

Abstract Submitted  
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**High-aspect-ratio organic-pattern formation with self-limiting manner by controlling plasma process based on substrate temperature measurement.** MAKOTO SEKINE, YUSUKE FUKUNAGA, TAKAYOSHI TSUTSUMI, KENJI ISHIKAWA, HIROKI KONDO, MASARU HORI, Nagoya University — For further development in electric devices, it is necessary to reduce the pattern deformations, such as bowing, striation and line edge roughness. To solve them, the understanding of etch reactions on the sidewall of organic material patterns is required. We reported that the etch performance of organic materials greatly depends on the temperature. In this study, we report organic pattern etching and trimming by H<sub>2</sub>/N<sub>2</sub> plasma using a precise wafer-temperature control system. A CCP reactor with H<sub>2</sub>/N<sub>2</sub> (75/25 sccm) gas flow was kept at 2.0 Pa. A 100-MHz power for plasma generation and 2-MHz power for wafer biasing were supplied to the upper and the lower electrode, respectively. The bias power was off during the trimming. Wafer temperature was measured every 50 ms by auto correlation type frequency domain low coherence interferometer. Our system controlled the intervals of ON-OFF of the power supplies to maintain the wafer temperature with a range of 3C from 100C during the process. The organic films were etched off in the first 40 s etching by ion-induced reactions. After the 10 s of over-etching, the trimming process was applied for 300 s. We found that the etching of sidewalls stopped and about 10-nm width patterns were formed with a self-limited manner. This self-limitation possibly confirms that the formation of protective layer against etch species i.e. H atoms. We also investigate this phenomenon by in-situ XPS of blanket films exposed to N and H atoms.

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