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Layer by layer graphite film reinforced aluminum composites with an enhanced performance of thermal conduction in the thermal management applications

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Abstract

Layer by layer aluminum matrix composites with an outstanding thermal conductivity reinforced with the graphite films were fabricated through pressure infiltration process. Three different types of graphite films were characterized and studied as the reinforcement candidates in preparation of aluminum composites. In order to obtain comprehensive excellent conductive composites, several kinds of aluminum alloy matrix were applied in the preparation process. Scanning electron microscopy, X-ray diffraction, Raman spectroscopy and optical microscopy were used to evaluate the graphite films and laminated composites. The interlayer shear strength and thermal physical properties of the graphite film reinforced aluminum composites were studied. The results revealed that graphite films and aluminum alloy were layered alternately distributed and no interfacial reaction products were observed. The graphite films reinforced pure Al composites showed a relatively low coefficient of thermal expansion and an enhanced heat conductive performance with a thermal conductivity of 743 W/(m·k).

Keywords: graphite films, aluminum, laminated structure, thermal conductivity, pressure infiltration

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