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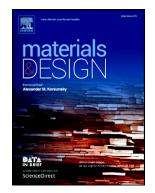
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ACCEPTED MANUSCRIPT

Challenging thermal management by incorporation of graphite into aluminium

foams

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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.

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