發泡鋁之螺栓接合面接觸熱阻與介面壓力之實驗研究

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摘 要

本研究主要在探討發泡鋁(Aluminum Foam)的螺栓接合面接觸熱阻之研究，實驗將發泡鋁試片（Al-6061）放置於上、下兩鋁合金塊中間，利用螺栓的接合方式來固定實驗試片，採用一維熱傳導的方式來進行實驗的量測而發泡鋁試片與鋁合金試片都為直徑63.5 mm 的圓柱體，螺栓直徑為5 mm 的三個螺栓組態與 3 mm的六個螺栓組態。 本研究探討不同發泡鋁的物理性質對其熱傳導特性之影響，主要分為：單位英吋的孔洞數（PPI值）、相對密度、試片高度與螺栓組態這三大主要的參數；鋁合金試片就單一為3個螺栓、6個螺栓及表面粗糙度為 σ =1.10 μ m；接合面螺栓扭力的範圍為 0.1~0.5 N-m。通過試片之熱傳量大約在 50~150KW/m2。 研究中並利用感壓軟片的量測來證實螺栓接合面之界面壓力與發泡鋁試片的一些相關參數的影響。實驗的結果顯示界面壓力隨著扭力的增加而增加，當界面壓力增加時其接觸的面也就變大，感壓軟片的濃度與接觸點也更加的明顯；而螺栓組態的影響卻沒有預期的良好，主要因發泡材料特殊的接合面與本實驗試片大小的影響，發現並無太主要的影響關係。 在試片溫度的量測當中，密度越大的發泡鋁試片其接觸間的界面溫差越小；發泡鋁的相對密度越大時其試片的總熱傳導值就越大，而當扭力增加時接觸面積增加界面壓力提升、接觸情形較佳時，界面接觸熱阻就越小；當螺栓組態從3個增加到6個時，對接觸熱阻與總熱傳導值有改善但卻無顯著的影響；而當試片高度增加時其接觸熱阻並無太大的不同，但總熱阻卻因高度的增加而增加；其中最重要的就是PPI值得探討，在不同的PPI值中總熱阻與接觸熱阻均會隨著PPI值的越大而增大。

關鍵詞 : 發泡鋁材，螺栓的接合表面粗糙度，感壓軟片，接觸熱阻，總熱傳導值，PPI值。

目錄

簽名頁 授權書.....iii 中文摘要.....v 英文摘要.....vii 誌謝.....ix 目錄.....xi 圖目錄.....xiii 表目錄.....xv 符號說明.....xvi 第一章 序論.....1 1.1 研究背景.....1 1.2 研究目的.....2 第二章 文獻回顧.....4 2.1接觸熱阻之相關研究.....4 2.2多孔性材料特性方面.....6 第三章 研究方法.....9 3.1 加熱器.....9 3.2 冷卻系統.....10 3.3實驗試片.....10 3.3.1 鋁合金試片.....10 3.3.2發泡鋁試片.....11 3.4界面壓力量測.....13 3.5螺栓接合面總接觸熱阻實驗數據量測.....14 第四章 結果與討論.....17 4.1溫度量測.....17 4.2界面壓力之量測.....19 4.3總熱傳導值與接觸熱阻的量測.....20 4.3.1相對密度的影響.....21 4.3.2試片高度的影響.....22 4.3.3試片 PPI 值的影響.....22 4.3.4不同螺栓組態的影響.....23 4.3.4界面壓力與接觸熱阻之影響.....23 4.3.5實驗誤差之影響.....24 第五章 結論.....26 參考文獻.....28

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