包埋電流變液之三明治板的動態特性模擬與量測

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摘 要

電流變液在外加電場下，在毫秒的時間內，其性質由牛頓流體轉換成Bingham塑性體，當材料承受週期應變下，電流變液在剛性上及阻尼上會有顯著的變化，本論文主要在於探討電流變液包埋於三明治平板結構之研究。本研究以漢米爾頓原理推導具有埋入電流變液之三明治平板之控制方程式，並為配合處理較複雜之幾何形狀，以及電流變液具有非線性，將考慮此一材料之非線性特性推導出相對應之有限元方程式。為了能驗證理論模擬之正確性，本研究中製作平板試片，調配電流變液，包埋入平板試片，以懸臂的方式量測動態下結構前兩個共振頻率與阻尼隨外加電場及振幅等之改變，實驗結果可以驗證電流變液對於結構之影響，當電場強度增加，其結構剛性增加，共振頻率隨之增加，其結構阻尼變化，隨著振幅增加而減少，越大的振幅下，改變量越平緩。

關鍵詞 : 電流變液 ; 智慧型板結構 ; 動態特性

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