The Investigation of an Improved Tin-Zinc Solder for Practical Use

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Abstract

Detailed observations have been conducted of the surface and substrate interfaces of a solder based on an addition of a few tens of ppm of Mn to Sn7Zn after exposure to heat and humidity and elevated temperature. Tensile tests were carried out on butt joints between rectangular cross-section Cu bars. Under the conditions of heat and humidity both galvanic corrosion at the interface and simple surface corrosion occurred but in this case it was the latter that had the greatest effect on joint strength. The trace addition of Mn was found to be effective in inhibiting both types of corrosion. Surface analysis techniques were used in an attempt to map the distribution of Mn in the solder fillets. Particular attention was given to the behavior during elevated temperature ageing of joint interfaces, especially any intermetallic compounds. The thin layer of intermetallic compound formed on Ni and Ag substrates during soldering grew to a relatively stable layer more than 10μm thick after heat treatment. A feature of the SnZn alloy confirmed in this study was the low tendency to dissolve Ag. A new solder paste flux medium developed during this study has made possible a Sn-Zn solder paste with a long shelf life in refrigerated storage.