

中華民國力學學會第廿九屆全國力學會議，國立清華大學，新竹，2005年12月16-17日

Analysis and experiment of a shear mode pzt actuator

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Abstract

The analytical close-form solution for the deflection of a novel beam-shaped shear mode PZT actuator is derived. The actuator can be applied in a microfluidic system. Its active region possesses two oppositely poled segments separated by one in-between non-poled segment. The deflections in four cases of segment dimensional designs are compared between the analytical solution and the ANSYS FEM solution. The two solutions show a good agreement. And, the maximum deflection of the case with symmetrical design is the largest. Moreover, the experiment for the sample with symmetrical design is performed, which the actual shear piezoelectric coefficient is obtained. And, based on the actual coefficient the experimental result agrees with the analytical solution very well.

Key words: PZT; Actuator; Analytical solution; Shear mode

剪切型壓電致動器之分析與實驗

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摘要

本文敘述一種新型之剪切致動壓電致動器並推導得到其致動位移之解析解，此型式之致動器可用於微流體系統之驅動，其樑形幾何在致動區有兩個極化方向相反之區段，兩者中間有一未極化區段，四種區段長度不同設計的解析解與 ANSYS 有限元數值解之結果非常一致，且發現對稱之幾何設計有最大之致動位移，所以，製作對稱幾何之試片並進行位移量測，獲取其實際剪切壓電係數，代入解析解之位移分佈與量測結果非常吻合，證實解析解的正確性。

關鍵字: 剪切型;壓電致動器;解析解