

**Adhesion Enhancement of Cu Films on Polyimide Using Ion Beam Processing****Won-Kook Choi, Ki-Hwan Kim, Hong-Gyu Jang, Hyung-Jin Jung, and Seok-Keun Koh**

Kim Sung Ryong\*

*Division of Electro-Optic Ceramics, Korea Institute of Science and Technology, Cheongryang P.O. Box 131, Seoul, Korea* , *Samyangsa R&D center\**

Previously, it was reported that the adhesion between metal/polymer system such as Al/PC<sup>[1]</sup>, Al/PMMA<sup>[2]</sup>, and Cu/Teflon<sup>[3]</sup> was greatly improved by depositing metal films on polymer substrate irradiated by keV ion beam in O<sub>2</sub> environment. Cu films 1000 Å thick were deposited on the PI substrate using ion beam sputtering(Method I). Before Cu deposition, the PI substrate were modified by 1 keV ion beam irradiation with a dose of  $1 \times 10^{15} \sim 1 \times 10^{17}$  in O<sub>2</sub> environment. A cold-hollow cathode 5 cm gridded ion source was used for the surface modification and Cu deposition.

Moreover, Cu films were deposited by a partially ionized beam(PIB) source in which Cu particles were ionized and accelerated from 0 to 4 kV(Method II). The adhesion of the Cu films was examined using a scotch tape test and a scratch test. For the study of chemical reaction at the interface using XPS analysis, the Cu films 50 Å thick were also deposited in each process.

In Method I, the enhancement of adhesion was explained by the increase of hydrophilic group of carbonyl C=O bonding on modified PI surface and hence the organo-metallic bonding occurred at the interface. In Method II, the Cu 2*p* core-level was shifted to higher binding energy as the acceleration voltages were increased, and which indicated that Cu acted as a donor and chemical reaction occurred between Cu and the PI substrate.

- [1] S.K. Koh, S.K. Song, W.K. Choi, H.-J. Jung, and S.N. Han, *J. Mat. Res.* **10(9)**, 2390 (1995).
- [2] S.K. Koh, W.K. Choi, S.K. Song, H.-J. Jung, and S.N. Han, *Ungyong Mulli*, **8(2)**, 193 (1995).
- [3] S.K. Koh, W.K. Choi, C.G. Choi, S.C. Park, and H.-J. Jung, Applying for US patent.