

Dry etch profile of contact hole in inductively coupled plasma

Nomin Lim¹, Changmok Kim¹, Ki Han², Yeon-Ho Im³, Hyun woo Lee⁴ and Kwang-Ho Kwon¹

¹Korea University, Republic of Korea

²Nanophotonics Research Center-Korea Institute Science & Technology, Republic of Korea

³Chunbuk National University, Republic of Korea

⁴Hanseo University, Republic of Korea

Plasma is widely used in semiconductor device processes. Among them, the plasma etching process is a patterning method for removing a substrate material by using ions, reactive gases or radicals generated by plasma, and it is an indispensable process to provide the precision of process, miniaturization, and low damage. There is an increasing need to form fine contact holes for solving the problems caused by distortion and tilting of the etched profile. On the other hand, the tilted etched profile had got a big attention by etching process engineers. However, this phenomenon was not evaluated in detail. Any detailed researching results on the tilted etched profile have not been suggested, yet. Accordingly, in this work, the phenomenon of the tilted etched profile was studied in detail. In this work, the photoresist (PR) was used as a mask and plasma-enhanced

chemical vapor deposited silicon oxide (SiO₂) of 2 μm thickness was used as a dielectric material. In order to analyze the tilting phenomenon, a dielectric (plastic) block and a metal (aluminum) block were used and the sample was put on the material blocks. For this work, the material blocks were fabricated with various height (T = 0, 0.25, 0.5, 1 cm). After the contact hole sample was placed on the prepared blocks, contact hole etching was performed. We performed the inductively coupled C₄F₈/CH₂F₂/O₂/Ar plasma to etch SiO₂ films. The total gas ratio was 120 sccm. The source power, bias power, and process pressure were 50W, 400W, and 10mTorr, respectively. Scanning electron microscope (SEM) was used to identify the contact hole angle and etching profile after contact hole etching. The higher the block height, the larger the degree of contact hole tilting. Finally, we discuss How the behaviour of plasma ions and electric field at the edge affected the contact hole etching characteristics.

Biography

Nomin Lim is from Korea University belongs to the department of control and instrumentation engineering. His research is on the semiconductor process using plasma under the guidance of professor Kwang Kwang-Ho. He is conducting research to systematically identify the mechanism of etching through analysis. His content of the study was published in Japanese Journal of Applied Physics, Journal of nano science and nanotechnology, and thin solid films etc.

nomin_lim@korea.ac.kr

 Notes: