TF3-013

Mechanism Study of Flowable Oxide Process for Sur-100nm Shallow Trench Isolation

Daekyoung Kim[1], Haegyu Jang[1], Hun Lee[2], Kichul In[2], Doohwan Choi[2], Heeyeop Chae[1,3]*

[1]Sungkyunkwan University Advanced Institute of Nano technology (SAINT), Suwon 440-746, Republic of Korea, [2]School of Chemical Engineering, Sungkyunkwan University, Suwon 440-746, Republic of Korea, [3]KOOKJAE. ELECTRIC KOREA CO.,LTD

As feature size is smaller, new technology are needed in semiconductor factory such as gap-fill technology for sub 100nm, development of ALD equipment for Cu barrier/seed, oxide trench etcher technology for 25 nm and beyond, development of high throughput Cu CMP equipment for 30nm and development of poly etcher for 25 nm and so on. We are focus on gap-fill technology for sub-30nm. There are many problems, which are leaning, over-hang, void, micro-pore, delaminate, thickness limitation, squeeze-in, squeeze-out and thinning phenomenon in sub-30 nm gap fill. New gap-fill processes, which are viscous oxide-SOD (spin on dielectric), O3-TEOS, NF3 Based HDP and Flowable oxide have been attempting to overcome these problems. Some groups investigated SOD process. Because gap-fill performance of SOD is best and process parameter is simple. Nevertheless these advantages, SOD processes have some problems. First, material cost is high. Second, density of SOD is too low. Therefore annealing and curing process certainly necessary to get hard density film. On the other hand, film density by Flowable oxide process is higher than film density by SOD process. Therefore, we are focus on Flowable oxide. In this work, dielectric film were deposited by PECVD with TSA(Trisilylamine - N(SiH3)3) and NH3. To get flow-ability, the effect of plasma treatment was investigated as function of O2 plasma power. QMS (quadruple mass spectrometry) and FTIR was used to analysis mechanism. Gap-filling performance and flow ability was confirmed by various patterns.

Keywords: Flowable Oxide, Mechanism