

# Activities of the Micromachine Center in FY 2009

### Overview

The Micromachine Center (MMC) carries out various activities aimed at establishing fundamental technologies in micromachines, micro electro mechanical systems (MEMS), and other micro/nano fields. These activities include research studies, data collection and provision, and projects to encourage information exchange and cooperation among businesses in MEMS and other industries carried out through the MEMS Industry Forum (MIF) in order to improve the environment for MEMS industrialization, such as policy recommendations and industrial vitalization, as well as activities to promote standardization and improve public awareness of MEMS.

In FY 2009 the MMC worked to implement various projects in a manner deemed most effective and efficient. These projects are designed to contribute to the growth of Japan's industrial fields having ties with micromachines, MEMS, and other micro/nano technologies by exploiting unique features of the non-profit sector in order to supply an extensive and flexible array of services necessary for meeting numerous demands in micromachines and MEMS fields that cannot be met by the private sector alone. The projects are also aimed at creating a safe and secure society with little impact on the environment through technological innovation in these fields in order to contribute not only to Japan, but also to the international community as a whole. The following is an overview of each project.

### 1. Research Studies

The MMC has conducted research studies aimed at gaining a clearer picture of the technological and industrial trends in micromachine and MEMS technologies, which are emerging as key technologies in the manufacturing industry. These research studies entailed the investigation of new issues facing micro/nano technologies that arise when merging nanotechnology with technologies in other fields and included surveys of technological and industrial trends at home and abroad.

### 2. Data Collection and Provision

In order to strengthen Japan's industrial competitiveness in micromachines and other technologies, the MMC has implemented a data collection and provision project for the purposes of clearly identifying technological and industrial trends and for contributing to surveys, studies, and information distribution. A portion of the collected information has been made available over the Internet, and all data is available to the general public year-round in the MMC archives.

### 3. MEMS Industry Forum Projects (promoting information exchange and cooperation among businesses in MEMS and other industries)

The MMC has conducted the following activities in FY 2009 within the MIF in collaboration with affiliated academies, regional centers, and overseas institutions.

#### 1) Policy recommendations

The MIF Promotion Committee comprising MIF member companies held an informal gathering on MEMS to encourage the exchange of ideas with government and related agencies. The MIF also held the MEMS Industry Forum Workshop as one

of the concurrent events at MicroNano 2009 and actively promotes government policies related to MEMS.



The 2009 informal gathering on MEMS



The 2009 MIF Workshop

#### 2) Industry-academia collaboration

The MIF continued its study group activities, which bring together member companies interested in specific research themes. The MIF also gave extensive consideration to R&D projects needed for accelerating the BEANS Project and for realizing a low-carbon economy. In addition, the MEMS Advanced Technology Forum was held three times during the year.

#### 3) MEMS infrastructure improvements

The MIF implemented the following five projects aimed at improving the infrastructure for MEMS development.

- Expansion and upgrading of the MEMS foundry network system
- Compilation and upgrading of MEMSPedia
- Dissemination of the MEMS equivalent circuit generator
- Strengthening of collaboration among regional public foundries and local clusters
- Implementation of personnel training projects

#### 4) Information exchange among businesses

The MIF also implemented the following seven projects for encouraging information exchange among businesses in MEMS and other industries.

- Promotion of the MEMS Mall
- Holding of the exposition MicroNano 2009
- Holding of Exhibition Micromachine/MEMS
- Expansion of the international affiliate network
- Participation in the 15<sup>th</sup> World Micromachines Summit
- Participation as an exhibitor at Hannover Messe
- Dispatch of overseas fact-finding missions and exchange of researchers



**MicroNano 2009 (including the Exhibition Micromachine/MEMS)**

#### **4. Activities to Promote Standardization**

In the fields of micromachines and MEMS, the MMC has promoted standardization while demonstrating its initiative on the international stage.

##### **1) Joint research for the purpose of proposing international standards**

- a. Standardization for methods of evaluating the performance of micro-gyroscopes
- b. Standardization for measuring methods and notation for MEMS shapes

##### **2) Follow-up to a proposal of standards for testing MEMS wafer-to-wafer bonding strength**

We conducted a follow-up on methods for a 3-point bending test and a die shear test that Japan proposed in FY 2008 as methods for testing wafer-to-wafer bonding strength, with the aim of realizing their adoption as international standards in FY 2009.

##### **3) Research study on overseas standards**

##### **4) Adoption of a thin film material tensile testing method as a JIS**

#### **5. Dissemination and Publicity Projects (dissemination, publicity, and information services)**

The MMC has continued to publish and distribute newsletters, hold exhibitions, and otherwise expand public awareness of micromachines and MEMS. The MMC also continues to collect reference materials and documentation related to micro/nanotechnologies from universities, industrial circles, public organizations, and other sources in Japan and overseas. This documentation is consolidated with reference materials for surveys conducted at the MMC and is available in the MMC's archives for browsing and searching. Information is also being provided internally and externally through MMC's Web site.

#### **6. Other Projects**

##### **1) A follow-up to previous national/NEDO-commissioned projects (activities related to MEMS R&D projects)**

In an effort to establish fundamental technologies for

micromachines and MEMS, the MMC has been a central figure in actively promoting MEMS R&D projects while harnessing the combined capabilities of government, industry, and academia. In FY 2009 we engaged in the activities below to follow up on these projects.

The MMC continued its activities of the previous year to aggressively promote and disseminate the MemsONE software, which was the product of R&D in the MEMS Open Network Engineering System of Design Tools project (commonly referred to as the MemsONE Project), a national/NEDO project that was completed in March 2007. We have also continued our aggressive promotion and dissemination of the fine MEMS knowledge database and the new MEMS equivalent circuit generator developed in the Highly Integrated, Complex MEMS Production Technology Development Project (commonly referred to as the Fine MEMS Project), a three-year project carried out between 2006 and 2008. We also worked to develop an outline for firmly establishing fine MEMS in Japan's industry and to write up drafts and proposals for plans related to relevant R&D projects. Specifically, we drew up plans for effectively establishing the role of a support organization for outfitting the Tsukuba Nanotech Innovation Arena and for effectively considering R&D on an advanced network sensor system and environmentally friendly processes.