[II~12]

Properties of Copper Film on Si(100) and Si(111) Substrate by Ionized Cluster Beam Deposition (ICBD)

Sung Han*, Ki-Hwan Kim, Hong-Gui Jang, Ki Hyun Yoon*, Hyung-Jin Jung, Seok-Keun Koh

Division of Ceramics, Korea Institute of Science and Technology,
P.O. Box 131, Cheongryang, seoul, 130-650, Korea

*Department of Ceramic Engineering, Yonsei University**

Copper thin film has been investigated as metallization for ULSI device due to low electronic resistivity and high electromigration resistance. These properties can be obtained from relatively very dense film and good crystallinity. The various metal film that has high density and preferred orientation can be made by ionized cluster beam deposition (ICBD). In this study, the copper films were prepared by ICBD system. The copper films were deposited on Si(100) and Si(111) substrate as a function of various acceleration voltage(Va) and film thickness. The deposition rate was 0.3 Å/sec. The copper films were deposited at room temperature and working pressure was $5 \times 10^{-7} \sim 1 \times 10^{-6}$ torr. Ionization voltage was 450 V and acceleration voltage was ranged from 0 to 4 kV. The film thickness was varied between 100 and 1000 Å Crystallinity was investigated by intensity ratio (200) to (111) of XRD pattern. Surface morphology analysis of each copper film was carried out by SEM and AFM image. The resistivities of copper films deposited under various conditions were measured by 4-point probe method. By using these results, each copper film on Si (100) substrate was compared to that on Si (111).