

**Deposition of Plasma Polymerized Films on Silicon Substrates
Using Plasma Assisted CVD Method For Low Dielectric Application**

M. C. Kim, S. H. Cho, J. -H. Boo, S. B. Lee, J. G. Han, B. Y. Hong, S. H. Yang¹

Center for Advanced Plasma Surface Technology, Sungkyunkwan University, Suwon 440-746, Korea

¹Plasma Technology Application Division, Korea Institute of Industrial Technology, Chonan 330-820, Korea

Abstract

Plasma polymerized thin films have been deposited on Si(100) substrates at 25-400 °C using thiophene (C₄H₄S) precursor by plasma assisted chemical vapor deposition (PACVD) method for low-dielectric device application. In order to compare physical properties of the as-grown thin films, the effects of the plasma power, gas flow ratio and deposition temperature on the dielectric constant and thermal stability were mainly studied. XRD and TED studies revealed that the as-grown thin films have highly oriented amorphous polymer structure. XPS data showed that the polymerized thin films that grown under different RF power and deposition temperature as well as different gas ratio of Ar:H₂ have different stoichiometric ratio of C and S compared with that of monomer, indicating a formation of mixture polymers. Moreover, we also realized that oxygen free and thermally stable polymer thin films could be grown at even 400 °C. The results of SEM, AFM and TEM showed that the polymer films with smooth surface and sharp interface could be grown under various deposition conditions. From the electrical property measurements such as I-V and C-V characteristics, the minimum dielectric constant and the best leakage current were obtained to be about 3.22 and 10-11 A/cm², respectively.