THERMAL CYCLIC TEST FOR Sn-4Ag-0.5Cu SOLDERS ON HIGH P Ni/Au AND Ni/Pd/Au SURFACE FINISHES

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ABSTRACT

In electronic packaging, the reliability of the interconnection changes with the surface finish and the type of solders being used. Thermal cycling is one method of reliability assessment. In thermal cycling experiments, the strain state is simplified by soldering together regular shaped pieces of materials with different coefficients of thermal expansion and exposing the joint to repeated fluctuations of temperature within a certain range. Thus, this study focus on the intermetallic evolution of Sn-4Ag-0.5Cu on Ni/Au and Ni/Pd/Au surface finishes with thermal cycling up to 1000 cycles with the range of temperature varying from 10 to 80 °C. Optical microscope and FESEM (Field emission scanning electron microscope) were used to analyze the samples. From the study, it was observed that the intermetallic changes from $(Cu, Ni)_6Sn_5$ to $(Ni, Cu)_3Sn_4$ after 1000 thermal cycles for Ni/Au. This changes promotes the formation of cracks at the solder joint because of the different mechanical properties between Ni-Sn based intermetallic and Cu-Sn intermetallics. However, for the Ni/Pd/Au surface finishes, no cracks formed after thermal cycling up to 1000 cycles. Showing that the reliability of the solder joint is higher for Ni/Pd/Au surface finishes in this experiment.

Keywords: Ni/Au; Ni/Pd/Au; lead free solders, thermal cyclic test; Sn-4Ag-0.5Cu.

INTRODUCTION

The move to lead free soldering have open up the possibility of other surface finishes options. It is necessary to make sure that the lead-free product is just as reliable as the one that has been using tin-lead solder for years, even in critical applications with very demanding environments. However, assessment of solder joint reliability of electronic packages has become difficult because of the large number of components and materials