Effect of Hold Temperature on the Liquid Solder (SnBiZn)/Metallization (Cu) Interfacial Reaction

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Abstract

In the electronics packaging industry there is a continuing drive to reduce size, cost and more recently environmental impact. These improvements cannot be made at the expense of performance or reliability. The need to remove lead from conventional solder demands that new lead free solders and their interactions with associated metallization layers are rigorously investigated. Many potentially suitable lead free solder systems have been designed and their suitability tested for surface mount applications; one such system is Sn-Bi-Zn. However, only a limited amount of experimental data is available on the dynamics of the liquid solder – metallization interactions during reflow processing. Due to the relatively high reflow temperatures and the complex microstructures of these alloys the reaction during reflow significantly influences the performance of the joint during service. This poster presents the results of an investigation into the interfacial reaction between Sn-3.0Bi-8.0Zn solder and copper metallization.

This study requires a high degree of control over temperatures and hold times during preparation. In addition the sample sizes must of the order of those used in surface mount application but still suitable for analysis. At SIMTech a wide range of commercial specification packaging equipment is available. However, to maximize resources, minimize preparation time, to obtain optimal thermal control and carryout in-situ thermodynamic measurements samples where prepared in a differential scanning calorimeter.

A combined SEM, EDX, optical investigation was used to interrogate the widely different microstructures obtained at different hold temperatures, (240, 250, 260°C). The extent of intermetallic formation is quantified and compositional variations investigated.

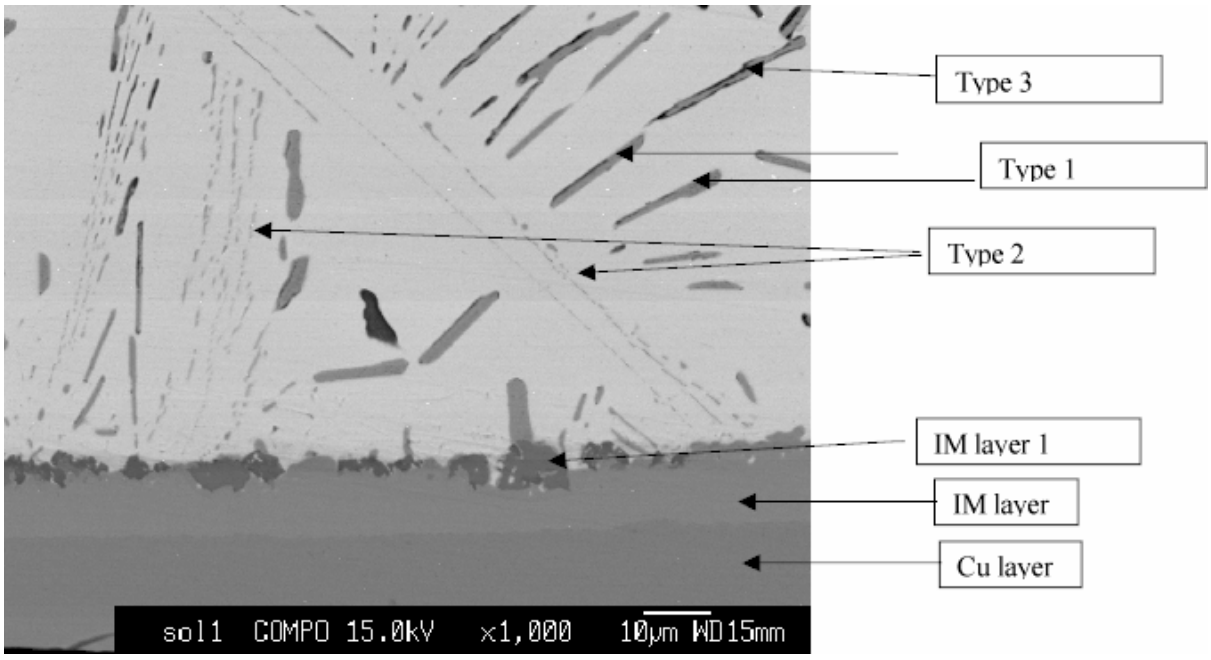

Figure 1: BSE image of polished cross-section after DSC in-situ preparation, 250°C