

Electrical and corrosion characterisation of nano-composite eutectic Bi-Ag solder alloy reinforced with multi-wall carbon nanotube and multi-layer graphene

ABSTRACT

Bi-Ag solders were proposed in this research as alternative to high lead solder. In order to improve its property, reinforcement with multi wall carbon nanotubes (MWCNT) and multi-layer graphene (MLG) were proposed. The electrical and corrosion characterisation of the nano-composite eutectic Bi-Ag lead free solder were evaluated in this research. The nano-composite samples were made by using powder metallurgy technique. It is found that for both reinforced nano particles in the matrix, the electrical resistivity decreased, while the effect of MWCNT on the electrical resistivity of the solder matrix was more than MLG. The corrosion behavior of Bi-2.5Ag and its composite samples with MWCNT and MLG was studied by an electrochemical technique. The results from Tafel plot curves which were run in three different acidic electrolytes illustrated that the corrosion rate for all the composite samples increased. Furthermore, it was deduced that the corrosion rate and passivation were the functions of the electrical conductivity of the sample, the electrical conductivity of electrolyte and the number of H⁺ in the corrosive electrolyte.

Keyword: Lead free solder; Nano-composite solder; Electrical characterisation; Corrosion characterisation; Eutectic Bi-Ag; MWCNT; MLG