OPTIMIZATION OF ELECTROLESS Co(W,P) DEPOSITION FOR Cu INTERCONNECT APPLICATION

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Damascene copper metallization schemes for Ultra-Large-Scale-Integration (ULSI) applications in sub-0.18 μm technology require application of a barrier/capping layers. Such layers are expected to be thin (50-100 A)[1] and made up of amorphous alloys of Co(Ni), P and refractory metal such as W, Mo, V, which can be formed using electroless plating method. In fact, it has already been shown that thin electroless Co(W,P) films can act as a barrier layer against Cu diffusion up to 550°C.[2] Intensive research is underway in order to implement this amorphous alloy with its deposition process in Cu interconnect manufacturing scheme.

In this paper we present results on the optimization of electroless deposition bath in order to obtain the most desirable material and chemical properties of the deposited film. Our analysis focused primarily on the effect of complexing agents on the deposition rate, film composition, and structure. The parameters of the electroless plating process such as plating temperature, pH and kinetics were demonstrated to be dependent on the ligand type. Most of the depositions were performed at 75 ^{o}C with deposition times varying from 0.5 to 7 minutes. Nevertheless, deposition can be performed at significantly lower temperature, i.e. room temperature, by properly adjusting the bath composition. Our investigation revealed that the complexing agent impose a major impact on all of the parameters investigated.

Some examples on the successful process integration of Co(W,P) layer for Cu interconnect manufacturing will also be presented.

References

1. Roadmap of Microelectronics Technology. Interconnections 2001 update.
2. Kohn A., Eizenberg M., Shacham-Diamand Y., Israel B., Sverdlov Y., *Microel. Eng.,* **55;** 297, (2001).