

螺栓接合面接觸熱阻與鋁蜂巢板熱傳特性之研究

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摘要

本論文分為兩部分，第一個部分為螺栓接合面接觸熱阻之研究，第二個部分為鋁蜂巢板熱傳特性之研究。論文的第一個部分，是經由實驗量測兩鋁合金試片（6061-T6）利用螺栓接合時接觸熱阻之研究。在本研究中共採用三種不同之螺栓組態及不同之三種螺栓尺寸來進行實驗，螺栓扭力的範圍為1~10N-M。研究中並利用感壓軟片量測螺栓接合面之界面壓力，實驗結果顯示界面壓力會隨著螺栓扭力及螺栓數目的增加而增加。在界面溫度差方面，試片利用螺栓接合時界面溫度差明顯小於試片沒有利用螺栓接合的情況。在相同的螺栓數目的情況下，螺栓直徑由5MM增加到8MM時，接觸面熱傳導值並未產生明顯的影響，而固定螺栓的直徑時，利用八個螺栓接合之接觸面熱傳導值明顯大於利用四個螺栓接合之接觸面熱傳導值，而增加試片表面粗糙度會導致接觸面熱傳導值下降。當界面塗有RTV的情況下，總熱傳導值並會隨著RTV厚度的減小而增加。論文的第二個部分，是針對鋁蜂巢之熱傳特性進行實驗研究，主要在探討不同的金屬蜂巢狀結構，不同材質及不同接合條件下之熱阻變化。實驗中發現在溫度量測方面，在相同的接合條件下孔徑較小的鋁蜂巢試片，接觸面溫度差較小熱傳效果較佳。在軸向總熱傳導值量測方面，在相同的材料及接合方式上孔徑較小的鋁蜂巢試片總熱傳導值較高，而在不同材料的鋁蜂巢試片比較上，兩種實驗用鋁蜂巢試片在實驗的扭力範圍內總熱傳導值十分接近。在不同接合方式的比較上，增加螺栓數與增加螺栓直徑均會使總熱傳導值增加，總熱傳導值亦會隨著鋁蜂巢高度的增加而減小。在軸方向接觸熱阻方面，接觸熱阻大約佔總熱阻的1/10。而且對孔徑為6.3MM之鋁蜂巢，接觸熱阻隨著扭力的增加而下降。但對於孔徑為12.7MM之鋁蜂巢，扭力及螺栓組態對接觸熱阻影響並不明顯。鋁蜂巢在相同的方向下，接觸熱阻值並不會隨著高度的增加有明顯的變化，而總熱阻值會隨著高度的增加有明顯的增加。

關鍵詞：接觸面熱傳導值、螺栓接合、界面溫度差、界面壓力、感壓軟片、接觸熱阻、鋁蜂巢狀結構材料，總熱傳導值

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