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Cu-SiCp composites as advanced electronic packaging materials

Abstract

The demand for advanced thermal management materials such as silicon carbide particles reinforced copper matrix (Cu-SiC_p) composites is increasing due to the stringent design requirement in the electronic packaging industries. High interest on Cu-SiC_p composites is highlighted by the high thermal conductivity and low coefficient of thermal expansion (CTE) properties. However, the thermal properties of the Cu-SiC_p composites are constrained by the bonding between the copper matrix and the silicon carbide particles (SiC_p) reinforcement. In the powder metallurgical (PM) methodology in particular, the bonding between the two constituents is weak, thus demoting the thermal properties of the Cu-SiC_p composites. In order to improve the interface bonding, the SiC_p were copper coated via electroless coating process. Based on the experimental results and findings, a continuous copper deposition on the SiC_p was obtained via the electroless plating process. The copper film was found to be high in purity and homogeneously deposited on the SiC_p surfaces. The CTE values of the Cu-Coated Cu-SiC_p composites were found significantly lower than those of the non-Coated Cu-SiC_p composites and were in agreement with Kernels model which accounts for both the shear and isostatic stresses developed in the component phases.

Keywords; Electroless Copper, Electronic Packaging Materials, Metal Matrix Composite (MMC)