## Sym. A : Silicon Process

METALIZATION & INTERCONNECTION- I

### C-WED-02

**ELECTROMIGRATION IN PLASMA ASSISTED CHEMICAL VAPOR DEPOSITED ALUMINUM,** D.C. KIM, B.I LEE and S.K JOO. (Div. of MS. & E., College of Engineering, Seoul National University, San 56-1, Shillim-dong, Kwanak-ku, Seoul, 151-742, Korea)

Chemical vapor deposition of aluminum has been extensively studied for the metallization of ULSI circuits. One of the most serious problems in Al CVD studies has been Cu incorporation.

To obtain Copper-alloyed CVD aluminum, we approached a post annealing process for diffusing Cu from sputtered pure Cu or binary compound Cu thin layer deposited on the PACVD Al film. Especially, the compound Cu film has a nearly eutectic composition(Al-33wt%Cu). The efficiency of the compound Cu as a diffusion source was compared with that of pure Cu. We will characterize the influences of microstructure and distribution of Al-Cu second phases on electromigration performance of the PACVD Al film alloyed by diffusion process.

### C-WED-03

**THE ROLE OF MICROSTRUCTURAL CONTROL IN DESIGNING HIGHLY RELIABLE MICORELECTRONIC INTERCONNECTS,** S. H. Kang and J. W. Morros, Jr. (Center for Advanced Materials, Lawrence Berkeley National Laboratory and Department of Materials Science, University of California, Berkeley, CA 94720)

The reliability of microelectronic devices requires functional, mechanical, and structural stability of its active elements during operation. Many failure modes that limit the reliability are governed by microstructural features whose scale changes with miniaturization of the devices. An important case is presented here: electromigration failurein interconnects. We demonstrate the microstructural mechanisms of electromigration failure, particulary in Al-alloy interconnects, which have been understood both by experiments and by theoretical modeling. Miniaturization creates a quasi-bamboo microstructure whose resistance to electromigration failure is governed by its longest polygranular segments. A metallurgical technique that controls the segments then improves the reliability of the interconnects. A simple phenomenological equation is proposed to provide a methodology for assessing interconnect reliability.

### C-WED-04

INTERFICAL REACTION OF METAL THIN FILMS ON ION IMPLANTATED SILICON UNDER HIGH CURRENT DENSITY, **H. H. LIN**, K. N. CHEN, S. L. CHENG and L. J. CHEN (Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan)

Multilevel metal wiring structures are widely used in VLSI technology. The minimization of critical dimensions in electronic devices gives rise to an increased density of structures per wafer. As a result, the circuit current densities and Joule heating increase with the scale.

In the present study, for both Ni(or Co)/$n^+$-Si contacts, failure at the positive contacts was found to be controlled by a wear-out mechanism due to electromigration-assisted Ni(or Co) diffusion away from the Si, and the local heating occurred at the metal/Si interface. On Ni(or Co)/$p^+$-Si contacts, the electron-hole recombination contributes substantially to the preferred failure at the negative contacts. Network structure was found in both Co and Ni samples. The network structure is induced by the constitutional supercooling of metal-Si melts. The depth of silicide formation is near the junction depth. I-R curve indicates that the Joule heating is dominant initially. Above the critical current, the resistance decrease is due to metal/Si-junction leakage. Finally, only in the Ni/$p^+$-Si system, nickel silicide line is formed and occurs only in the $p^+$-Si channel.

## Sym. I : Polymers for Electronics

LED - Ⅲ

### C-WED-05

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The design of conjugated polymers for electro-luminescence requires an understanding of fluorescence, processibility of thin films and device physics. The synthesis and properties of some solution-processible 2,3-disubstituted poly(arylene vinylene) derivatives and a cyclic crown ether analogue will be reported. The luminescent properties can be rationalised in terms of the X-ray structure of a model "oligomer".

Organic-based field effect transistors are of considerable interest in a variety of low cost applications. In this paper we report the use of a fused thiophene derivative which has a remarkably good mobility and a high on/off ratio as the active layer in a thin film field effect transistor configuration. Important understandings of the π-π interactions are obtained from the X-ray crystal structure.