening the infrastructure for the MEMS industry. These policy recommendation activities were conducted to promote the development of MEMS-related industries.

(2) Industry-academia liaison activities

Micro/Nano Cutting Edge Technology Exchange meetings were held three times during the fiscal year (in July, November and March), in order to deepen understanding and recognition of state-of-the-art technologies in various fields relating to micro/nano technology, and to disseminate micro/nano technologies and promote industry-academia interchange. For each session, two knowledgeable persons from universities, the National Institute of Advanced Industrial Science and Technology (AIST) and so on were invited to give presentations and provide technical consultation.

(3) Creation of an infrastructure for MEMS development

- ① Expansion and upgrading of MEMS Foundry Network systems
- ② Promotion of MemsONE dissemination
- ③ Strengthening of collaboration with public foundries in each area and local clusters
- ④ Promotion of personnel training projects

(4) MEMS business interchange activities both at home and abroad

- ① Opening of a MEMS Mall
Study of basic activities and site configuration for MEMS Mall and preparation of a MEMS Mall draft proposal.
- ② Holding of Micro/Nano 2007 general exhibition
Micro/Nano 2007 was held July 25 - 27 primarily at Tokyo Big Sight.
- ③ Participation in 13th World Micromachine Summit

The 13th World Micromachine Summit was held Thursday, April 26, 2007 through Saturday, April 28, 2007 in Venice, Italy (at the Telecom Future Centre).

- ④ Formation of an international affiliate network

The establishment of cooperative ties with overseas MEMS related organizations was promoted. As of FY 2007, there were 11 overseas affiliates.

- ⑤ Dispatch of overseas missions and researcher interchange

In FY 2007, the Micromachine Center participated in a micro/nano related event in Germany (Hannover Messe), and also dispatched missions to overseas countries and promoted interchange with both research institutions/organizations and individual researchers.

3. Research projects

The Micromachine Center conducted research relating to micromachine and MEMS technologies in order to accurately determine technical and industry trends and study new technical issues in the areas in which micro- and nanotechnologies are becoming integrated.

(1) Implementation of research relating to the BEANS Project

The BEANS project represents the achievement of the “MEMS Frontiers: Study of Future Device Technologies Made Possible by Fusion with Nanodevices” project implemented in FY 2006. In order to make the BEANS project into a national project, a “BEANS Project Research Council” was established and study was conducted of the project scheme, organization, research content and the like.

(2) Study of technical trends in Japan and other countries

In the first half of the fiscal year, study focused on the type of presentations made at TRANSDUCERS '07 and the trends in oral presentations for each field. In the second half of the year, as in past years, a study was conducted of the type of presentations featured at MEMS2008 and the trends for each industry.

(3) Study of industry trends

To stimulate MEMS industries and expand the MEMS industry base, a study was conducted to determine the current status and market trends relating to the MEMS foundry industry in Japan, as well as the state of MEMS foundries in other countries. In addition, basic data needed to upgrade MEMS foundry functions in the future was compiled.

(4) Periodic survey of MEMS technology strategy map

As a periodic survey of the technical strategy map for the MEMS industry, a roadmap for improving the environment for MEMS personnel training was established in order to accommodate MEMS market expansion.

(5) Upgrading of micro/nano database

An effort was made to further enhance the database on the Micromachine Center website by provide a search function for documents made available to supporting members as well as by including survey reports, mini-survey reports, a map of research centers and so on.

4. Projects to promote standardization

Standardization projects were pursued with our international initiatives in micromachine/MEMS technology fields.

(1) Standardization priority review

With regard to standardization candidate topics in core common fields and device fields, studies were conducted of the current status and the need for technical verification, the need for development of new measurement methods, research and development organizations, priorities, existing standards and so on. Accordingly, in the device field it was decided to give top priority to angular velocity sensors (gyro) and geomagnetic sensors.

(2) Research and development activities relating to certification of standards for the purpose of proposing international standards

With regard to life acceleration tests, test specimens for individual universities were prepared from the same test materials and fatigue tests were conducted using various methods and the results were compared. With regard to bonding strength tests, testing equipment was developed and a qualitative determination of the current state of bonding strength evaluation research was conducted for microstructure members, and a study of existing standards was conducted.

(3) Follow-up activities relating to proposal of standards for thin film material fatigue testing

The views of various countries were accommodated and follow-up activities were conducted up through the submission of a committee draft for vote (CDV).

(4) Study of overseas standards

Following a review of the following standards proposed by Korea, voting and the submission of comments from Japan were conducted.

① General Principles of MEMS (CDV)

② RF-MEMS switch (CD)

③ Bonding test method (CD)

(5) Creation of JIS standards for thin film material tensile test method standard

Work was begun on the creation of JIS standards for the tensile test method and standard test specimens standardized by the IEC in 2006.

(6) In June 2007, the Micromachine Center became the Japanese review body in the MEMS field for IEC/TC47 (specialist committee for semiconductor devices). The Center also proposed that Working Group 4 (WG4) in the MEMS field be upgraded to a subcommittee (SC).

5. Dissemination and publicity projects

The Micromachine Center issued and distributed a newsletter and sponsored exhibitions and the like in an effort to promote widespread dissemination and education regarding micromachines and MEMS. The Center also collected micro/nano information and reference materials from universities, industry, public institutions and so on both at home and abroad and organized these materials together with the reference materials from studies conducted by the Center. These materials can be viewed and searched in the MMC library, and they have also been made available to researchers both at home and abroad via the MMC website.

(1) Improved dissemination and exchange of information through the MCC website

The Micromachine Center worked to provide information and conduct interchange activities using the MMC website. The content available to supporting members has also been upgraded.

(2) Publication of “MICRONANO” quarterly

The Center published a quarterly magazine entitled “MICRONANO” in April, July, October and January and distributed it to supporting members and other relevant entities, and also posted English and Japanese editions on its website.

(3) Publication of monthly newsletter

The Center published a monthly newsletter in Japanese entitled *MMC/MIF News* and distributed it to supporting members, MEMS Industry Forum members and other entities via the Micro/Nano Net. The newsletter provides MMC-related news for the previous month, information on upcoming events and so on.

(4) Publication of MicroNano Express newsletter

The Center published an electronic newsletter in Japanese to provide information on special events and the like and distributed it to supporting members, MEMS Industry Forum members and other entities via the MicroNano mailing list.

(5) Maintaining and upgrading of the MMC library (by upgrading the academic paper abstract database, etc.)

The Center summarized abstracts of technical papers and references in the *Micro/Nano Index* newsletter (Japanese only) and distributed the newsletter in electronic form to supporting members, related institutions etc.

The Center also upgraded the library by organizing and storing the technical documentation and references that had been gathered and making these materials available for viewing.

(6) Micromachine/MEMS Exhibition

The 18th Micromachine/MEMS Exhibition was held as part of Micro/Nano 2007 at Tokyo Big Sight Wednesday, July 25 through Friday, July 27, 2007. Total attendance was 12,424 persons, the largest yet (last year's attendance was 11,736 persons). The exhibition featured 362 organizations exhibiting at 484 booths.