



1980s

g-line resist

~ Discrete Semiconductor/Others ~

Positive photoresist was developed by Hoechst in 1963 (AZ1350). It was a combination of novolac resin and photosensitive polyphenol. Although this photoresist had superior resolution compared to rubber-based negative photoresists, its high hardness and brittleness had the disadvantage of scratching the photomask in contact exposure systems. Furthermore, because of its weak adhesion to wafers, large side-etching occurred in wet etching. The developer solvent contained sodium hydroxide, which was a source of impurity contamination for the semiconductor. Therefore, it was not often used in the wafer process and was limited to use for chrome mask fabrication.

In the late 1970s, positive resist became available for use in the wafer process due to the replacement of contact exposure systems with proximity and/or unit-magnification projection exposure systems, IBM's development of an organic tetramethylammonium hydroxide (TMAH) instead of sodium hydroxide for photoresist developer and the development of dry etching to replace wet etching.

VLSI Technology Research Association, established in 1976, aimed at developing lithography technology by using positive photoresists. However, the positive photoresists of the time had problems to generate processing defects caused by lacked adhesion to the substrate material and photoresist peeling during development in the 1.3 μm level process using g-line exposure. TOKYO OHKA KOGYO solved these problems at the same time of Hoechst's patent expiration and commercialized positive photoresist for projection exposure (OFPR-800) in 1979. At the same time, TOKYO OHKA KOGYO commercialized a TMAH-based developing solution (NMD-3) after receiving technical disclosure from IBM.

This resist had higher sensitivity to g-line of reduction-projection lithography which was developed simultaneously. The resist was based on novolac resin, with high molecular weight and high softening point, had high resistance to the dry etching that began to be applied to wafer processing. The resist was widely utilized in the 1.3 μm level process in the 1980s.