

3rd Japan-Korea-China MEMS Standardization Workshop

In order to speed up the design and development process, ensure compatibility and make mass production possible, MEMS international standardization will be crucial. In Japan, the Micromachine Center has played a leading role in pursuing international standardization with the International Electrotechnical Commission (IEC). So far three international standards originating in Japan have been published: Terms and definitions, Tensile testing method of Thin film materials and Thin film standard test piece for tensile testing. Another proposed standard, Thin Film Fatigue Test Methods, is currently under review as a Committee Draft Version (CDV).

Against this backdrop, the first Japan-Korea-China MEMS Standardization Workshop was held in Tokyo in 2005 as a forum for the exchange of information and the promotion of cooperation on the part of Japan, South Korea and China with regard to MEMS standardization. Last year, a second workshop was held in Gyeongju, South Korea. This year, the third MEMS Standardization Workshop was held on June 28, 2007 to coincide with the IEC TC47 Beijing Conference. Two speakers each from Japan, South Korea and China gave a total of six presentations on the evaluation of material properties for MEMS thin film materials. These presentations were followed by a spirited discussion.



The Tian You Hotel (the venue for the Japan-Korea-China MEMS Standardization Workshop)

The following is an overview of the presentations.

- (1) J. H. Kim of the Korea Institute of Machinery and Materials (KIMM) gave a presentation on the preparation of test specimens and test methods relating to compression testing of micro/nano pillar shaped test specimens fabricated from thin films. Dr. Kim also presented the results of measurement of polymer and metal thin films. South Korea will propose this material test method as a standard originating in South Korea.
- (2) Dr. Zhao of the Chinese Academy of Sciences gave a presentation on the degree of elasticity and fracture toughness of MEMS and bio-MEMS thin film materials. With regard to the degree of elasticity, Dr. Zhao demonstrated analytically that when the thickness of the thin film is less than an atomic layer of 100, a size effect becomes evident in the Young's modulus due to the surface energy of the material.
- (3) Dr. Higo of the Tokyo Institute of Technology gave a presentation on the evaluation of bonding properties for MEMS materials. Dr. Higo focused in particular on a discussion of new phenomena that are the opposite of the ordinary size effect – for example, with regard to the size dependency for the bonding strength between polymer (SU-8) and silicon boards, the strength is sometimes reduced when the size is small – as well as the causes for these new phenomena. With regard to methods for measuring the

bonding strength of MEMS materials, a new project aimed at standardization has just been initiated in Japan as well, and this presentation played a major role in promoting this project to South Korea and China.



- (4) Dr. C. S. Oh of the Kumoh National Institute of Technology in South Korea gave a presentation on the measurement of thermal expansion in thin film materials using laser interferometry. This is an area in which not much research has been promoted in Japan, and thus the presentation was of considerable interest. Moreover, as South Korea plans to propose this method of measuring thermal expansion as an international standard, it is one for which study will be needed in Japan as well.
- (5) Dr. Isono of Ritsumeikan University gave a presentation centering on the results of bending tests of nanosize thickness single-crystal silicon thin films. In particular, Dr. Isono presented a great many test results to show that, with submicron thicknesses, the silicon exhibits plastic deformation even at room temperature. This is an extremely important finding in terms of applications for MEMS/NEMS, and it attracted a great deal of attention.
- (6) Dr. Ren of Tsinghua University gave a presentation focusing on the progress of MEMS research at Tsinghua University. His presentation communicated the enthusiasm with which MEMS research is being conducted at Tsinghua University as well.



This is the third time the Japan-Korea-China MEMS Standardization Workshop has been held. The major achievement of the Workshop is its role in providing a forum for the exchange of information regarding the current state of MEMS standardization and future prospects in each country, as well as enhancing the common recognition in these three countries. It is crucial that these achievements be utilized in MEMS standardization strategies in Japan. Moreover, most of the presentations in the Workshops held up to now have focused primarily on evaluating the properties of MEMS materials. In the future, the workshop should function as a forum for the exchange of information among Japan, South Korea and China regarding the standardization of MEMS devices and their fields of application.

The 4th Japan-Korea-China MEMS Standardization Workshop will be held in 2008, with Japan once again serving as host.