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Plasma parameters of the low dielectric constant SiOC(-H) thin films during the PECVD process

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In the multi-level wiring structure in the ultra-large scale integration circuits, a bottleneck against high speed operation of elements is capacitance between wires. In order to decrease the capacitance between wires, it is necessary to reduce the dielectric constant of an interlayer insulating film. Among the low dielectric constant films, the SiOC(-H) film finds appropriate materials for the advanced Cu interconnects applications. Hence, it is of prime importance to analyze and better understand the plasma parameters during the formation of the SiOC(-H) film. In the study, we report on the characterization of the plasma parameters during the deposition of low dielectric constant SiOC(-H) thin films on *p*-type Si(100) substrates by using plasma enhanced chemical vapor deposition (PECVD) method. factors affecting the carbon, hydrogen incorporation into SiO_2 films during plasma-enhanced chemical vapor deposition are studied using in-situ analysis of optical emission spectroscopy (OES) and Langmuir probe measurements. The detailed information of the relative radical densities, electron density (N_e) and electron temperature (T_e) of the bulk plasma were carried out in order to understand the deposition process of SiOC(-H) films. The detailed results are presented. This information's are valuable to prepare the SiOC(-H) films with desirable properties which is required for the next generation integration process.