

Thermophysical Properties of the Sn-Ag-Cu Based Pb-free Micro and Nano Sized Solder Balls

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Due to the inherent toxicity of lead (Pb), environmental regulations around the world have been targeted to eliminate the usage of Pb-bearing solder balls in electronic assemblies and packaging. This has forced the development of Pb-free solders, and the Sn-Ag-Cu ternary eutectic alloy is considered to be one of the promising alternatives. Except the thermal properties, much research about the properties of Sn-Ag-Cu alloy has been performed. Among the several Sn-Ag-Cu alloy series with the variation of the Ag and Cu contents, it was found in our previous study that Sn-3.0Ag-0.5Cu has the most proper thermophysical properties. Therefore in this study, in order to find the size and shape effects on the thermophysical properties, several kinds of Sn-3.0Ag-0.5Cu solder balls with different diameters of 5~15, 20~38, 25~45 130~150 μm , and 190 nm solder balls were prepared and disk type samples were formed by pressing with different pressures. The thermal diffusivity and the specific heat were measured from room temperature to 150°C and the thermal conductivity was calculated using the measured thermal diffusivity, specific heat, and density data. The result shows that the thermophysical properties are strongly dependent on the size and the shapes of the balls.

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