

MEMS薄膜弹性模量及残余应力提取的数值算法

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基金项目：

摘要：

材料弹性模量、残余应力的在线提取，已成为MEMS领域中日益迫切的需要。本文首先简要介绍现有的一些主要的材料参数提取方法，然后提出了一种无需静用下两端固支梁吸合电压的显式解析表达式，而是利用决定静电作用固支梁弯曲挠度的微分方程直接计算吸合电压，再提取材料参数的算法。避免了在推导吸压的显式表达式过程中可能引入的误差，有利于保证材料参数测量的精度。模拟结果表明这种算法速度快、精度高，对实际应用有较好的参考价值。

关键词：材料参数测量；数值算法；吸合电压

Numerical Method for Extracting Young' s Modulus and Residual Stress of a MEMS Film

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Abstract:

A novel method for calculating Young' s modulus and residual stress of a MEMS film is proposed based on pull-in voltages of a set of fixed-fixed beams. In the method the pull in voltage of the fixed-fixed beam under an electrostatic load is directly calculated from the governing ordinary differential equation by using a numerical method, Young' s modulus and residual stress can then be calculated from the measured pull in voltages of a set of fixed-fixed beams. The method can avoid the errors due to deducing the explicit analytical expression of the pull-in voltage of the beam, and is helpful to ensure accuracy of material property extraction.

Keywords: material property extracting; numerical method; pull-in voltage

投稿时间：2010-04-07