液晶技術在熱傳實驗系統之應用

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摘 要

本研究之主要目的是在建立一套應用液晶技術的熱傳實驗系統。首先描述了應用液晶技術比較基本可行的三種熱傳實驗方法的基本理論：（1）穩態方法，（2）對固體表面單步級加熱之暫態方法，與（3）對固體表面加熱/減熱（複步級加熱）之暫態方法。然後綜合探討了應用液晶技術來建立熱傳實驗系統應考慮的重要因素，如液晶種類之選擇，實驗參數之選擇，液晶之光學性質及其溫度校正，照明與觀察方法，影像處理系統，以及影像與熱傳數據之後處理程序等。 依液晶技術之考量建立了熱傳實驗系統後，本研究採用上述（1）穩態方法與（2）對固體表面單步級加熱之暫態方法，以具有前端未加熱長度的平板流問題進行實驗，並試圖應用在長圓柱之橫向流問題，將實驗結果與已知之解析解或實驗結果進行比較，以檢驗實驗系統之正確性。 平板流之實驗結果顯示，利用穩態方法以及對固體表面單步級加熱之暫態方法所得之局部熱傳係數結果與理論值吻合相當良好，充分確認了新建熱傳實驗系統軟硬體之正確性。繞越長圓柱之橫向流，利用新建之熱傳實驗系統進行實驗，所得之局部紐塞爾數結果與文獻上之數據比較，也非常相近似。

關鍵詞 : 液晶技術 ; 穩態方法 ; 暫態方法 ; 步級加熱

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