## １．概要（Summary）：

Three-dimensional stacking technology has been developed for high-integration, high-speed and high performance electric devices. In 3-D interconnects for system integration, bumping technology plays an important role. In this study, micro cone-shaped Au bumps fabricated by nanoparticle deposition method (Fig. 1) is studied. In particular, the formation of the bumps is investigated using FIB milling and SEM-SIM inspections.
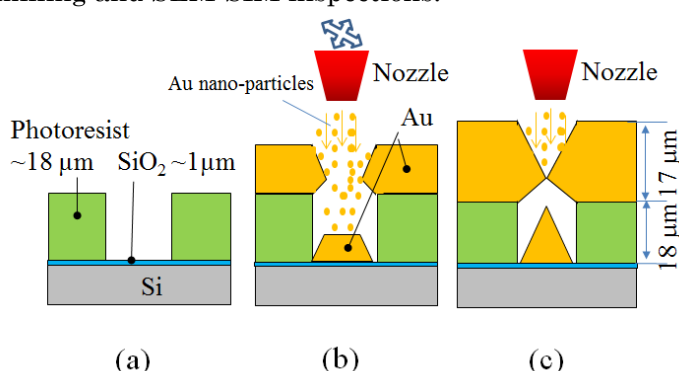


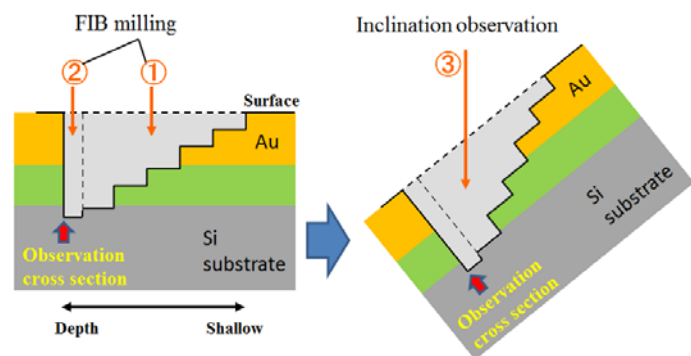Fig. 1 Nanoparticle deposition formation of cone shaped bumps for 3D integration system.



Fig. 2 FIB milling and observation procedure: (1) rough machining, (2) high planarity shape machining, and (3) cross-section inclination observation.

## ２．実験（Experimental）：

Cone-shaped micro bumps were formed on Si substrate with the process shown in Fig. 1. The sample after that was FIB milled and inspected by a FIB-SEM double beam system (XVision200DB, Hitachi, Ltd.,) to confirm the formation of bumps. The experimental procedure is illustrated in Fig. 2.

## ３．結果と考察（Results and Discussion）：

The observation results are shown in Fig. 3. Since SEM is also equipped, real-time imaging at high resolution of a specimen is permitted during the FIB milling process. As a result, high-precision processing was implemented and the formation of bumps was confirmed.
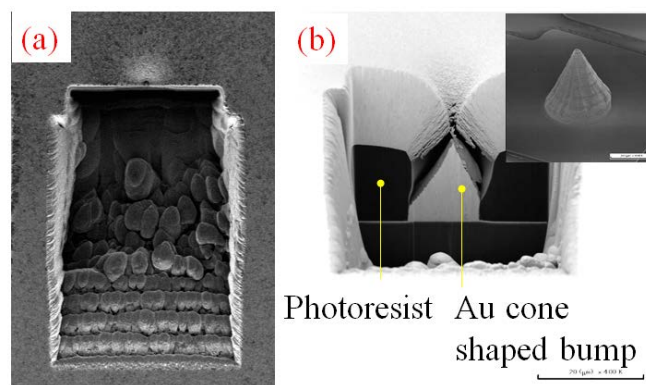


Fig. 3 Cone-shaped bump formation confirmation by FIB milling. (a), (b) are the top- and bird's eye-view of bump position after FIB milling process, respectively. Inset is the image of cone shaped bump after lift-off.

## ４．その他・特記事項（Others）：
なし

## ５．論文・学会発表（Publication/Presentation）：
なし

## ６．関連特許（Patent）：
なし