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Characterization of pulsed discharges for next-generation plasma processes SANG-HUN SEO, SHIN-JAE YOU, KAIST, DONG-SEOK LEE, Samsung Electronics, SANG-WON LEE, Plasmart Co., HONG-YOUNG CHANG, KAIST, LOW-TEMPERATURE PLASMA LAB. KAIST TEAM, PLASMART CO. COLLABORATION, SAMSUNG ELECTRONICS COLLABORATION — As the device size is rapidly shrunk, various issues have been encountered in plasma etching processes for manufacturing of semiconductor with feature size of few tens nm. In particular, the deep contact hole etching with high aspect ratio becomes more and more difficult with reducing the contact-hole size and the serious distortions of contact profile are observable. Although several mechanisms on the distortion of contact profile, especially bowing and necking, have been suggested, any solutions on the basis of these mechanism have not been proposed. In this study, we concerned about the local pressure around the etched hole and propose new mechanism on bowing, tilting, and necking. In small and high-aspect-ratio contact, ions incident to the contact hole can give an amount of pressure to the by-products which are formed inside the contact hole and pumped out outside the contact hole, resulting in the increase of local pressure around the contact hole. We call this the ion-pressure effect. For the relief of the ion pressure, we investigated the pulse-modulation of rf power in ICP and CCP as the preliminary work and found that the modulation of bias power instead of source power is needed to relieve the incident ion pressure.

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