

Micro-Scale Brittle Machining for MEMS Sensors

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Abstract

While MEMS/NEMS sensors are being rapidly developed in the past decades, sensors with micro-scale features are difficult to fabricate due to their high relative precision. This is in particular an issue when the sensor is made of brittle material or fabricated on a brittle substrate while requires tight tolerances with small batch production. Conventional electro-chemical/chemical or energy-based machining methods are time-consuming but often result in loose precision when machining such a sensor. This presentation shows some primary studies to fabricate such a micro-scale feature with micro-scale brittle machining. Micro-scale machining, although provides high flexibility and relatively high precision, can cause low yield rate as brittle material is fragile with high fracture stress and can be easily damaged in the machining process. Several machining strategies, including micro scribing and ultrasonic-assisted machining, and process parameters have been studied to investigate the feasibility of applying the micro-scale brittle machining technique for fabricating such sensors.

Bibliography

Dr. Jhy-Cherng Tsai is an Associate Professor at the Department of Mechanical Engineering, National Chung-Hsing University, Taiwan. He earned his Ph.D. in Mechanical Engineering and M.S. in Computer Science from Stanford University in 1993 and 1990. He also holds an M.S. and a B.S. degree in Mechanical Engineering from National Taiwan University, Taiwan. Dr. Tsai is a member of CSME Taipei, CIAE, CMMT and IEET. His research interest includes tolerancing engineering, precision engineering, and automation engineering.