

## Reduction of Bubble-induced Defect in Semiconductor Lithography Process

Kyoung-Whan Oh<sup>1</sup>, Takashi Sasa<sup>1</sup>, Seok Heo<sup>1</sup>, Daejung Kim<sup>1</sup>, Ouiserg Kim<sup>1</sup> and Jung-Hyeon Kim<sup>2</sup>

<sup>1</sup> Samsung Electronics, 1-1 Samsungjeonja-ro, Gyeonggi-do 18448, Republic of Korea

<sup>2</sup> Kumoh University, 61 Daehak-ro, Gumi-si, Gyeongsangbuk-do 39177, Republic of Korea  
kw208.oh@samsung.com

**Abstract.** : In this study, methods for suppressing the occurrence of air bubbles in the photoresist (PR) dispensing apparatus of photo lithography system in semiconductor manufacturing process were analyzed. The proposed ways are intended to reduce product defects by targeting the specific areas where air bubbles are generated in the manufacturing equipment. The semiconductor industry faces the major challenge of reducing product defects by suppressing nano-particle contamination and bubble generation in PR. The width of the circuit pattern has narrowed as exposure technology in scanner equipment has improved especially using extreme ultraviolet (EUV) light sources. As a result, managing the smaller size of particles and bubbles has become increasingly difficult. Currently, semiconductor manufacturing equipment can manage wet particles and bubbles as small as 19 nm, and the industry continues to push for even smaller sizes. This paper aims to analyze the root cause of bubble generation in the dispensing system that delivers PR from the bottle to the nozzle for coating the wafer. By employing TRIZ inventive principles, the analysis leads to a detailed and efficient improvement plan that can be applied to existing mass production facilities to achieve zero instances of air bubbles. Furthermore, the proposed device designed to eliminate the root cause of air bubbles is incorporated into the newly developed facility, effectively reducing air bubbles and particles and ensuring high cleanliness.

**Keywords:** TRIZ, Lithography, Photoresist, Bubble, Defect