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Effect of Ni and Co nanoparticle-doped flux on microstructure of SAC305 solder matrix

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ABSTRACT

Microstructure of the eutectic region and β-Sn grain of the solder matrix play an important role in the properties of the Sn-based solder joint. In the present study, Ni and Co nanoparticle (NP)-doped flux were added into the SAC305 solder matrix to observe their effect on the microstructure of the eutectic region and β-Sn grain during the reflow process. Results reveal that after the addition of Ni and Co NP-doped flux, the size of β-Sn grain and the size of IMC particles present in the eutectic region significantly reduced. The area of the eutectic region also increased. Reduction in size of β-Sn grain and IMC particles improves the mechanical and structural properties of the solder joint.

1 Introduction

Due to the miniaturization of electronic devices in the electronic packaging industry, the size of printed circuit board (PCB) is driven to smaller size. Solder materials that have low melting temperatures are used for the fabrication of chips on PCB [1]. Solder material containing lead, particularly Sn–Pb eutectic solders, has been widely occupied [2]. In the past decades, Lead-based solder materials are found to be highly toxic [3]. So, Lead-free solder materials are needed to replace lead-based solder materials [4]. Recent researchers have found many lead-free solder materials in which most of which are Sn-based solder alloys [5]. One of the suggested solder materials is Sn–Ag–Cu (SAC) solder alloy due to its better engineering performance [6, 7]. During soldering, the solder matrix forms in the SAC solder which

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