Mechanical Properties of Ternary Sn-In-Ag BAll-Grid Array Assemblies at Ambient and Elevated Temperatures

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Abstract

The mechanical behavior of a ternary Sn-15In-2.8Ag ball-grid array assembly was evaluated at ambient and elevated temperatures. The maximum stress of the Sn-15In-2.8Ag ball-grid array assembly decreased as the temperatures increased and the strain rates decreased. An irregular brittle NiSnIn intermetallic layer formed at the SnInAg/Au/Ni/Cu interface resulting in decreased bond strength of the joints. The Arrhenius diagram of the Sn-15In-2.8Ag ball-grid array assembly at a constant stress of 16MPa consists of two straight lines intersecting at 50℃, which indicates that two kinds of creep mechanism controlled the Sn-15In-2.8Ag ball-grid array assembly deformation. The AuIn2 intermetallics and grain boundaries acted as the location for nucleation of the creep voids, which induced reduction of the solder’s cross-sectional area and led the Sn-15In-2.8Ag ball-grid array assembly to fail rapidly with a transgranular creep fracture.

Keyword：Sn-15In-2.8Ag solder, ball-grid array assembly, IR reflow process,