

Study on Synthesis and Analysis of Organic-Inorganic Hybrid polymer Thin films by PECVD for Low-k materials

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Organic-Inorganic hybrid polymer thin films have been deposited on silicon substrates under the several conditions such as the ratio between ethylcyclohexane (ECH) and tetraetoxysilane (TEOS) and RF power by using plasma enhanced chemical vapor deposition (PECVD) method. ECH and TEOS were utilized as organic and inorganic precursors, and H₂ (hydrogen) and Ar (argon) gases were used as a bubbler and carrier gases, respectively. In order to compare the difference of the electrical and the optical properties of the thin films, these were grew up under the conditions of various RF (radio frequency using 13.56 MHz) powers in the range of 20 ~ 60 W and annealed at various temperatures in the range of 200 ~ 500 °C. The as-grown and annealed polymer thin films were in first analyzed by FT-IR (Furie Transform - Infrared), SEM (Scanning Electron Microscope), and AFM (Atomic Force Microscope). The result of FT-IR measurement showed that the plasma polymerized thin films have highly cross-linked density with increasing RF power and TEOS ratio. 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 was obtained to be 1.69, respectively.