

Concept & Situation of Open Laboratory

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1 Abstract

With the performance of electronic devices soaring in recent years, the miniaturization, high density and structural complexity of semiconductor packages (hereinafter, the package) are all progressing, while the product cycle has been shortened. Accordingly, it has become even more important to develop novel materials and provide them to customers on time. To propose integrated solutions to our customers, we established the Open Laboratory in our Packaging Solution Center to implement total assembly-process solutions, including the development of advanced packaging technologies and proposal of materials.

2 Concept of the Open Laboratory

Ahead of the rest of the world, we set up the Jisso Center to evaluate and analyze semiconductor packaging material internally and have promoted the development of various packaging materials since 1994 (Figure 1). Consequently, we expanded our product lineup, including semiconductor materials, from pre- to postprocessing.

In parallel with ongoing exponential functional improvements in electronic devices, as reflected by smartphones and tablet PCs in recent years, the miniaturization and densification of semiconductor packages has rapidly progressed. In response, the semiconductor packaging structure has become more complex, including not only high-density surface packaging but also a 3D structure with TSV (TSV: Through Silicon Via) and the packaging process had also been varied (Figure 2). While the product cycle has been shortened, it has become even more important; not only to propose novel packaging materials and provide them to customers on time but also promptly propose integrated solutions to customers, including advanced packaging technologies and from their perspective.

