[PS-03]

Introduction to poly etcher using VHF-ICP source for next generation etch processing

Gi-Chung Kwon, Hong-Seub Kim, Seong-Hyuk Choi, Y. K. Lee*, and H. Y. Chang*
Jusung Engineering Co., Ltd., 49, Neungpyeong-Ri, Opo-Eup,
Kwangju-Si, Kyunggi-Do 454-892, Korea
*Department of Physics, KAIST, 373-1 Kusong-dong,Yu-Sung Gu, Taejon 305-701, Korea

For etching process of the nano-scale device, the challenge is smaller and higher-aspect-ratio features in which the focus is on ensuring correct selectivity and controlling the profile and top/bottom CD. From the plasma process perspective, it is urgently required as low electron temperature, uniform high-density plasma over large area, high-etch selectivity, no charge damage, etc. In this study, we have developed the new plasma source of VHF-ICP with a parallel resonance antenna for dry etcher. In VHF-ICP source, we have obtained the following results. The antenna of the low impedance reached easy impedance matching in VHF and the plasma of the high density was generated by the high current of coils. Also, the uniformity of the density could be adjusted through controlling current which flows into each turns. The low capacitive voltage applied to antenna could minimize capacitive damage and reduce particles from ceramic plate covering chamber. The VHF-ICP source made electron temperature low, which can minimize plasma damage on wafer. The plasma density from this source is $1\times10^{11} \sim 1\times10^{12}$ cm^{-3} and the electron temperature is less than 2.5 eV. We obtained the uniformity of the plasma less than 5 % with ease. For this applications, patterned WSi gate, poly-Si gate, and W-Bit line wafers were etched using VHF-ICP for dry etcher. The process characteristics of dry etcher have obtained no micro-loading effect less than 5 %, high selectivity W to Hard Mask (SiN) more than 2:1, wide range CD bias control between 0 and 20 nm, and vertical profile more than 89 degree for W-Bit line. Also, we have obtained high poly to PR selectivity with low N-&P Bias for gate etch. This source is to hope for good solutions of the nano-scale devices.