MMC

MICROMACHINE

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MMC Activities

Activities of the Micromachine Center in Fiscal 2004

OVERVIEW

The Micromachine Center undertook the following activities regarding research and study about micromachines (MEMS and other minute machines and systems), the collection and provision of micromachine information, and exchange and cooperation with domestic and worldwide organizations. The aim was to establish basic micromachine technologies and promote their industrialization, thus contributing to the further development of Japan's industrial economy and to international society.

1. Research and Investigation of Micromachines

Research activities were aimed at gaining a clear understanding of the trends in micromachine technologies and industries and conducting investigations of and research on new technological issues regarding the fusion of micro- and nanotechnologies, as well as making adjustments appropriate for the multidirectional expansion of micromachine technology.

(1) Microanalysis/Production System Project (recommissioned NEDO project and contract)

The MMC participated in the national government/NEDO-sponsored Microanalysis/Production System Project and is working on the construction of a document database system. Specifically, the MMC attended μTAS2004 and MEMS2005 and examined a total of 480 microchemistry-related documents, classifying the content of each and compiling a database accordingly.

(2) Studies on the future prospects of micromachine/MEMS technology

The MMC not only held six next-generation project meetings attended by key figures in industry, academia, and government, but also undertook joint research commissioned by the Mechanical Social Systems Foundation, proposing a next-generation MEMS project to begin in fiscal 2006 aimed at meeting the requirements and expectations of industry regarding MEMS and trends in MEMS technology.

(3) Studies on R & D trends for micromachine technology in Japan and abroad

The Subcommittee on Trends in R&D for Micromachine Technology in Japan and Abroad (Chairman: Prof. Shuichi Shoji, Waseda University)met three times, conducting exploratory analysis of the latest situation regarding the rapid expansion, both domestically and internationally, of micromachine technology and research trends and of basic technological data that contributes to the advancement of micromachine technology; and compiled the results of investigations on technological trends into the 2004 report on the investigation into trends by category.

(4) Studies on MEMS reliability assessment technology(project commissioned by the Japan Machinery Federation)

The Subcommittee on Trends in Reliability Assessment Technology was established and met five times. The subcommittee investigated the current situation of and issues for MEMS reliability assessment technology using related academic literature, and compiled the recommendations regarding policies for strengthening approaches in this field into the 2004 report on the investigation into MEMS reliability assessment.

(5) Studies on micro/nanosystem-related processing and assembly/measurement and assessment/handling technology(project commissioned by the Mechanical Social Systems Foundation)

A report was compiled of the results of investigations aimed at exploiting MEMS characteristics and enhancing their potential as an integrated technology through the integration of third-generation microprocessing technology and nano-and other disparate cutting-edge materials. In cooperation with the "Studies on the future prospects of micromachine/MEMS technology" described above in (2), the MMC made proposals for a next-generation MEMS project.

(6) Joint survey research activities concerning the industrialization of MEMS

As measures to promote the expansion and strengthening of MEMS foundry operations, the a subcommittee comprising three foundry manufacturers considered two issue-standardization of specialized MEMS terminology, and methods of response to MEMS foundry users-and made recommendations to the Foundry Service Industry Committee. These recommendations are to be implemented in fiscal 2005.

(7) MEMS-ONE: MEMS Open Network Engineering System of Design Tools Project (NEDO-commissioned project)

The MMC has organized an industry/academia cooperative research consortium (comprising nine businesses, ten universities, one research institute, and one organization). In June 2004, the center was commissioned to act as representative for MEMS-ONE (MEMS Open Network Engineering System of Design Tools Project), a national government/NEDO project, to oversee development for a three-year period until March 2006.

Specifically, the MMC oversees a total of six committees, including the Project Promotion Committee, and ensured that the project overall proceeded according to plan in the first stage.

The MMC also took part in the construction of the MEMS-ONE knowledge database and materials/process database, collecting and compiling information from academic literature and data provided by universities.

(8) Studies on the ripple effect and diffusion of MEMS-ONE(NEDO-commissioned project)

The MMC and Mizuho Information & Research Institute, Inc. jointly conducted a NEDO-commission project with the aim of promoting the diffusion of MEMS-ONE. Specifically, a written and, in some cases, aural survey of potential MEMS-ONE users (domestic organizations) was conducted, as was a market/needs survey aimed towards diffusion.

2. Collection and Provision of Micromachine Information

Information and documents on micromachines in universities, industries, and public organizations both in Japan

and overseas have been collected and, along with MCC-produced survey results and documents, maintained and not only made freely available in the MMC library, but also disseminated widely, both domestically and internationally.

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

The MMC Internet homepage was revised and thoroughly overhauled.

(2) Publication of a micromachine periodical (*"Micromachine Index"*)

A micromachine periodical entitled *Micromachine Index* gathering together abstracts of important documents was published and distributed to interested parties (fiscal 2004: Nos. 92-99 issued [8 volumes]).

(3) Publication of a newsletter

Information concerning research and governmental trends related to micromachines was distributed monthly to supporting members.

