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**論文名稱:** 數值模擬分析脈衝管流通過具多孔質熱沉之矩形發熱元件的對流散熱

**英文論文名稱:** Numerical Study of Pulsating Channel Flow on Convective Heat Transfer From Por

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**[ 摘要 ]**

近代電子產品面臨微小化後散熱不易的嚴重問題，導致需要尋求一種更快速有效的散熱技術。本文目的嘗試結合多
之矩形電子元件之對流熱傳中，探討其散熱增強之效益。研究方法爲以數值模擬方式分析在強迫脈衝流作用下，孔
性。文中以暫態Brinkman－ Forchheimer－Extend Darcy模式，來模擬多孔質熱沉內部的流場狀態，而純流體區內
及邊界條件，以流線函數-渦度公式轉換上述複合系統熱流場之聯立方程組。接著數值方法則使用控制體積法及上風
式。藉由各項參數，包括達西數、脈衝頻率、脈衝振幅及熱傳導比之變換，來探討流場、溫度場之變化及其對熱傳
作用下，元件後方迴流大小與強度呈周期性變化，此對元件對流散熱的增強有直接影響。而此熱傳增強效果會隨著
而增加，但隨達西數Da增加而減小。此外改變熱沉幾何結構亦可達到熱傳增強之效果，但所引起之壓降因子其振幅
Wp*、Ss*、Rk等之增加，則無明顯變化。研究結果證明在某些條件下結合多孔質熱沉與脈衝流可做爲高速運算電

**[ 英文摘要 ]**

Modern microelectronics thermal management is facing considerable challenges in the wake of miniaturizing of d
dissipation. The main motivation of this study is to explore the effects of both the heat transfer enhancement fact
convective cooling of electronic device. This work details the numerical simulation of forced pulsating convective
attached heated block at bottom wall. The analysis is based on the use of unsteady Navier-Stokes equation in th
flow model in the porous region, and the energy equation on the thermal field. After a stream function-vorticity tra
for the porous/fluid/solid composite system is obtained using the control-volume method associated with hybrid n
variations in the Darcy number, pulsating frequency and amplitude, and conductivity ratio, to illustrate important f
the periodic alteration in the structure of recirculation flow behind heated block, caused by both porous cover and
cooling of the heated block. This enhanced effect increases with increasing pulsation frequent and amplitude, an
number. In addition, the oscillation amplitude of temporal pressure drop factor caused by the above-mentioned m
increases with Da, Hp*, Wp*, Ss* and Rk. In summary, it is shown that at specific choices of descriptive paramet
porous cover can be considered as an augment heat transfer tool for cooling high-speed electronic devices.

**[ 論文目次 ]**

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