

Press Release

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To whom it may concern



ADEKA CORPORATION
Legal Affairs and Publicity Department,
Publicity and Administration Group
7-3-35 Higashi-ogu,
Arakawa-ku, Tokyo
Contact: +81-3-4455-2803
<http://www.adeka.co.jp>

Development of New Additive for Copper Plating

-- Single-component additive for TSV filling --

ADEKA CORPORATION (President: Akio Kohri) has developed a new additive for TSV (Through Silicone Via) copper plating.

TSV electrodes can provide vertical electrical connections that pass internally through semiconductor chips (Figure 1).

Semiconductor devices are reaching their physical limit with respect to improving performance by miniaturizing line widths. Semiconductor manufacturers are now attempting to achieve smaller size and higher performance of devices by stacking multiple chips into the 3D structure. TSV technology is indispensable in the creation of these 3D structures, since it plays the important role of connecting the stacked chips with benefits of the shortest connection length and the high-density connection. Development of TSV-based 3D structures involves some key technologies such as the via (small hole of diameter a few μm to a few tens of μm) formation, via filling with conductors, and so on. Via filling technique based on copper electroplating is receiving considerable attention as one of the most important technology for the electrode formation.

In the copper filling process, TSV via must be perfectly filled without any tiny voids or seams for a reliable electrical connection. Copper sulfate plating solution, which is in general use for copper plating, contains a suitable balance of several types of additives (such as accelerator, suppressor, and leveler) to meet the good filling. However, our newly developed additive is of a single type and gives high performance with copper filling. The features of this new additive are as follows:

(1) Single component enhances manageability:

Strict constant control of plating solutions is required at manufacturing sites that use plating methods. This new single-component type additive makes it much easier to control solutions than when blending more than one additive, thereby contributing to a significant cost reduction.

(2) Complete bottom -up filling:

Bottom-up filling (copper deposition progress from the bottom of the via) avoids the occurrence of defects in the filled copper. (Figure 2)

(3) Highly versatile:

The new additive is effective with TSVs of various sizes. We confirmed perfect filling for a wide range of via sizes, i.e. diameters of 5 to 20 μm and aspect ratios of 1 to 10. Our additive is also effective with via holes of different sizes on the same wafer. (Figure 3)

The market for TSV copper plating materials is anticipated to be approximately ¥10 billion from 2017 onwards, around ¥5 billion of which will be for additives.

We aim to acquire a market share of 50% by establishing this new additive system.

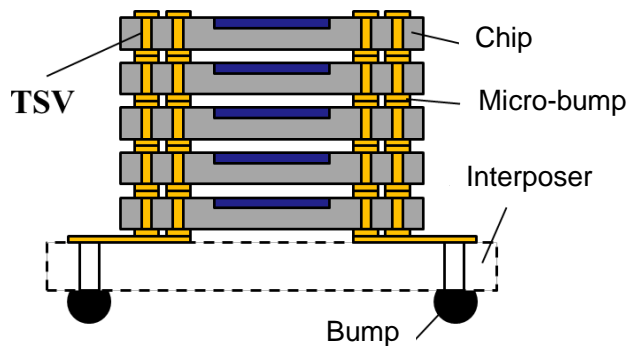


Figure 1 The Model of stacked chips with TSV connections

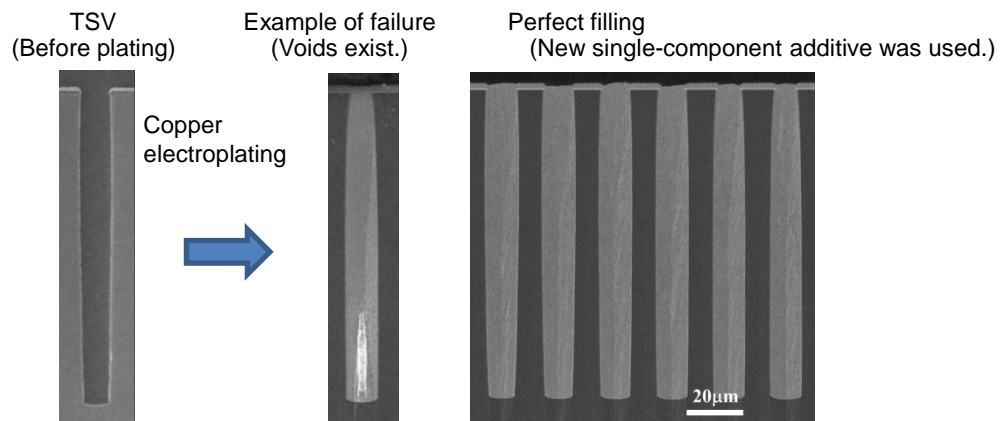


Figure 2 Cross-sectional SEM images of plated TSV 1 (Via filling with the new additive)

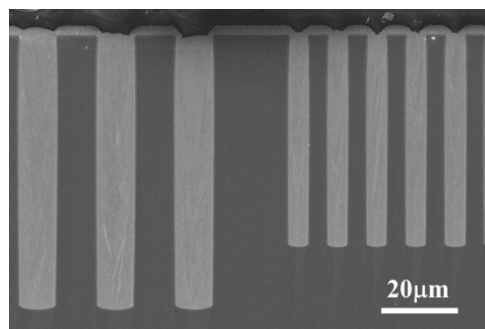


Figure 3 Cross-sectional SEM image of plated TSV 2 (Simultaneous filling of different sizes with the new additive)