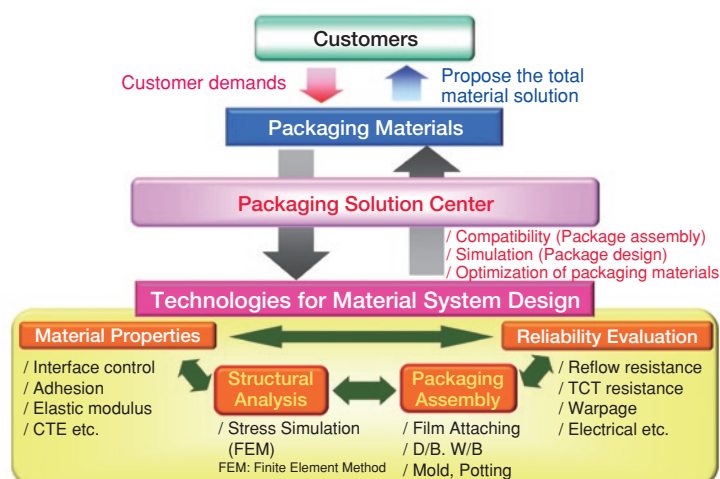


Figure 1 Activities of Packaging Solution Center

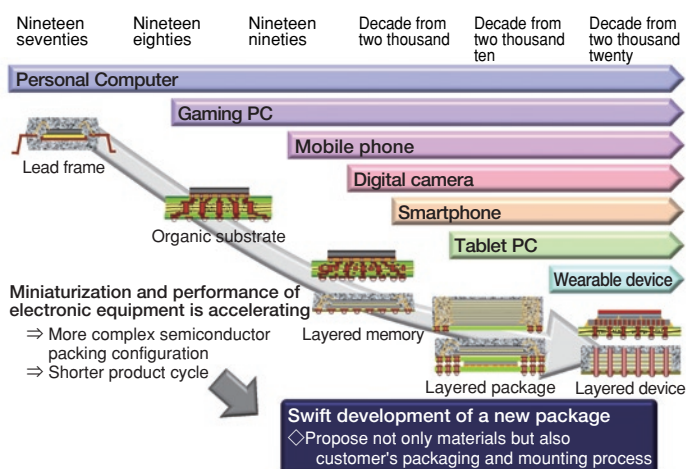


Figure 2 Trends in electronic equipment & semiconductor package

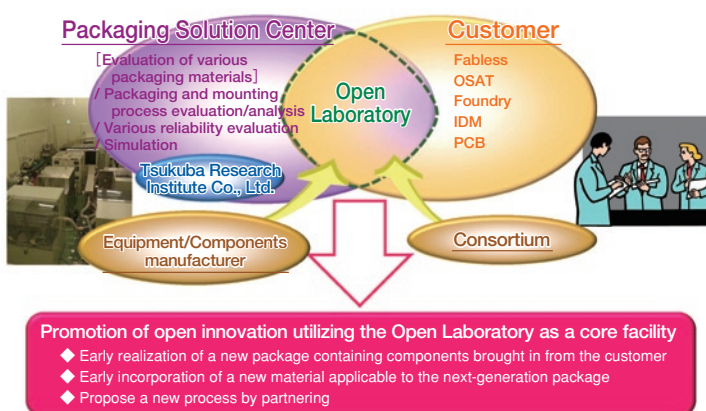


Figure 3 Open Laboratory Concept

Subsequently we established the Open Laboratory in our Packaging Solution Center (former Jisso Center), which saw us introduce state-of-the-art packaging and testing equipment therein based on various semiconductor packaging materials, evaluation and analytical technologies to respond timely to various customer needs (Figure 3). In the Open Laboratory, most advanced semiconductor packages from customers can be packaged and evaluated utilizing our own various packaging material product lines. Also utilizing our Open Laboratory as a core facility, we will promote the development of novel materials and processes by committing to active cooperation with equipment manufacturers, process developers and component manufacturers. Furthermore, we will continue to propose optimized material combinations and processes utilizing our accumulated extensive material database and performing various simulations in response to the next-generation package structure as a design basis.

3 Key Features and Activity Situation of the Open Laboratory

The key features of the Open Laboratory can be summarized as follows (Figure 4):

- 1) Various packaging approaches can be attempted, from ultra-thin chip stack at 40 μm thick or less and fine-pitch flip-chip package 50 μm thick or less; utilizing various state-of-the-art component packaging equipment designed for ϕ 300 mm wafers.
- 2) Different simulations can be carried out utilizing an extensive material database.
- 3) Micro-defects can be analyzed using high-precision analytical equipment.

Moreover, packaging evaluation can also be performed using various materials for components, such as semiconductor devices supplied from customers, and integrated technical supports from the usual trial and error approach for materials proposed by customers to establish process conditions for customers' packages. This allows us to expedite the required time for evaluation by customers and boost the early materialization of semiconductor packages by customers. Conversely, as for 3D packages with TSV, we joined the IMEC 3D Program and are promoting the evaluation of various packaging materials.

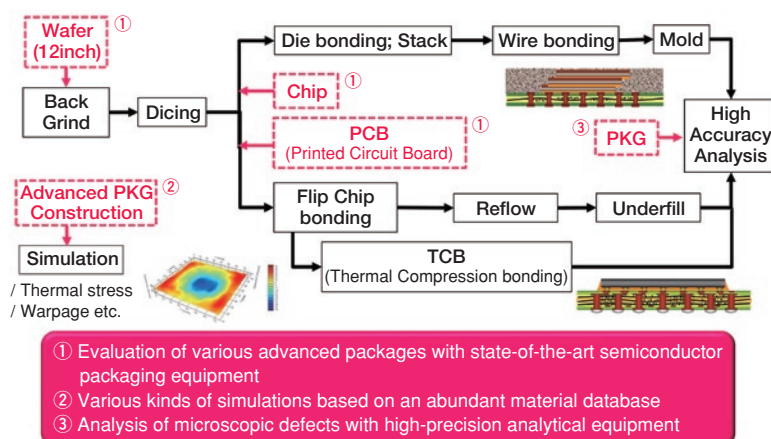


Figure 4 Open Laboratory Activities

4 Future Business Development

- 1) Early development of a packaging process to handle next generation packages and accelerating material development.
- 2) Proposal of novel materials and processes to create new value by promoting open innovations with equipment manufacturers, process developers and component manufacturers; utilizing our Open Laboratory as a core facility.