

عنوان مقاله:

Nonlinear static and dynamic behaviors of a microresonator under discontinuous electrostatic actuation

محل انتشار:

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خلاصه مقاله:

This article studied static deflection, natural frequency and nonlinear vibration of a clamped-clamped microbeam under discontinuous electrostatic actuation. The electrostatic actuation was induced by applying AC-DC voltage between the microbeam and electrode plate. In contrast to previous works, it was assumed that length of the electrode plate was smaller than that of the microbeam. In addition, it was assumed that a layer whose length was equal to that of the electrode plate was deposited on the lower side of the microbeam. Equation of motion was derived using Newton's second law. The static deflection due to the DC electrostatic actuation and the natural frequency about this position were obtained using the Galerkin method. Nonlinear vibration of the system due to the AC electrostatic actuation was obtained using the multiple scale perturbation method. Variations of static deflection, pull-in voltage, natural frequency and frequency response of vibration about the static deflection of microbeam with respect to variations of second layer length, second layer thickness, electrode plate length and value of electrostatic actuation were also studied. It was shown that, depending on the value of these parameters, static deflection and natural frequency of vibration about static deflection increased or decreased. Moreover, it was demonstrated that, depending on the value of these system parameters, nonlinear vibration of the system due to the AC electrostatic actuation might be realized as a softening or hardening behavior

کلمات کلیدی:

Microbeam, Electrostatic actuation, Natural frequency, Nonlinear vibration, Galerkin method, Perturbation method

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