

Process optimization for improving TFT bad pattern

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Abstract

At present, getting shorter channel length and line CD is more and more important due to the product with high PPI (Pixel Per Inch), especially for high generation process. However, TFT bad pattern is often be found at the set-up process because of the interact instability of equipment and process condition. In this paper, we compared the experimental results of CD bias through tuning photo condition and wet etchant in order to improve TFT bad pattern, finally we can achieve expected CD bias through the improving of HNO₃ concentration, and we also know the adhesion of PR material and metal can't be improved by photo condition tuning for the interface etch of high HNO₃ concentration.

Summary

In the set-up process of high generation factory, we find TFT bad pattern in ADS Array process because of high etch CD bias, such as lager channel length and small metal line CD, which means high defect ratio of line open and bad TFT characteristic for low Ion. Generally we wanted CD bias of under 1.5um at one of the over etch (OE) ratio from 40% to100%, but we get large CD bias and bad metal profile at the initial etchant of 4.5% HNO₃ and 40%OE. In order to improve etch CD bias, photo condition and new PR are used for improving the adhesion of PR and metal, and besides the etchant of different HNO₃ concentration is evaluated. The experiment is processing on the glass with gate metal deposition (Mo/Al/Mo), and gate mask is processing under different condition, such as PR material and soft bake temp, dev. time and post bake use. CD before etch and after etch process is measured with optical equipment for computing CD bias. The result is shown in Fig.1.

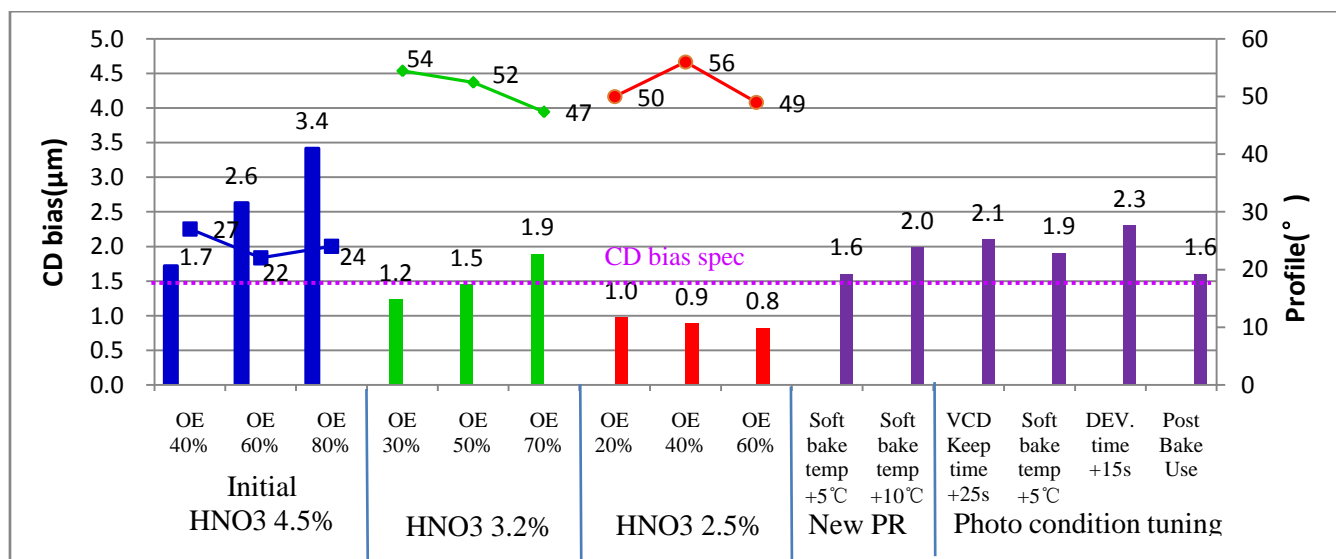


Fig.1. CD bias and metal profile under different etch and photo condition

In this experiment comparing to the CD bias of initial etchant(HNO₃ 4.5%, 40%OE) photo condition tuning has no effect to decrease CD bias, including new PR material, softbake temp, VCD keep time, post bake and dev. time, which means no improving on the adhesion between PR and metal under the initial etchant, maybe the high HNO₃ concenteration will bring the interface etch. After we decrease HNO₃ concenteration to 3.2% and 2.5%, CD bias will decrease to the spec but metal profile will become bad at 2.5% HNO₃ because of the overetch of top Mo. From this experiment we set up a suitable etchant (HNO₃ 3.2%) for good TFT pattern in high generation.