## **Research and Standardization Activities**

MEMS international standardization was reviewed at an IEC/SC47F meeting held June 17 and 18 at Jeju in Korea, where three of the Unesco World Heritage sites are located. In coordination with this meeting, the 5<sup>th</sup> Japan-Korea-China MEMS Standardization Workshop was held on June 19. This workshop is held to promote cooperation and the exchange of information relating to MEMS standardization on the part of Japan, Korea and China. The first workshop was held in 2005 in Tokyo, and each year the venue alternates among the three countries. The following is an overview of this year's workshop.

## 1. IEC SC47F / WG1 meeting

Following email review and agreement by specialists regarding some of the technical issues, it was agreed that the "RF-MEMS Switch" "FBAR Filter" "Tensile Properties Test Method by Means of Bending" and "Wafer-to-wafer Bonding Strength Test Method" proposed by Korea would be promoted from the Committee Draft (CD) stage to the Committee Draft for Vote (CDV) stage. The response to comments from the other countries regarding the "Fatigue Test Method Using Resonant Vibration" that had been proposed by Japan and approved as a New Work Item Proposal (NP) was accepted, and a CD will be prepared in accordance with this response. The "Micropillar Compression Test Method" and "Coefficient of Thermal Expansion Test Method" proposed by Korea did not attract sufficient project participant countries and were not approved as NPs. Although the proposals were rejected this time, they will be resubmitted, and China is expected to become a project participant next time, resulting in project approval.



## 2. 5th Japan-Korea-China MEMS Standardization Workshop

The first half of this workshop was devoted to presentations by representatives from Japan, Korea and China on the latest news and roadmaps relating to MEMS standardization in each country. The second half of the workshop was devoted to the following MEMS research presentations.

(1) Professor Ohwada of Teikyo University gave a presentation on an electronic compass that is currently under development. This electronic compass is made up of biaxial and triaxial magnetic sensors and an acceleration sensor that detects the inclination of the compass. The use of MEMS technology in its manufacture enabled miniaturization of the device. Issues to be considered with regard to compass performance include the inclination of the device and correction of the disturbances caused by external magnetic fields.



(2) Professor Isono of Kobe University gave a presentation entitled "Scanning Prove??? Parallel Nanolithography for NEMS Fabrication Using MEMS Cantilever Array," relating to nanoscale patterning and processing using a cantilever

array. Applying bias voltage with an AFM cantilever during scanning makes it possible to process 50 nm linewidths during anodic oxidation, selfassembled monolayer patterning and EB resist processing.



- (3) Professor Ya-pu Zhao of the Chinese Academy of Science gave a presentation entitled "Electrowetting on a Lotus Leaf (EWOL)." Electrowetting is the process of changing the angle of contact by applying voltage. This process is expected to find applications in fluid variable-focus lenses (Philips) and monitors (e-ink) (Liquavista).
- (4) Yong-Hak Huh of the Korea Research Institute of Standards and Science (KRISS) gave a presentation on a bulge test method using application of hydraulic pressure, measurement of displacement using a laser interferometer (electronic speckle pattern interferometry or ESPI), application of gas pressure, and detection of displacement using capacitance. He also discussed parameters that will be important for standardization.
- (5) Dr. Hojun Ryu of the Electronics and Telecommunications Research Institute (ETRI) gave a presentation on an uncooled infrared sensor (bolometer) and said that standardization of this infrared sensor would also be pursued.

At this workshop, China also announced that it had established a domestic organization for MEMS standardization, and specifically that it will propose, as an NP, a draft standard for defining and measuring geometrical shapes. There is great anticipation with regard to the start of concrete action by China. While the vibrant activity in MEMS standardization is a welcome development, duplication and competition have occurred in the draft standards proposed by the individual countries, making cooperation and coordination by Japan, Korea and China all the more essential.