Investigation on Indentation Creep Performance of Carbon Nanotubes Reinforced Tin-58Bismuth Composites

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ABSTRACT

Low concentration of carbon nanotubes were added into eutectic Sn-58Bi solder alloy with the intention to improve the creep performance of the alloy. The solder alloy was produced using powder metallurgy route. Prior to the synthesis of the solder alloy and the composites, the effect of powders loading modes and rotational speeds of the V-shape mixer on the mixing uniformity were studied. The microstructure of the solder alloy and the composites were also examined under the optical microscope to observe the effect of sintering. Further microstructure characterization was performed using the scanning electron microscope as well as the energy dispersive X-ray analysis. Differential scanning calorimetry analysis was also performed on the powders mixtures to study the reactions that occurred during the sintering process. Sargent-Ashby creep model was then used to characterize the creep stress exponent of the solder alloy and the carbon nanotubes reinforced composites. Results from the experiment showed that the addition of small amount of carbon nanotubes of up to 0.2wt% was sufficient to lead to an improvement in the creep performance of the eutectic Sn-58Bi solder material. However, the improvement was not evident in the 0.5wt% and 1.0wt% composite samples due to the agglomeration of carbon nanotubes.