P-009

SELECTIVE CHARACTERIZATION AND COMPLETE PLANARIZATION OF PLUG WITH ALUMINUM BY CYCLE CHEMICAL VAPOR DEPOSITION, SEONG-DEOK AHN and SANG-WON KANG(Dept. of Materials Science & Engineering, KAIST, Taejon, 305-701, Korea)

The complete selective chemical vapor deposition (CVD) of Al is very attactive for filllling narrow holes. We have developed the cycle-CVD technique to accomplish the complete selective CVD. Cycle-CVD of Al films is constituted by sequential introduction of Al MO source and purge gas. This technique is combined by two key technologies. One is the precise control of the amount of Al MO source and source injection time to ascertain the Al nuclei below the critical size. The other is the precise control of the purge time to accomplish the complete extinction of embryos. As a result of cycle-CVD, we expect the complete selective deposition of Al film and this technique is the most promising technology for filling narrow holes and the palnarization of deep-submicron contact/via holes.

P-010

CHEMICAL VAPOR DEPOSITION OF COPPER ON SURFACE MODIFIED POLYIMIDE, JUNG-YEUL KIM (Dept. of Semiconductor Eng, Uiduk Univ., Kyongju, 780-910, Korea), and D.K. Park (Dept. of Electronic Mat. Eng, Suwon Univ., Suwon, 445-890, Korea)

The selective chemical vapor deposition of the copper from (hfac)Cu(VTMS)(hfachexafluoroacetylacetonate;VTMSvinyltri methylsilane) precursor onto the surface-modified polyimide substrate has been studied to understand the mechanism of nucleation and growth as a function of surface pretreatment. No copper deposition was observed on both unmodified and Ar ion beam treated polyimide substrate. However, blanket copper deposition was observed on the surface of the oxygen RIE treated polyimide substrate. Selected-area, laser-aligned, x-ray photoelectron spectroscopy (SAXPS) results showed that the oxygen RIE oxygenates the PI resulting in a supersaturated carbonyl oxygen on the PI surface. The nucleation and growth of copper CVD film on the surface of oxygen RIE treated PI substrate can thus be explained by the preferential reaction of surface carbonyl groups of PI with the vapor phase precursor. SEM results also revealed that copper films grew on the substrate surface by the Volmer-Weber mechanism.

P-011

OXIDATION OF Cu(Mg) ALLOY THIN FILMS, HEUNGLYUL CHO, JAEGAB LEE(Dept. of Metallurical Eng. Kookmin Univ.), EUNGU LEE, KIBUM KIM

Recently, copper alloys have attracted attentions for their applications in microelectronic device interconnections because alloying elements in copper alloys are able to form stable surface-oxide barrier layer at the low annealing temperature, thus resulting in passivating copper surfaces. Another advantage is to improve the adhesion of copper to SiO_2. Furthermore, the addition of alloying element causes a slight increase in resistivity. However , the passivating mechanism and the behavior of alloying elements during oxidation are not well understood. Therefore, we have investigated the oxidation of Cu-Mg alloy in the controlled oxidation ambient to identify the sequence of oxidation for Cu-Mg alloy. The results revealed that the addition of Mg to pure copper enhanced the adhesion of copper to SiO_2 significantly and effectively suppressed the growth of Cu_2O on the surface. It was noted that the mechanism for oxidation of Cu-Mg alloy in the low oxygen pressure included the sequential formation of MgO and Cu_2O. In addition, the quality of MgO determined the effectiveness of the MgO layer as an passivating layer. It was observed that the presence of oxygen in the alloy affected the quality of the passivation layer. Oxidation of the alloys in the low pressure of oxygen reduced the resistivity to 3.0 $\mu\Omega$-cm. Also the surface morphology after oxidation of the alloy was identified to be dependent on the content of Mg.

P-012

SUPPRESSION OF CORROSION PHENOMINON ON AlCu SURFACE WITH FLOURINE TREATMENT, S. G. KIM, K. H. BACK, C. I. KIM*, J. KIM, J. G. KOO, and K. S. NAM (Semicon Div. ETRI, Daejon, 305-600, Korea, Electrical&Electronic Eng. Chungang Uni. 156-756, Korea)

The inclusion of copper(Cu) in Al, inhibiting electromigration, offers a more difficult plasma etching challenge. One of the difficulties is that the concentration of Cu may result in accelerated corrosion of Al in the presence of Cl and moisture. In this study, the corrosion phenomenon on the etched Al-Cu film surfaces has been investigated by SEM, XPS, ellipsometry, and TEM.

Chlorine(Cl)-based gas chemistry is generally used to etching for Al-Cu films metallization. After etching Al-Cu alloy films using $SiCl_4/Cl_2/He/CHF_4$ plasma, a corrosion phenomenon on the AlCu surface has been studied with XPS. SF_6 plasma treatment subsequent to the etch process prevents the corrosion effectively in the pressure of the 300mtorr. It is found that the chlorine on the etched surface is not substituted for fluorine atoms during SF_6 treatment, but a passivation layer on the surface by fluorined-related compounds would be formed. The passivation layer prevents the moisture penetration on the SF_6 treated surface and suppresses the corrosion successfully.

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