

Hybrid-Polymer Thin Films by PECVD Method and Characterization of Their Electrical and Mechanical Properties

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Organic-Inorganic hybrid polymer-like thin films have been deposited on glass and silicon substrates under the several condition such as different temperature, the ratio of ethylcuclohexane and TEOS and RF power by plasma enhanced chemical vapor deposition(PECVD) method using single molecular precursors of the organic-inorganic hybrid polymers. Ethylcyclohexane and TEOS (tetraethylorthosilicate) were utilized as organic and inorganic precursors, and hydrogen and Ar (argon) were used as a bubbler and carrier gases, respectively. In order to compare the difference of the electrical and the optical properties of the plasma polymerized thin films, we grew the hybrid polymer-like thin films under the conditions of various RF (radio frequency using 13.56 MHz) powers in the range of 20~100 W and deposition temperatures. The as-grown polymerized thin films were in first analyzed by FT-IR, UV-Visible spectroscopy, SEM, and AFM. The result of FT-IR and UV-Visible measurement showed that the plasma polymerized thin films have highly cross-linked density with increasing RF power, TEOS ratio, and deposition temperature. AFM and SEM also showed that the polymer films with smooth surface and sharp interface could be grown under various deposition conditions. Impedance analyzer was utilized for the measurements of I-V and C-V curves. From the electrical properties measurements, the lowest dielectric constant and best leakage constant were obtained to be 2.67 and 10^{-11} A/cm² at 1MV/cm, respectively.