Intermetalic Growth Rate in Transient Liquid Phase Sintering of Pb-Free Solder Interconnects

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Following the electron devices are widely used in daily life, Pb-free solder alloy, as the replacement of Pb solder joint material, needs extensive researches to observe the properties for using and simulation purpose. Solder are used as the joint to connect two work pieces in printed wiring board of electronics. Most lead-free solders comprise tin (Sn) as the majority component, and nominally pure b-Sn is the majority phase in the microstructure of these solders. The most important thing for solder joint that researchers care about is its life cycle. Due to the incomplete of the mechanical profile of Pb-free solder joint for now, this research worked on obtain data of life cycles. At the boundary of the Sn phase and Ag phase, the intermetallic would grow during the heating process, which affects the life cycle of the solder. This study incorporates mechanical testing and measurement of the intermetallic in scanning electron microscope (SEM) images in image J, to get enough data of life cycle to form a profile and the effects of the intermetallic. The measurement on images shows that the intermetalic layer grows in scallop-shape and the thickness increases with the temperature and sintering time. The growth rate can be modeled as a linear equation of the power of one half of the sintering time. This measurement will contribute to the ongoing research about the transit liquid phase sintering and the ball-grid array (BGA) reliability.