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Tokyo Ohka Kogyo Co., Ltd.

**Development of High Temperature Tolerant Temporary Adhesive
for Use in the TSV Process for 3D LSIs**

Tokyo Ohka Kogyo Co., Ltd. (Headquarters: Nakahara-ku, Kawasaki-shi, Kanagawa-ken, Japan; President: Yoichi Nakamura; Hereinafter TOK) has developed a high temperature tolerant temporary adhesive for use in the Zero Newton[®] wafer handling system. The new adhesive enhances the Through Silicon Via (TSV) formation process by offering a higher temperature tolerance which is advantageous to plasma-enhanced CVD (PECVD) processing.

Wafer handling system technology is indispensable to TSV formation, a process that is regarded as one of the key technologies to drive the next generation of semiconductor packaging. The Zero Newton[®] developed by TOK offers revolutionary results. It improves wafer performance by utilizing perforated glass carriers with solvent dissolvable adhesives, and solves such issues as wafer breakage and wafer chipping resulting from thinned carriers which have reduced strength, thereby enabling TSV formation. Furthermore, by injecting solvent into the many holes of the carriers to dissolve the adhesive after the TSVs are formed, it is possible to gently debond the wafer from the temporary carrier without stress and without adhesive residue.

TOK has enhanced the thermal performance of the adhesives used with their temporary wafer handling systems. This improvement has led to compatibility with increased processing temperatures of about 280°C for plasma-deposited insulating films formed by PECVD. Under high temperature conditions like this, various issues may arise, including: out-gassing from the temporary adhesive which poses a risk to the quality of the wafer-to-carrier bond, decomposition of the temporary adhesive due to high temperatures, and chip warpage caused by the thermal flow of the temporary adhesive. To address these issues, TOK has formulated new adhesives, while IBM has evaluated these materials for compatibility with IBM's 3D TSV wafer processes. As a result, TOK has developed a product for high quality film that is both thermoplastic but experiences little thermal decomposition even in 280°C high temperature conditions.

The development of materials tolerant to high temperatures is becoming increasingly important in further enhancing the performance of the TSV formation process. TOK is committed to enhancing semiconductor package technology and, by making full use of the material and equipment techniques it has developed to date, will continue to provide equipment, temporary adhesives, and carriers for use in its Zero Newton[®] wafer handling system, as well as to promote photoresist development, which is indispensable to the TSV formation process.

Please contact TOK (81-44-435-3001) for more details. A technical presentation and publication showing a subset of these results will be reported by Tamura et al. at ECTC, June 4, 2010 in Las Vegas, Nevada.

Process flow of Zero Newton® wafer handling system

