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The Effectiveness of Bismuth Addition to Retard the Intermetallic Compound Formation

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Abstract : The aim of this paper is to study the effectiveness of bismuth addition in the solder alloy to retard the intermetallic compound formation and growth. In this study, three categories of solders such as Sn-4Ag-xCu (x = 0.5, 0.7, 1.0) and Sn-4Ag-0.5Cu-xBi (x = 0.1, 0.2, 0.4) were used. Ni/Au surface finish substrates were dipped into the molten solder at a temperature of 180-190 ^oC and allowed to cool at room temperature. The intermetallic compound (IMCs) were subjected to the characterization in terms of composition and morphology. The IMC phases were identified by energy dispersive x-ray (EDX), whereas the optical microscope and scanning electron microscopy (SEM) were used to observe microstructure evolution of the solder joint. The results clearly showed that copper concentration dependency was high during the reflow stage. Besides, only Ni₃Sn₄ and Ni₃Sn₂ were detected for all copper concentrations. The addition of Bi was found to have no significant effect on the type of IMCs formed, but yet the grain became further refined.

Keywords : Bismuth addition, intermetallic compound, composition, morphology
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