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**Study of Nano-Contact Etching Characteristics Using C6F6 Gas.**

JONG-WOO SUN, SUNG-CHAN PARK, CHUL HO SHIN, CHANG JIN KANG, HAN KU CHO, JOO TAE MOON, Process Development Team, Semiconductor R&D Center, Samsung Electronics — As device feature size shrinks to sub-0.1 $\mu$ m, oxide contact etching has become difficult to satisfy the process requirements. Especially, the aspect ratio of device has become higher and the mask thickness thinner. In this paper, we chose C6F6 as one of the promising candidates of next generation HARC etching gas, and have studied plasma and etching characteristics. Compared to other common etching gas (such as C4F6, C4F8), C6F6 could make more polymer and it could resolve the selectivity and profile problem. To identify the difference between C6F6 and other gases, plasma and etching characteristics were compared by QMS, OES, XPS, and etching tests. C6F6 showed 1.7 times higher polymer deposition rate than C4F8, and lower C/F ratio in polymer than other gases. This C/F ratio in polymer affected selectivity and profile during etching. C6F6 cracked into relatively larger molecules than other gases and this fragment patterns also affect polymer condition and etching characteristics. From the experiments, we used C6F6 to etch sub-0.1 $\mu$ m HARC etching and compared other gases.

Jong-Woo Sun  
Process Development Team, Semiconductor R&D Center,  
Samsung Electronics

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