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Pull-In Instability Determination of Microcapacitive Sensor for Measuring Special Range of Pressure

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Abstract : Pull-in instability is a nonlinear and crucial effect that is important for the design of microelectromechanical system devices. In this paper, the appropriate electrostatic voltage range is determined by measuring fluid flow pressure via micro pressure sensor based microbeam. The microbeam deflection contains two parts, the static and perturbation deflection of static. The second order equation regarding the equivalent stiffness, mass and damping matrices based on Galerkin method is introduced to predict pull-in instability due to the external voltage. Also the reduced order method is used for solving the second order nonlinear equation of motion. Furthermore, in the present study, the micro capacitive pressure sensor is designed for measuring special fluid flow pressure range. The results show that the measurable pressure range can be optimized, regarding damping field and external voltage.

Keywords : MEMS, pull-in instability, electrostatically actuated microbeam, reduced order method
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