(4) Maintaining and upgrading the MMC library

Documents on micromachines in universities, industries, and public organizations both in Japan and overseas have been collected and combined with survey results compiled and documents produced by MMC and made available in the MMC library (48 books collected in fiscal 2004, making a total of 1,100 books as of March 31).

3. Exchange and Cooperation with Micromachine-related Organizations Worldwide

To promote affiliation, exchange and cooperation with related organizations in and outside Japan, the MMC involved itself in such activities as participating in the Micromachine Summit, holding the International Micromachine/Nanotech Symposium, and inviting to Japan and sending overseas researchers and experts in the field.

(1) Participation in the 10th Micromachine Summit

The 10th Micromachine Summit was held over three days, from May 3 to 5, 2004, in Grenoble, France. The event was attended by 108 participants representing 23 countries and regions. A delegation of four and three observers attended from Japan, and presentations were made by Isao Shimoyama (professor, the University of Tokyo), Toshiro Shimoyama (Honorary Chairman of MMC), Takayuki Hirano (MMC Technology Adviser), and Kunihiko Hara (Executive Director, Nippon Soken Inc.)

(2) Holding the 10th International Micromachine/Nanotech Symposium (partially subsidized by activities promoting the machine industry)

The 10th International Micromachine/Nanotech Symposium was held on November 11 at the Science Museum in Kitanomaru Park, Tokyo, with the aim of promoting micromachine technology and educating a wider public audience. The event was well attended, with a total of 359 participants including speakers, invited persons and media representatives.

(3) International exchange and dispatch of researchers

A fact-finding mission visited Taiwan and Singapore over six days, from September 6 to 11, 2004. In Taiwan, the group visited the Industrial Technology Research Institute (ITRI) and three companies, and in Singapore visited the Institute of Microelectronics (IME) and two companies; approaches to MEMS and nanotechnology were discussed. To summarize, Taiwan is planning the foundry industrialization of MEMS and promoting the use of large diameter wafers on the same level as semiconductors; Singapore is focusing on nanotechnology research.

(4) Building a MEMS foundry network system

To further the industrialization of MEMS, the MMC has established and operates a foundry network comprising businesses that provide foundry services. In addition to the 10 foundry business members, the National Institute of Advanced Industrial Science and Technology (AIST) joined the network this year as an associate member. The Foundry Service Industry Committee met five times; strategies for expanding the network were considered; the MMC Internet homepage - a channel for providing information - was upgraded; and two MEMS lectures were held.

(5) Establishing a forum for the exchange of cutting-edge micro/nano technology

A forum for the exchange of cutting-edge micro-nano technology was held two times for supporting members with the aim of strengthening cooperation between industry and academia in the micromachine/MEMS field.

4. Promotion of Standardization of Micromachines

In cutting-edge technological fields such as micromachine/MEMS, standardization is being promoted as international initiatives are taken.

(1)Standardization of fatigue testing methods for micro-nano materials (application for sponsorship submitted to the Ministry of Economy, Trade and Industry)

Continuing on from last year, the MMC is conducting research on standard fatigue testing methods that enable evaluation of the mechanical properties of various thin film materials measuring less than 10μm wide and 100μm long, with the aim of international standardization.

(2) Standardization of tensile testing methods for thin film materials

With the support of the Japanese Standards Association, the MMC has prepared proposals for the international standardization of tensile testing methods for thin film materials and standard test pieces. The CD (Committee Draft) submitted to the International Electric Congress (IEC) was referred to each of the member countries and approved at the IEC meeting held in Seoul in October 2004. It was then decided to submit a CDV (Committee Draft for Vote), one more step closer to international standardization.

(3) Support for standardization of IEC terminology

At the IEC meeting held in Seoul in October 2004, the CDV proposed by Japan was approved. It was then decided to submit a FDIS (Final Draft International Standard). International standardization will thus be achieved in 2005.

(4) Research and investigation of micromachine standardization

Following the IEC international standardization of specialized terminology, it was decided to next proceed with Japan Industrial Standard (JIS). Now that the international standardization of specialized terminology, tensile testing and fatigue testing has been completed, an investigation is underway about what other areas require standardization.

5. Dissemination of information and education about micromachines

The MMC undertook a variety of activities aimed at disseminating information and providing education about micromachines, including in particular the issue and distribution of quarterly magazines and sponsorship of exhibitions.

(1) Publication of public relations quarterly magazine *"Micromachine "*

Volumes 47 to 50 were published in Japanese only. English versions are available on the MMC website.

(2) The 15th Micromachine Exhibition

The 15th Micromachine Exhibition was held from November 10 to 12 at the Science Museum in Kitanomaru Park, Tokyo. Altogether 247 companies, organizations, and other exhibitors - the largest number of exhibitors at any micromachine exhibition to date - participated (the total number of booths was 352), and the total number of visitors was 8,213.

(3) Administration of the Federation of Micromachine Technology

As secretariat for the Federation of Micromachine Technology, the MMC endeavored to enhance cooperation between and strengthen micromachine-related organizations.