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Study of Electroless Sn-Coated Cu Microparticles and their Application as a High Temperature Thermal Interface Material

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Abstract: A series of Cu-Sn reactions were studied for the electroless plating of Sn onto Cu microparticles. The Cu microparticles were more temperature-sensitive than the planar Cu substrate when electrolessly plated with Sn. The coordination ligand (L) thiourea complexing agent played a key role in the interface reaction between the inner Cu core and the outer Sn shell and also significantly impacted the surface morphology of the outer coating layer. Cu@Sn core-shell structured particles with a thick coating layer were successfully fabricated, and a powder preform was developed by pressing these particles together. The outer Sn layer melted at 250°C; then, it depleted and completely transformed into Cu-Sn intermetallic compounds (IMCs) as the reflow process proceeded. The Cu particles uniformly embedded in the Cu-Sn IMC networks, forming interconnections with a considerably higher remelting temperature. The preform reflowed at a low temperature (250°C) for only 8 min but formed a thick bondline with a high remelting point up to 425°C. The newly fabricated thermal interface material exhibited high shear strength at high