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Study on the characteristics of etching organic hard mask for patterning high aspect ratio contact holes HYUN-SIL HONG, SUNG-IL CHO, MI-NA CHOI, CHANG-JIN KANG, HAN-KU CHO, JOO-TAE MOON, Samsung Electronics — A hard mask etch scheme for high aspect ratio contact holes has been developed to improve the low selectivity. The removable organic materials were investigated as possible candidates of mask. However, the organic materials showed the profile problem of crock shape due to isotropic etch effect in O2 chemistry. In this paper, we introduce HBr or Cl2 to improve the profile. Infra red spectroscopy (IR) and X-ray photoelectron spectroscopy (XPS) analyses were used to understand the etching mechanism. HBr and Cl2 control the mask CD (critical dimension) and the profile. Cl2 is more effective for profile changes than HBr. After etching the mask using Cl2 or HBr, the IR analyses showed the formation of C-Cl or C-Br bonds, while C=C, C≡C, and aromatic groups are disappearing. It was shown the Cl and Br component are appearing through the XPS analyses. Based on results, halogen gases react at the surface of organic materials and this layer prevents from reacting with O2. Passivation effect is prominent in the sidewall because the ion sputtering is low. Therefore, this halogenized layer prevents from isotropic etching and results in the tapered profile.

- [X] Prefer Oral Session
- [ ] Prefer Poster Session

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