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[摘要]

本研究探討冷媒R134a與R-141b在光滑表面與兩種鰭片表面於平板上的薄膜蒸發熱傳性能。探討的主要參數範圍為 $(17.9\sim45.7\text{ kW/m}^2)$ ，R-134a液態冷媒滴淋溫度至測試室的溫度約在 $10.5\pm0.5^\circ\text{C}$ 之間，而R-141b的測試溫度約為 10°C 和 40°C ，對R-134a能有效的增強熱傳效果，傾斜角度在 $20^\circ\sim30^\circ$ 左右的平均蒸發熱傳係數最高，而R-141b傾斜角度則沒有。鰭片高度分別為0.3mm與0.5mm。R-134a實驗中，鰭片高度0.5mm的平均蒸發熱傳係數是光滑表面的2.5~4.8倍。R-141b的實驗中，鰭片高度0.3mm的平均蒸發熱傳係數是光滑表面的1.5~1.8倍。

本研究並以高速攝影機進行滴淋蒸發的流場觀測，拍攝時每秒400張，快門速度為 $1/400$ 秒，發現熱通量的增加，和熱通量的改變，而由純粹的蒸發熱傳變為蒸發熱傳與核沸騰兩種效應並行的狀態，影響熱傳效率。而實驗中還發現大的不同。

本論文將文獻中的經驗公式與實驗值比較，發現文獻中大部份的經驗公式皆未考慮到核沸騰的影響而低估熱傳係數。本研究以實驗值利用回歸分析提出經驗公式，除了部分數據因實驗時滴淋條件不佳以外，預測平板薄膜蒸發的其他

[英文摘要]

This thesis discusses the effect of surface geometries and inclination angle on the falling film evaporation performed on a smooth plate and two finned plates using refrigerant R-134a at $10.5\pm0.5^\circ\text{C}$ system temperature and the fin thickness = 0.3 mm for both finned surfaces. The fin height is 0.5 mm for Fin-A, and 0.3 mm for Fin-B. 10°C and 40°C , and the heat fluxes are varied between 17.9 and 45.7 kW/m². The local heat transfer coefficients and flow distribution is observed through a sight glass. The test results showed that the falling film evaporation heat transfer coefficient increases as the inclination angle increases. However, the finned surface yields better falling film evaporation heat transfer performance. For the R-134a, the Fin-A surface, having 0.5 mm fin height, yields 2~4 times enhancement of the heat transfer compared to the smooth surface. The Fin-B surface enhanced the heat transfer by 2.5~4.8 folds. For the R-141b, the Fin-B surface yields 1.5~1.8 times heat transfer enhancement. Bubble nucleation visualization observation showed that bubble nucleation is more pronounced on the finned surface than the plain surface. This is mainly attributed to the bubble nucleation effects on the finned surfaces.

[論文目次]

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