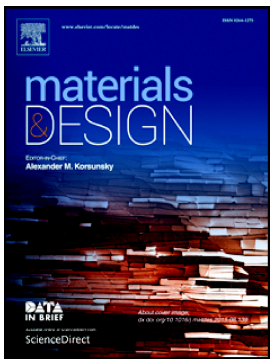

Challenging thermal management by incorporation of graphite into aluminium foams

L.P. Maiorano, J.M. Molina

PII: S0264-1275(18)30641-5
DOI: doi:10.1016/j.matdes.2018.08.026
Reference: JMADE 7324

To appear in: *Materials & Design*

Received date: 24 May 2018
Revised date: 31 July 2018
Accepted date: 12 August 2018

Please cite this article as: L.P. Maiorano, J.M. Molina , Challenging thermal management by incorporation of graphite into aluminium foams. Jmade (2018), doi:10.1016/j.matdes.2018.08.026

Challenging thermal management by incorporation of graphite into aluminium foams

L.P. Maiorano[a], J.M. Molina[a,b *]

[a] Instituto Universitario de Materiales de Alicante, University of Alicante, Ap. 99, E-03080 Alicante, Spain

[b] Departamento de Química Inorgánica de la Universidad de Alicante, University of Alicante, Ap 99, E-03080 Alicante, Spain

ABSTRACT

The recent progress made in active thermal management for electronics demands the development of new open-pore foam materials with excellent thermal performance that result from the combination of high thermal conductivity (≥70 W/mK) and the lowest possible fluid pressure drop. The foams considered to date in the literature do not meet these conditions. In this work, a new class of two-phase composite foam materials, which contain graphite flakes and aluminium, were fabricated by the gas pressure liquid metal infiltration method. These materials were fabricated in two main microstructures: i) aluminium foam with oriented graphite flakes in struts; ii) alternating layers of oriented graphite flakes and aluminium foam. The resulting materials exhibited thermal conductivities within the 60-290 W/mK range, and power dissipation capacities up to 325% higher than those for conventional aluminium foams, with pressure drops kept at convenient values for the most demanding active thermal management applications.

Keywords: metal foam, graphite flakes, infiltration, thermal conductivity, thermal management.

*corresponding author
e-mail: jmmj@ua.es; Tel: +34 965903400 (2055)