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Synthesis and Characterization of Cyclohexene Polymer Thin Films by PECVD Method.

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Polymer-like cyclohexene thin films have been deposited on glass, silicon and copper substrates at below 100 °C for analysis of their various properties by plasma enhanced chemical vapor deposition (PECVD) method. Cyclohexene monomer was utilized as organic precursor, and hydrogen and Ar were used as bubbler and carrier gases, respectively. In order to compare the influence of the electrical and the optical properties of the plasma polymerized organic thin films with deposition conditions such as RF power and deposition temperature. The as-grown plasma polymerized thin films were analyzed by FT-IR, UV-Visible spectroscopy and ellipsometry as well as I-V and C-V curves. As the plasma power was increased, the refractive index of thin films increased and transmittance decreased by ellipsometry and UV-Visible measurement, respectively. The minimum dielectric constant and the best leakage current were 3.0 and 7×10^{-12} A/cm^2, respectively. The corrosion protective abilities of polymerized cyclohexene films were also examined by AC impedance measurements in 3.5 wt.% NaCl solution. We found that the corrosion protection efficiency (P_K), which is one of the important factors for corrosion protection in the interlayer dielectrics of microelectronic devices application, was increased up to 90 % with increasing RF power. AFM and SEM showed that the polymer films with smooth surface and sharp interface could be grown under various deposition conditions.The contact angles also increase with increasing RF power. We also carried out in situ plasma diagnostics by optical emission spectroscopy (OES) for understanding the initial growth behavior of organic polymerized thin films.