Sym. A : Silicon Process

ETCHING & DEFECTS IN Si

A-THU-13

TRENCH ETCHING FOR SHALLOW TRENCH ISOLATION USING Cl2/Ar PLASMA, C. B. KIM, B. J. JUN, J. K. KIM, D. D. LEE, Y. S. SEOL(Semiconductor Research Division, Hyundai Electronics Industries Co. Ltd, Ichon-si 467-860, Kyoungki-do, Korea)

Using Cl_2/Ar plasma in magnetically confined reactor, we investigated the trench etch characteristics of various features ranging from 0.18㎛ to open spacing including trench depth uniformity, top and bottom corner rounding, and profile microloading effect for resist mask and nitride hard mask base trench etchings. The trench depth uniformity was worse than 10% when trench etching was performed in 9mT for the resist mask regime. However, the uniformity was improved to less than 5% with decreasing the pressure to 3mT in main etch or subsequent bottom rounding step. The profile microloading effect was also affected by the pressure: the trench profile was improved from 86° ~65° range between 0.20㎛ and open spacing to 87° ~76° range when the pressure was changed from 9mT to 3mT. However, the profile microloading was negligible for the hard mask regime. Rounded bottom corner was achieved by applying specially designed bottom rounding steps in which the rounded profile is made at bottom corner by polymer generation.

A-THU-14

CHARACTERISTICS OF Ir ETCHING FOR 0.20 μ m PATTERN, B.J. PARK, H.S. SHIN, J.W. KIM, Y.S. SEOL, D.H. LEE(Semiconductor Research Div. Hyundai Electronics Industries, Ichon, Kyungkido, 467-701, Korea), Y.K. CHO(Tegal Corp. Korea. Sungnam, Kyungkido, 463-020, Korea)

It is well known that Ir is a very attractive material for the capacitor electrode of DRAM with high dielectric material. It has a good capability of oxygen diffusion barrier from high dielectric material to sub-electrode during anneal in high temperature. We have investigated the statistical matrix experiment with dry etching parameters such as gas chemistry and power with modified RIE in Ir patterning. The results show that power was the most effective factor of etch rate and Cl_2 gas flow rate was important to anisotropy. And Optical Emission Spectrometer(OES) was used for plasma analysis such as relative Ar/Cl_2 ratio and tool of endpoint detection during the Ir etching. Finally optimized etch process was applicable to real device development for beyond 1G bit DRAM.

A-THU-15

DEFECT FORMATION IN SILICON WAGER SURFACE LAYER AND ITS INFLUENCE ON THE BULK PROPERTIES, Kira L. Enisherlova (Sc. Institute "Pulsar",St.Okruznoi proezd, 27, Moscow, Russia), Galina K. Ippolitova, Tatiana M. Tkacheva, George N. Petrov (ELLINA-NT, R&D Co., Dm. Ulianova St., 1/61 ap.19, Moscow, Russia)

By using the oxygen and carbon ion implantation into silicon wafers grown by floating zone technique as a tool the precipitation process in the presence of carbon in investigated. The defect structure formation and its transformation under high temperature treatment are a function of the presence and interaction between the native point defects and impurities (first of all, oxygen and carbon). The carbon influence on the precipitation in silicon is considered. The analysis of the implantation conditions and the following annealing conditions on the type and density of created defects is carried. The difference in the residual oxygen concentration can reach two orders of magnitude. In the presence of carbon is possible to observe oxygen precipitation even in the silicon samples grown by floating zone technique. It is necessary to control these processes during the whole technological cycle to obtain the high quality of the silicon wafer bulk

A-THU-16

EVALUATION OF STRESS INDUCED DEFECTS DUE TO RECESSED LOCOS PROCESS, YASUYUKI AOKI, NOBUYUKI KAWAKAMI*, KENTARO SHIBAHARA and SHIN YOKOYAMA(Res. Ctr. for Nanodevices and Systems, Hiroshima Univ., Higashi-Hiroshima 739-8527, Japan, *Electronics and Information Technology Lab., Kobe Steel Ltd., Kobe 651-2271, Japan)

Defects induced during recessed LOCOS process for deep submicron isolation was investigated. Si_3N_4 line patterns which consist of various widths were designed to evaluate defect density. Interval of the Si_3N_4 which corresponds to the field oxide width was 0.5 μm. Defects were observed as pits after Wright Etching. Stress distribution was calculated utilizing process simulator "T-Suprem4". The density of the defects were influenced by recessed depth and the width of the Si_3N_4 patterns. In the case of 30 nm recess depth, the etch pit density was increased as the Si_3N_4 became wider. This tendency is attributed to intrinsic stress of Si_3N_4 film, since the stress increases as the Si_3N_4 becomes wider. On the contrary, in the case of 50 nm depth, the density was decreased as the Si_3N_4 became wider. Magnitude of the intrinsic stress of Si_3N_4 film which concentrates at the bottom corners of the recessed Si is lowered by making the recess deeper, namely by separating the corner from the Si_3N_4. However, oxidation induced stress which is a considerable origin of the contrary tendency becomes higher because of the deeper recess.

THURSDAY