利用多孔材料於衝擊冷卻熱傳增強的實驗探討

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摘 要

本研究採用暫態液晶熱傳技術，探討－平板上貼附多孔材於單一空氣噴流下的熱傳表現。並進－步藉由不同參數組合，測試各參數對熱傳之影響，以提供實際相關應用與熱傳提升技術之參考。本研究先以平板衝擊熱傳結果與相關實驗文獻來進行比較，驗證實驗系統之正確性，再延伸進行平板上貼附多孔材料的衝擊熱傳實驗。 平板上附加多孔材料之熱傳實驗變化參數包括孔隙率(ε =0.94~0.76 五種)、雷諾數(Re=12400, 17900, 23750)、噴嘴距底板之高度(H/dj=6, 8, 10)、多孔塊高度(Hp = 30, 40, 50 mm)、以及中心挖孔深度(Hh = 0, 30, 40, 50 mm)等，並任意選定基本情形為 ε = 0.79, Re = 17900, H/dj = 8, Hp = 50 mm, Hh = 50 mm，以作為參數影響之比較基準。多孔材料主要由不同網孔的不銹鋼網堆疊而成，文中也比較了發泡鋁材的熱傳情形。 實驗結果顯示，多孔材中心孔全挖穿後，流體容易到達底板，熱對流效果增加；孔隙率較高的情形有助於流體在多孔材內部進行熱交換；以上兩種情形以及減小噴嘴距底板之距離，皆可獲得較高的紐賽數。一般而言，雷諾數的提高，可使整體的紐賽數值提升，但在雷諾數23750時，所得到紐賽數卻低於雷諾數17900之情形，可能是在高雷諾數之下，流體進入多孔材內部還未充分完成熱交換時就被送出所導致。因此，對本文研究的情形，高雷諾數對紐賽數不一定會有提升的效果。

關鍵詞 : 衝擊噴射，多孔材，孔隙率，雷諾數，紐賽數

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