Automation of Die Attach of Si onto Cu using BondFlow™

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Abstract

BondFlow™ is a new die attach material that can be spin coated onto the backside of a wafer and B-staged. The adhesive is thermoplastic polyimide (TPI) which is thermally stable in air to 300˚C for several hours. The TPI is made electrically and thermally conductive by adding silver particles. After B-staging, BondFlow has a long shelf life and is not tacky. Previous research has demonstrated that BondFlow can be spin coated onto the backside of an aluminum-metallized silicon wafer, B-staged, placed on dicing tape, diced, and then bonded to an aluminum substrate using a high throughput MRSI M3 die attach system. A void-free bondline was formed despite the severe CTE mismatch between Si and Al.

A goal of the present study was to investigate the automated bonding of silicon (2.6 ppm/˚C) dice onto copper (17 ppm/˚C) substrates plated with electroless Ni + electroless Pd + immersion Au (ENEPIG.) An MRSI production die attach system was used for this investigation. The MRSI system was capable of preheating the substrate and controlling the downward pressure of the collet onto the preform and Si chip. The quality of the bond was measured by C-SAM imaging and by die shear, both as-cured and after temperature cycling. The suitability of BondFlow for high volume die attach onto ENEPIG-plated copper was quantified. The relative advantages of BondFlow relative to other die attach materials (including solder, epoxy and sintered nanosilver) will be discussed.