

Thermal Flow through Brazed Woven Screens

J. Tian⁽¹⁾, T.J. Lu⁽¹⁾, H.P. Hodson⁽¹⁾, D.J. Sypeck⁽²⁾, H.N.G. Wadley⁽²⁾

(1) *Cambridge University Engineering Department, UK*

(2) *Materials Science Department, University of Virginia, USA*

The heat transfer performance of a novel type of periodic cellular structures, woven screens made by transient liquid phase bonding, is experimentally characterized under forced air convection. The experimental results for pressure loss and heat transfer are expressed on the basis of channel height, and are compared with other cellular materials. The effects of cellular morphology, porosity, material make (copper and stainless steel) are studied. Friction factor is found to mainly depend on porosity or open area ratio. Characteristics for heat transfer include solid thermal conductivity, porosity and surface area density. Analytical models are subsequently developed to predict the pressure loss (pressure drag model) and heat transfer performance (fin analogy model) for different textile geometries, with good agreement between prediction and measurement obtained. Compared with other heat exchanger media, the periodic copper structures have similar heat transfer performance as that of stochastic metal foams, but the overall performance of the former is superior due to lower pressure loss.

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