Thermal Expansion Behavior of the Electroless Copper Coated Cu-SiC<sub>p</sub> Composites Fabricated via the Conventional Powder Metallurgical Technique

Abstract

The introduction of the metal matrix composites as the advanced electronic packaging materials is highly anticipated because their thermal properties can be engineered to match those of semiconductors, ceramics substrates and optical fibers. Among these advanced packaging materials, silicon carbide particles reinforced copper matrix (Cu-SiC<sub>p</sub>) composites are highly rated due to the high thermal conductivity of copper and low coefficient of thermal expansion (CTE) of silicon carbide. However, the Cu-SiC<sub>p</sub> composites fabricated via the conventional powder metallurgy (PM) technique usually have immature thermophysical properties due to the weak bonding between the copper matrix and the SiC<sub>p</sub> reinforcement. In order to improve the bonding between the two constituents, the SiC<sub>p</sub> were coated with copper via electroless coating process prior to PM fabrication processes. Based on the experimental results, The CTE and porosity of the Cu-SiC<sub>p</sub> composites were significantly affected by the volume fraction of SiC<sub>p</sub>. Furthermore, the CTE and porosity of the Cu-Coated Cu-SiC<sub>p</sub> composites were significantly lower than the non-Coated Cu-SiC<sub>p</sub> composites. These differences were mainly contributed by the nature of the bonding between the copper matrix and SiC<sub>p</sub> reinforcement.

Keywords; Copper Matrix Composites, Electroless Copper, Silicon Carbide Particles, Thermal Expansion