PACVD of Plasma Polymerized Organic Thin Films and Comparison of their Electrochemical Properties

[1]I.-S. Bae, [1]S.-H. Cho, [1]M.-C. Kim, [2]Y.-H. Roh, and [1]J.-H. Boo

[1]Institute of Basic Science and Department of Chemistry, Sungkyunkwan University, Suwon 440-746, Korea

[2]School of Electrical and Computer Engineering, Sungkyunkwan University, Suwon 440-746, Korea

Plasma polymerized organic thin films were deposited on Si(100) glass and metal substrates using thiophene and ethylcyclohexane precursors by PECVD method. In order to compare electrochemical properties of the as-grown thin films, the effects of the RF plasma power in the range of 30~100 W. AFM showed that the polymer films with smooth surface and sharp interface could be grown under various deposition conditions. Impedance analyzer was utilized for the determination of I-V curve for leakage current density and C-V for dielectric constants, respectively. To obtain C-V curve, we used a MIM structure of metal(Al)-insulator(plasma polymerized thin film)-metal(Pt) structure. Al as the electrode was evaporated on the thiophene films that grew on Pt coated silicon substrates, and the dielectric constants of the as-grown films were then calculated from C-V data measured at 1MHz. From the electrical property measurements such as I-V and C-V characteristics, the minimum dielectric constant and the best leakage current of thiophene thin films were obtained to be about 3.22 and 1×10^{-11} A/cm^2. However, in case of ethylcyclohexane thin films, the minimum dielectric constant and the best leakage current were obtained to be about 3.11 and 5×10^{-12} A/cm^2.