

Interface Characteristics of Ion Beam Mixed Cu/Polyimide System

C.N. Whang

Department of Physics, Yonsei University, Seoul, Korea

ABSTRACT

In the very large scale integration(VLSI) and high minimization of electronic device, it is very important to develop the multilevel system which vertically accumulates the metal/polymer system. However, the poor adhesion on the interface of metal and polymer cause dropping function of the device and shortening its life. This study develops the method of adhesion enhancement and shows its mechanism by using Cu and polyimide which are most prevalent of metals and polymers.

Cu/polyimide and Cu/Al/polyimide(which Al as a interlayer which adheres better to polyimide than Cu is inserted) are irradiated with various doses by 80 keV Ar⁺ and N₂⁺. The scratch test shows that the interfacial adhesion of Cu/Al/polyimide is superior to that of Cu/polyimide. RBS analysis proves that Cu/Al/polyimide forms new phase while Cu/polyimide shows only inter-mixing phenomenon. XPS analysis shows that amide and tertiary amine work as adhesion promotors, while amorphous carbon does as a restraint factor. The analysis of change of void ratio to total material by sample, and the denseness reduces the probability of bonding between adhesion promotors and metals.

We can know that the interfacial adhesion of Cu/polyimide is most excellent from overall analysis under the condition that N₂⁺, is irradiated and Al is inserted and ion beam mixing technique is very useful in improving the adhesion between metal and polymer.