Interfacial reaction of Bi–Ag and Bi–Sb solders on copper substrate with multiple reflow number

ABSTRACT

Owing to the toxicity of lead, much effort has been put in studies on lead-free solders after environmental legislations prohibited the use of lead in these parts worldwide. Here, Biï Ag and Biï Sb alternative solder alloys containing 1·5ï 5 wt-% Ag and Sb were investigated. The effect of the reflow number and weight percentage of Ag and Sb on the surface properties of solders and interfacial reactions between the solder bulk and the Cu substrate were analysed by optical microscopy and scanning electron microscopyï energy dispersive X-ray. The results show that by increasing the reflow number and wt-% of Ag and Sb in the solder bulk, the thickness of the mechanical grain boundary grooving is increased. However, the thickness of the Cu3Sb intermetallic compound layer at the interface of Biï 5Sb decreased by increasing the reflow number. Moreover, our findings show that the amount of Ag and Sb in solder alloys and the reflow number have different behaviours on the wettability properties. By increasing the reflow number, the wetting angle decreased in Biï Ag solder alloys, whereas it increased in Biï Sb solder alloys.

Keyword: Bi-Ag solder alloy; Bi-Sb solder alloy; Grain boundary grooving thickness; Intermetallic compound (IMC) layer thickness; Lead-free solder; Multiple reflow number; Wetting angle