Abstract Submitted
for the GEC05 Meeting of
The American Physical Society

Plasma CVD of a-C:F Films Using C_8F_{18} and Characterization of their Properties YOSUKE SAKAI, SHOTA TAZAWA, YOSHIYUKI SUDA, HIROTAKE SUGAWARA, Hokkaido University — We have composed low-k amorphous fluorocarbon (a-C:F) dielectric films on the surface of spherical Al electrodes using a C_8F_{18} plasma CVD for development of a composite insulation system. The relative dielectric constant k of the a-C:F films was less than 2.5. An a-C:F film of the thickness of 1 μm on the electrode enhanced the insulation tolerance of sphere-to-sphere electrodes systems in Ar, N_2 and He about 700 V around the pd values of their Paschen minima. The C_8F_{18} plasma was analyzed with optical emission spectroscopy and mass spectrometry. It was found that CF_3 was one of the major fragment species derived from C_8F_{18}. The intensity of the CF_3 appearance was 6–10 times as much as that of CF_2, which was considered to be a primary precursor of a-C:F. In addition, C_2F_4 (= 100), C_2F_5 (= 119), C_3F_5 (= 131), C_3F_7 (= 169) and C_4F_7 (= 181) were detected by the mass spectrometry done in a molecular weight range $\leq$ 200. An FT-IR measurement showed that $=CF_2$ bonds more than $\equiv$CF bonds were involved in the deposited a-C:F films. The F/C ratio measured by an XPS observation was 1.4–1.5, and this ratio seemed independent of the CVD condition in the range of the C_8F_{18} pressure of 0.2–0.4 Torr and the input power of 80–100 W. The deposition rate was over 300 nm/min. This work was in part supported by a Grant-in-Aid of JSPS.

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Date submitted: 13 Jun 2005 Electronic form version 1.4