35－6 Influence of Shear Height on Shear Strength of Tin-Lead Solder Ball Bonding

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The crack generation energy U_1 and the crack progress energy U_2 of eutectic Sn-37 mass%Pb solder ball and Sn-36 mass%Pb-2 mass%Ag one were surveyed by the shear test. Both balls were bonded at various reflow cooling rates (10-200K/min). The shear test was carried out under the condtion of two kinds of the shear height, Z=0μm and Z=200μm. U_1 and U_2 were calculated by multiplying the shear strength by the shear distance. Though U_2 was independent on the cooling rate, the ball composition and the shear height, U_1 changed depending on these parameters. Only U_1 of Sn-36 mass%Pb-2 mass%Ag ball bonding cooled at 200K/min dropped sharply though U_1 of both ball bonding was almost the same and increased with the faster cooling rates in case of Z=0μm. U_1 of Sn-36 mass%Pb-2 mass%Ag ball bonding was higher than that of the eutectic ball at each cooling rate as a result of the shear test at Z=200μm. The needle shape Ag_3Sn intermetallic compound in Sn-36 mass%Pb-2 mass%Ag ball and near the interface contributed mainly to the lower U_1 at Z=0μm because Ni_3Sn_4 reaction layer formed at 200K/min was thin. The higher U_1 at Z=200μm was due to the fine lamellar structure (Sn phase/Pb phase) in Sn-36 mass%Pb-2 mass% Ag ball. The shear property of the same ball depended on the shear height in the present study.

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