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Self-Calibratable MEMS Absolute Temperature Sensor

A new method accurately measures micro electro mechanical systems (MEMS) stiffness, deflection, and device temperature directly, enabling self-calibration for industrial-scale batch fabrication.

Minute changes in the temperature of some micro electro mechanical systems (MEMS) can greatly affect the accuracy and precision of the system. Therefore, it is essential that temperature sensors be highly accurate and the measurements reproducible. Unfortunately, this is very difficult due to the limitations of calibration procedures. The stiffness of the cantilever of an atomic force microscope is currently determined by measuring the thermally-induced cantilever displacement and cantilever temperature. The high degree of uncertainty for these measurements leads to usually greater than 10% uncertainty for the cantilever stiffness measurement.

Purdue University researchers have developed an alternative method for accurately measuring MEMS stiffness and deflection. Additionally, this method measures the temperature of the MEMS itself rather than assuming the MEMS temperature is identical to the nearby temperature sensor. This method generates an expression for absolute temperature and uncertainty in temperature, and it facilitates electronic probing for industrial-scale batch fabrication or post-packaged on-chip measurement for self-calibration.

Advantages:

-Accurately measures MEMS stiffness and deflection

-Measures temperature of the MEMS directly

TRL: 5

Intellectual Property:

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05-31, Republic of Korea | NATL-Patent, 2013-05-31, India | NATL-Patent, 2013-05-31, China | NATL-Patent, 2013-05-31, Japan | PCT-Patent, 2013-05-31, WO | NATL-Patent, 2014-12-12, United States | Provisional-Patent, 2016-02-12, United States | NATL-Patent, N/A, Singapore

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