A Review: Effect of Copper Percentage Solder Alloy After Laser Soldering

ABSTRACT

Purpose - Owing to the evolution of lead-free solder in electronic devices, Sn-Cu solder alloys have drawn interest because of their outstanding versatility and cost-effectiveness. This study aims to reviewing the effect of copper percentage in Sn-based solder alloys (Sn-*x*Cu, *x* = 0wt% to 5wt%) on intermetallic compound (IMC) formation and growth after laser soldering.

Design/methodology/approach - The approach of this study reviews the interfacial reactions at the solder joint interface, solder joint morphology, and the theory on characterizing the formation and growth of IMC. In addition, the effects of alloying, and strengthening mechanism, including wettability, melting, and mechanical properties.

Findings - The current work presents a comprehensive overview on the composition of tin-copper (Sn-Cu) solders with a potential to enhance their microstructure, mechanical characteristics, and wettability by varying Cu percentage. This study finds, the excellent Cu content in the Sn-*x*Cu solder alloy is 0.6 - 0.7wt%, this composition provide high shear strength, vibration fracture life value and ideal IMC thickness value. This study also finds method of solder alloy preparation through powder metallurgy and laser soldering improve the solder joint reliability.

Originality - This paper summarises the useful findings of the Sn-Cu series comprehensively. This information will outlook for future trends in laser soldering on solder joint formation.

Keywords Powder metallurgy, solder alloy, laser soldering, intermetallic compound, solder joint strength.

Paper type Research paper

1. Introduction

The microelectronics industry primarily uses two technologies: chip technology and packaging technology (Tu, 2011). Solder joints have been implemented in the industry to attach electronic components to the substrates. One of the most significant market segments of the worldwide green electronics environment is lead-free solder alloys (Aamir et al., 2020). Conventional Sn-Pb solder alloys are primarily used in electronic manufacturing because of their functional benefits. Its melting temperature is close to that of the Sn–Pb eutectic alloy (Islam et al., 2005) has excellent wetting properties and corrosion resistance. However, the