

Application oriented MEMS/NEMS by open collaboration

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MEMS (Micro Electro Mechanical Systems) have been fabricated using advanced micromachining based on an extended semiconductor microfabrication. Sophisticated MEMS device used as a high performance rotating gyroscope for navigation control systems was developed. A 1.5 mm diameter silicon ring rotor is electrostatically levitated and rotated at 75,000rpm using high speed digital signal control. Two-axes rotation and three-axes acceleration are detected simultaneously with high precision. Small size packaged MEMS devices such as integrated capacitive pressure sensor, diaphragm vacuum sensor and MEMS relay for LSI tester have been fabricated using a wafer level packaging using a glass with electrical feedthroughs. The MEMS relay performs high frequency response up to 20 GHz and high reliability owing to the hermetic sealing. Active catheters, fine blood pressure sensors used in a blood vessel and endoscope with laser therapy function have been developed for minimal invasive medicine using MEMS based assembly. Integrated MEMS such as integrated capacitive pressure sensor have been developed.

As NEMS (Nano Electro Mechanical Systems) which include nano structure, arrayed systems as multiprobe data storage and massively parallel electron beam lithography system have been developed using a glass with high density electrical feedthroughs. Monolithic XYZ-stage has been also developed for the arrayed systems. Highly sensitive cantilever resonator and micro probes have been also developed as the NEMS.