Effect of different copper fillers on the electrical resistivity of conductive adhesives

Abstract

The effects of different copper fillers with different morphology and particle size have been studied in terms of electrical resistivity and thermal stability on the electrically conductive adhesives. The copper fillers used in this study were prepared by wet chemical reduction, electrolytic and gas atomization method, respectively. The as cured ECAs filled with different type of Cu fillers showed significant difference in electrical resistivity. Cu filler with smaller particle size showed higher packing density and larger surface area, which would enhance formation of conductive channels and increased conductive network in the ECAs, leading to a lower electrical resistivity. In addition, thermal stability of the ECAs were investigated under high temperature exposure at 125 °C and high humidity aging at 85 °C/85% RH for 1,000 h. Results showed that ECAs with Cu fillers of relatively small particle size and rough particle surface have excellent thermal stability due to enhanced adhesion and contact area between Cu fillers and the polymer matrix. A very low resistivity at an order of magnitude of 10^{-4} Ω cm could be maintained for these ECAs after 1,000 h at 125 and 85 °C/85% RH.