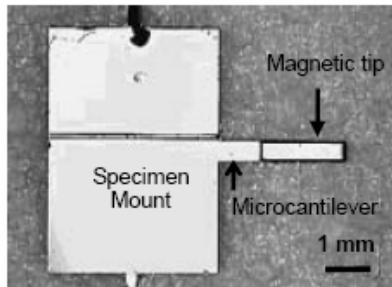


MEMS Reliability in Liquid Environments

E. K. Longmire* (PI), S. C. Mantell† (PI), S. M. Ali†, T. P. Kuehn†, M. J. Stegmeir*
Aerospace Engineering & Mechanics* / Mechanical Engineering†,
University of Minnesota

MEMS Reliability in Liquid Environments

- ◆ Microcantilever test structures made of Silicon, Silicon Nitride (SiN), SU-8, and Titanium have been microfabricated.
- ◆ Microcantilevers are cyclically actuated in water, saline, glucose solution and air.
- ◆ Actuation methods: Magnetic (Permalloy) and piezoelectric
- ◆ Sensing: Laser vibrometer, Photodiode, onboard piezo-resistive strain gages.
- ◆ Operational failures studied by monitoring changes in resonance frequency and Q-factor.

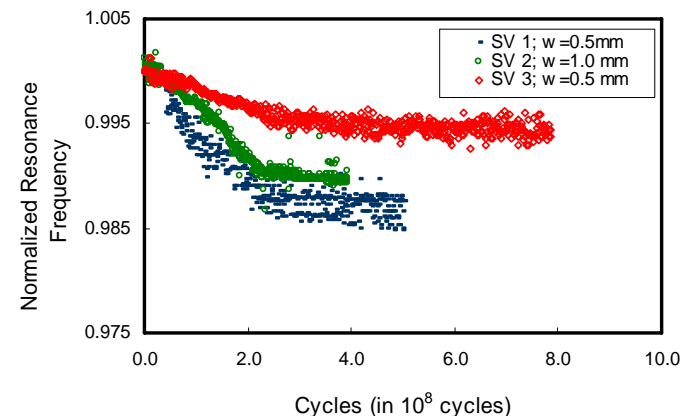


Optical image of magnetically actuated Silicon test specimen

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MAJOR OBSERVATIONS

- ◆ Resonance frequency and Q-factor of Silicon & SiN remain unchanged in air and water.
- ◆ Operational failure: Resonance frequency, Q-factor of Silicon microcantilevers decrease in saline due to mass deposition on silicon.



Conference Papers:

- ◆ T. P. Kuehn, S. M. Ali, S. C. Mantell, and E. K. Longmire, "Testing reliability of MEMS materials in liquids," SPIE Conference on Reliability, Packaging, Testing and Characterization of MEMS/MOEMS VI, San Jose, CA, Jan 2007,
- ◆ S. M. Ali, S. C. Mantell, and E. K. Longmire, "Reliability of microcantilevers in liquid environments," SPIE Conference on Reliability, Packaging, Testing and Characterization of MEMS V, San Jose, CA, Jan 2006.