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[25a-E104-1~10]8.2 Plasma deposition of thin film, plasma etching and surface treatment

Masanaga Fukasawa(Sony Semiconductor Solutions), Masanobu Honda(Tokyo Electron Miyagi)

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[25a-E104-10][The 43rd JSAP Paper Award Speech] Formation mechanism of sidewall striation in high-aspect-ratio hole etching

○Mitsuhiro Omura¹, Junichi Hashimoto¹, Takahiro Adachi¹, Yusuke Kondo¹, Masao Ishikawa¹, Junko Abe¹, Itsuko Sakai¹, Hisataka Hayashi¹, Makoto Sekine², Masaru Hori² (1.Kioxia, 2.Nagoya Univ.)

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3D flash memory encompasses numerous pillars which are fabricated by dry etching of stacked films, so the key technology is a high-aspect-ratio (HAR) hole etching process. In this study, sidewall striation formation in a HAR hole was investigated. In spite of the smooth morphology of the mask, sidewall striation was observed on dielectric films. From the results of the carbon mask sample treated with several gas plasmas and an ion beam experiment irradiated at a grazing angle on blanket films to simulated hole sidewalls, the possible sidewall striation formation mechanism is as follows. At a certain depth, striation forms on the fluorocarbon film deposited on the sidewall and is transferred to the dielectric films laterally as the hole diameter increases. As etching progresses, the mask thickness decreases and striation forms in a deeper region, depending on the aspect ratio.