微懸臂風速風向感測器

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摘 要

本研究之目的在於風速與風向的感測。研究中利用氮化矽（Si3N4）應力殘留（Residual Stress）導致成形後翹曲的特性來製作微型風速風向感測器。此微感測器整體體積相較於一般所使用之感測器為小，且結構簡單，也因為微小尺寸，讓它能有很好的靈敏度與精密量測性。但由於單一懸臂在氣體感測上，存在著方向性問題，中間以相似之製程方式提出的熱線式風速感測設計，即沒有這方面的顧慮。本研究之第三步將原先的微懸臂風速感測器做改良設計，以四支懸臂為主體結構，不僅可解決感測方向之問題，同時亦附加了風向感測特性。本研究將所選用之矽晶圓兩面沉積氮化矽，壓阻使用鉑(Pt)，運用蝕刻進行體型微細加工(Bulk Micromaching)，製作出互成直角的四支微懸臂樑(Micro-cantilever)，而先前所沉積的氮化矽部分亦因為晶圓中矽結構被蝕刻液反應完後，懸臂因製程上的多次加熱與冷卻，使得殘留應力得以釋放，進而產生懸臂翹曲的現象。當氣體流經四支懸臂的時候，便會造成懸臂不同程度與方向的形變，透過儀器量測比較四支懸臂樑因形變所造成的不同壓阻變化值，進而判斷流體的方向。且可由壓阻值的變化總值來決定風速。在實驗下，給予15 m/s、20 m/s、25 m/s、30 m/s風速，在360 ° 各個入風角中，趨勢皆呈現規律波形變化，可有效達到風向感測的目的。在風速感測方面，風速為15 m/s，其時之電阻值總變化量為1.2 Ω左右，而20 m/s之情況下，組值總變化量升到了2 Ω，在數據中的最大組值變化量為3.5 Ω，相應之風速為30 m/s，亦在感測範圍內呈現了一個可預期的變化關係。

關鍵詞 : 殘留應力，體型微細加工，微懸臂樑，壓阻，微機電系統

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