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# Fabrication and Characterization of a Low-Temperature Hermetic MEMS Package Bonded by a Closed-Loop AuSn Solder Line

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In this paper, we present a hermetic MEMS package bonded by a closed-loop 80Au20Sn solder line. We designed three different test specimens including a substrate-heated specimen without an interconnection line (SHX), a substrate-heated specimen with an interconnection line (SHI), and a locally heated specimen with an interconnection line (LHI). A pressurized helium leak test was carried out to evaluate the hermetic seal along a critical pressure test to measure bonding strength. In the bonding process, the substrate heating methods (SHX, SHI) require 400°C and 40 min, while the local heating method (LHI) requires a heater power of 6.76 W for 4 min. In the hermeticity test, SHX, SHI, and LHI show leak rates of $8.4\pm6.7\times10^{-10}$ mbar-l/s, $13.5\pm9.8\times10^{-10}$ mbar-l/s, and $18.8\pm9.9\times10^{-10}$ mbar-l/s, respectively, for the same internal volume of $6.89\pm0.2\times10^{-6}$ l. In the critical pressure test, no fracture was found in the bonded specimens at an applied pressure of 1±0.1 MPa. From these results, we determine an approximate bonding strength of the test specimen as 3.53±0.07 MPa. We have experimentally verified that LHI shows the potential of hermetic MEMS packaging with an interconnection line and a bonding process for mass production that requires little time.

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